AMBER
Advancing Materials for Impact

A World Leading SFI Research Centre

Science Foundation Ireland sfi For what's next

Advanced Materials & Bioengineering Research Centre

Dr. Lorraine Byrne, Executive Director AMBER.

HOST INSTITUTION

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

PARTNER INSTITUTIONS

CRANN, RCSI, UCC, Tyndall National Institute, DCU, NUI Galway OÉ Gaillimh, University of Limerick Ollscoil Luimnigh, TUS, UCD University College Dublin An Coláiste Ollscoile, Baile Átha Cliath

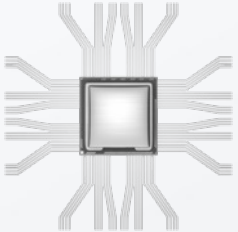
An estimated that 70% the innovations associated with the green and digital transitions will depend on materials

By 2050 90% of electricity generation in Europe will come from renewable sources,
It is estimated that materials represent between 50-70% of the energy market turnover.

Advanced materials for energy storage to facilitate integration of renewables into the grid and the deployment of electric vehicles, Climate Action Plan (2021)

Materials for energy efficient, low carbon footprint buildings, Demand will be driven by emerging policies and regulation including our national target of 10% decrease in embodied carbon in construction materials by 2030

Materials for sustainable packaging,. This will be essential for Irish industry to achieve the Climate Action Plan target of ensuring all plastic packaging is reusable or recyclable by 2030.



Materials for low power, high performance ICT., critical to the European Chips Act Goal of doubling current market share to 20% by 2030. The Irish semiconductor sector providing over 20,000 high skilled jobs and contributing €13.5bn in export revenue and €450m of R&D spend annually.

Customized medical engineered materials and implants to promote tissue regeneration,. This will inform the next generation of medical devices, Irish sector; 450 companies employing 42,000 people and contributing over €12 billion in export

International Context

The "4 Ds of the future" "Demographics, Decarbonisation, Digitalisation and Deglobalisation"

Demographics and Societal Factors

Due to continued population growth and convergence of living standards, **the global demand for raw materials will rise from 89 Gt in 2017 to 167 Gt in** 2060. (OECD)

CLIMATE CHANGE

OECD are projecting total green house gas (GHG) emissions to reach 75 Gt CO2(eq) by 2060 of which 50 Gt CO2(eq) is associated with "materials management

Corporate, Sustainability, Due Diligence Directive

SUPPLY CHAIN VULNERABILITIES

Trade policy are being increasingly driven by national security considerations. (CRM act, Chips Acts etc)

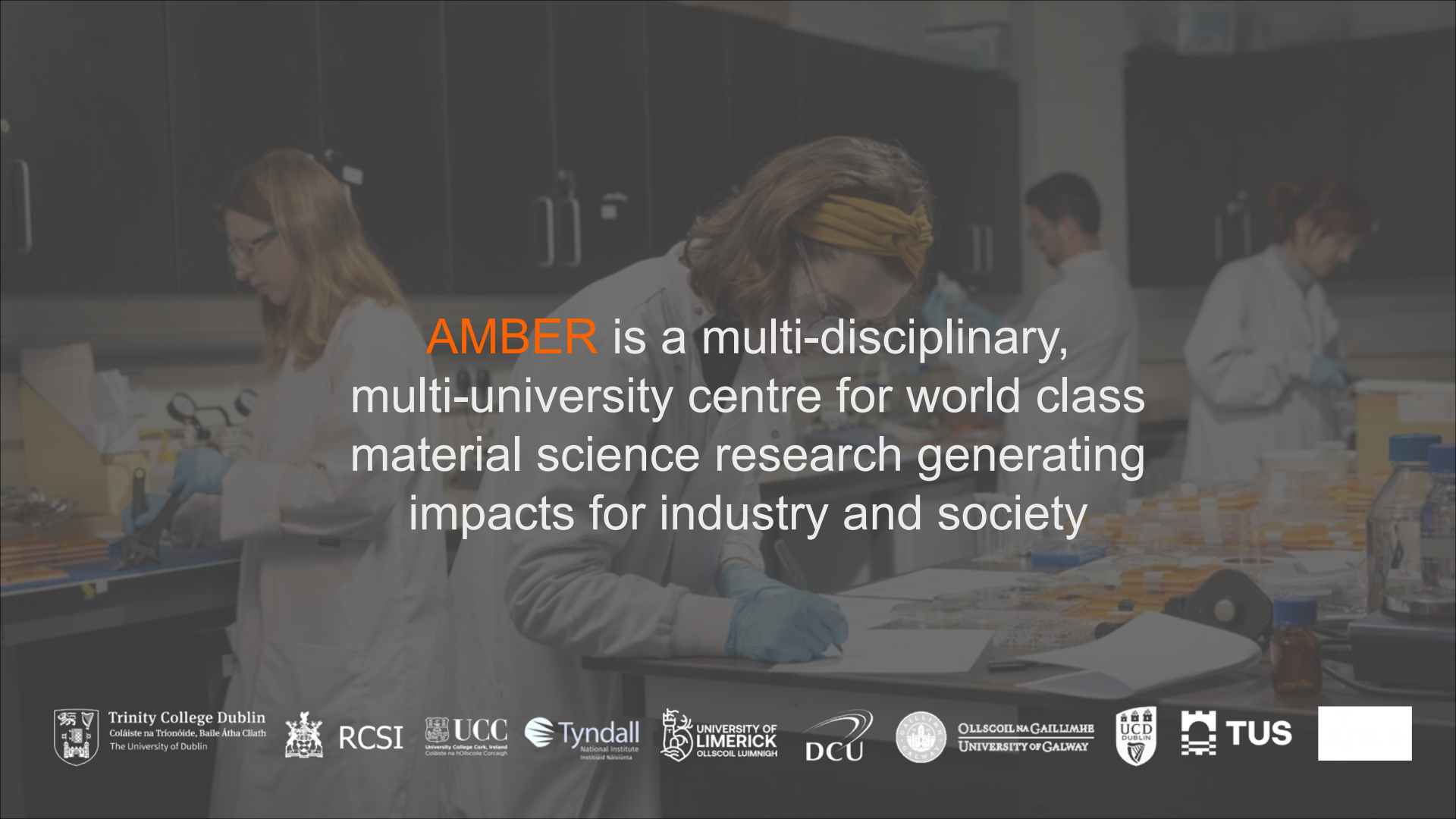
"Friend Shoring" practises

Talent and Skills

Ever present demand for the skillsets associated with scientists and engineers (e.g. critical analysis, problem solving)

The increasing pervasiveness of AI

"green skills" gap


AMBER is a multi-disciplinary, multi-university centre for world class material science research generating impacts for industry and society
Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin
RCSI
UCC
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh
Tyndall
National Institute
Institiúid Náisiúnta
UNIVERSITY OF LIMERICK
OLLSCOIL LUIMNIGH
DCU
OLLSCOIL NA GAILLIMHE
UNIVERSITY OF GALWAY
UCD DUBLIN
TUS

Our Mission: To drive excellence in materials science research for people, planet and prosperity.

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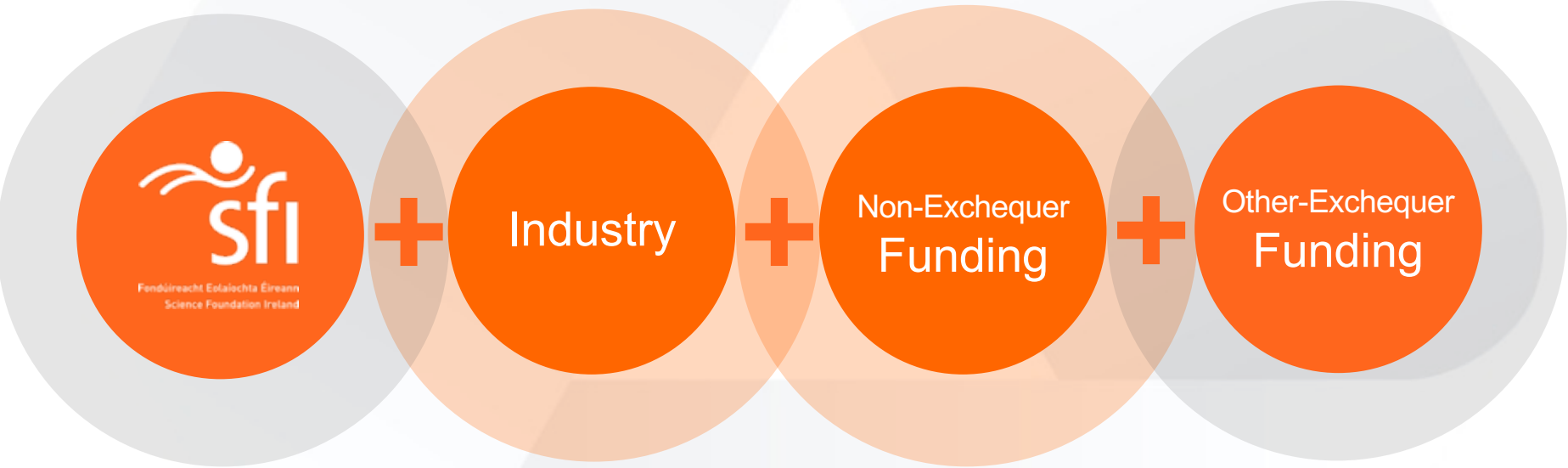
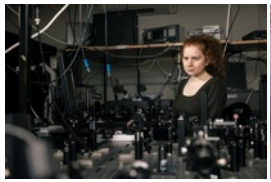
Centre model drives synergies between Researchers and with Industry as a means of Creating Impact beyond Individual Awards

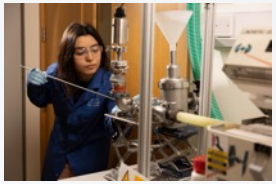
Our Funding

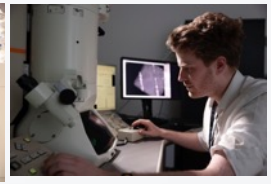

sfi
Fondúireacht Eolaíochta Éireann
Science Foundation Ireland
Industry
Non-Exchequer
Funding
Other-Exchequer
Funding

Our Investigators

AMBER at a Glance






89 ACADEMIC INVESTIGATORS

150 Postdoctoral Researchers

114 PhD Students

59* INDUSTRY PARTNERS

€21M* INDUSTRY FUNDING

€18M* INDUSTRY IN-KIND FUNDING

€65M* NON-EXCHEQUER FUNDING

30 EUROPEAN RESEARCH COUNCIL AWARDS

1.74 Field weighted Citation Impact

*Since inception in 2013

Research programme builds on the Centre's Pillars of Expertise into 4 Fundamental Research Themes and targeted areas with Industry

Targeted Projects with industry

- ICT Materials & Devices
- Sensor Materials
- Industrial materials & coatings
- Medical Devices
- Sustainability & the circular economy

Fundamental Research Themes

- Materials for ICT
- Materials for Energy
- Engineered Functional Materials
- Materials for Health

Underpinning Pillars of Expertise

- 2D Materials
- Modelling & Theory
- Synthesis & Fabrication
- Characterisation
- Bioengineering

AMBER II funding will see the Centre coalesce around key societal challenges

Information & Communication Technology

Creating computers with better memory and energy efficiency

Preparing for the next wave semiconductor manufacturing that is green and low power. Materials to enable next generation of low power, high performance devices and creating new forms of communication devices such as wearable and flexible electronics

AMBER II funding will see the Centre coalesce around key societal challenges

Materials for Energy

Research cluster creating next generation renewable energy technologies from Na Ion batteries, to CO2 capture and storage to green hydrogen.

AMBER enabling Interdisciplinary, Inter-Institutional engagement across key research themes

Materials for Health

Research cluster spanning engineering, materials science, pharmaceutics, cell and gene therapy delivery, immunology, stem cell biology and clinical medicine across RCSI, TCD, NUIG & UCC

AMBER II funding will see the Centre coalesce around key societal challenges

Materials for advanced manufacturing & industrial processes

Processes and self-assembly of nanomaterials and (bio)polymers into functional films and coatings which can be nanostructured or patterned for industrial and AM technologies

AMBER enabling Interdisciplinary, Inter-Institutional engagement across key research themes

Engineered Functional Materials (Sustainability)

Cross Centre engagement with UCC, TCD, UL & TUS focussing on materials innovations to enable the ‘circular economy’.

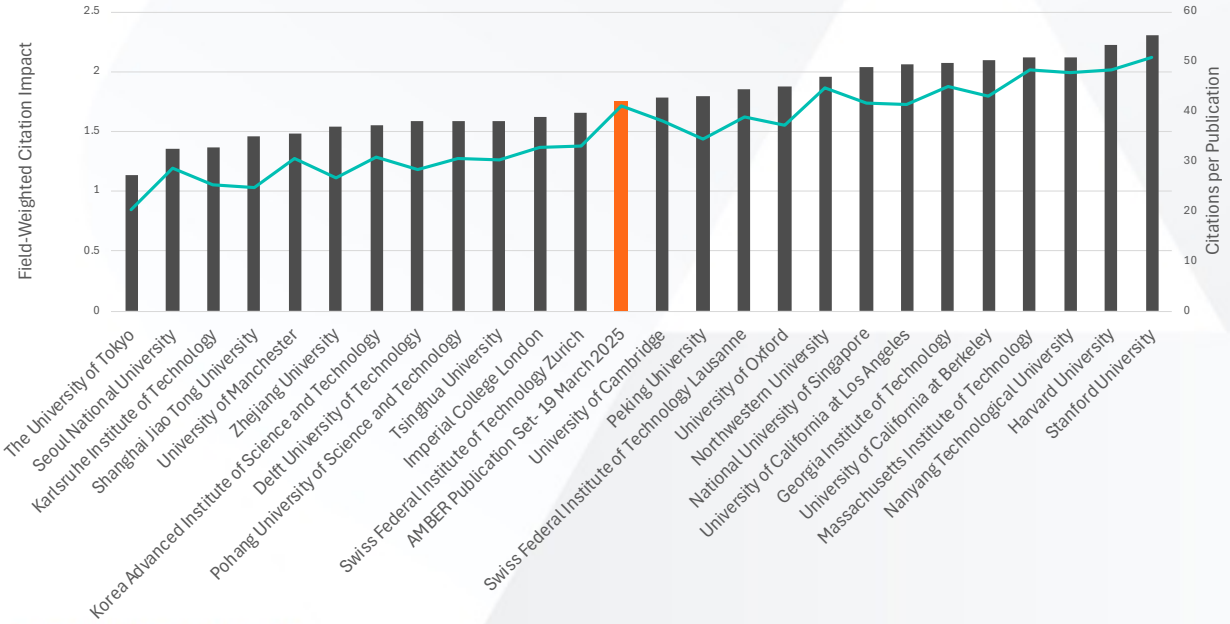
- *High performance recycled polymer materials*
- *Polymers derived from lignin and other sustainable sources*
- *Deprocessing of blister packs for recycling.*
- *Ultra thin glass*

Our Facilities

Scientific Impact

Deliver a programme of world-class basic and applied research, which makes a measurable contribution to advancing the state of the art through high-quality publications, citations, patents, and collaborations

AMBER Publication Metrics compared to QS Rankings top 25 Institutions for Materials Science 2025



1.74 Field-Weighted Citation Impact – all subjects

41 Citations per Publication

50% Publications in Top 10% Journal Percentiles

20% Output in Top 10% Citation Percentiles (%)

Data source SciVal (7 May 2025),
Year range 2013 to 2025
Subject classification ASJC
Filtered by Materials Science

International Engagement

Forge strategic European and global partnerships to strengthen AMBER's international leadership

- 65 % of papers with International Authors
- 1121 Publications
- 1512 International Institutions
- 75 Countries

€42.6M

International Funding Awarded over **115** Projects in phase II

ADMIRE Fellowship Programme

MSCA COFUND Action -12 appointed Postdoctoral fellows

fIIMAGIN3D

MSCA Doctoral Network focused on advancing the state-of-the-art in Fluorescence-lifetime imaging microscopy (Germany, Netherlands, Italy & Denmark)

DeMANS

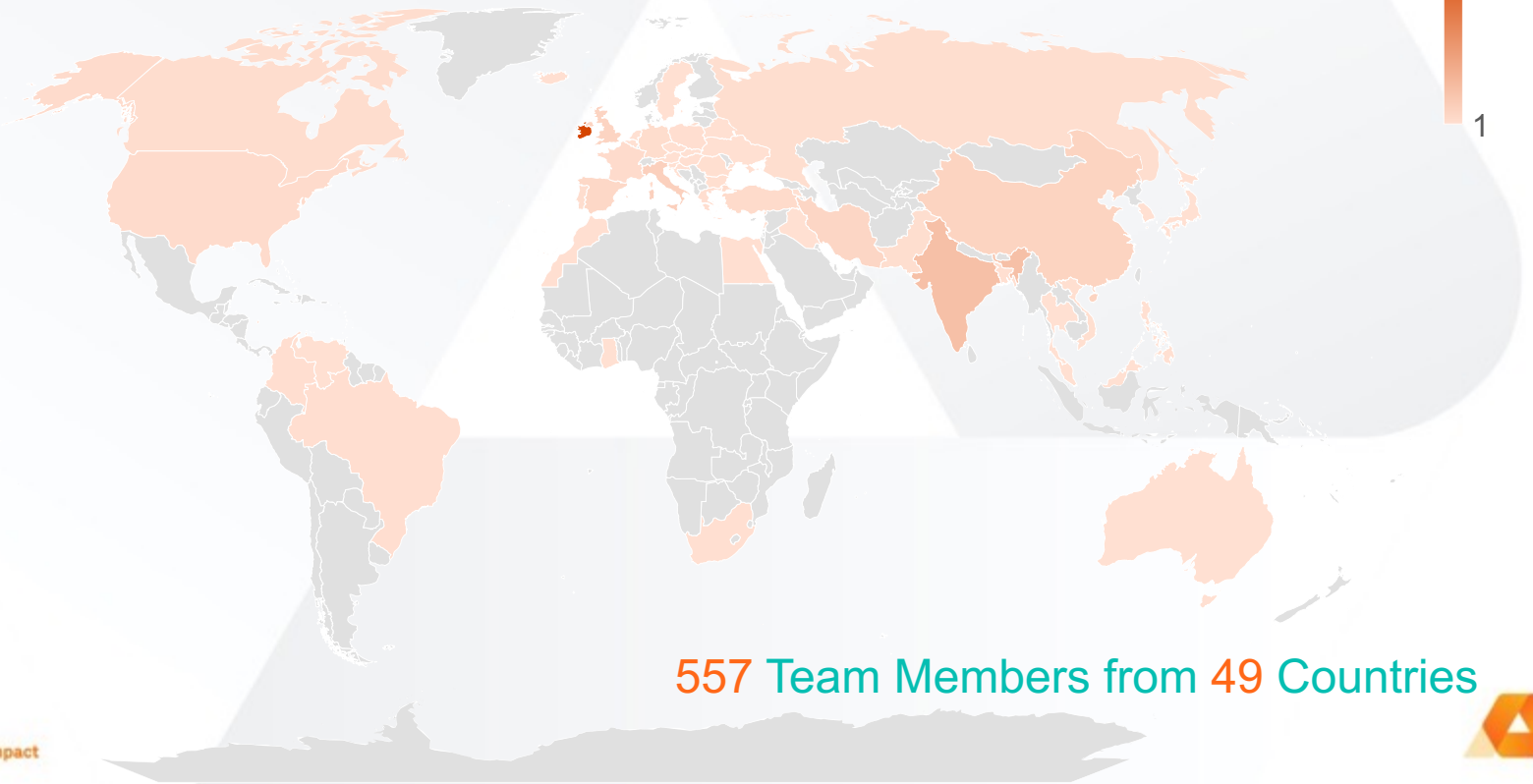
Research and Staff Exchange (RISE) project focused on additive manufacturing using (AM) sustainable (bio)polymer materials with Finland; New Zealand, Germany

EngSurf Twin

Widening Participation and Spreading Excellence programme EngSurfTwin [coordinated by Selçuk University, & Regeneu coordinated by Necmettin Erbakan University both in Türkiye.

REGE NEU

AMBER Team, A Global Community



557 Team Members from 49 Countries

AMBER Industry Partners

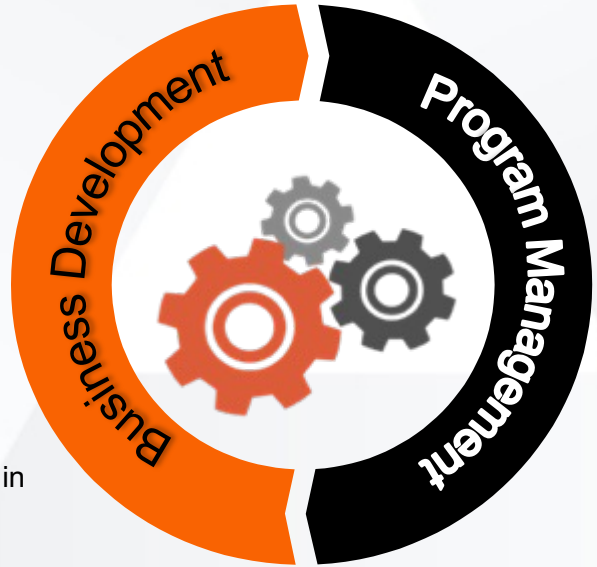
Partnership & Engagement
Business Development & Program Management

Early Focus

- Development of Pipeline aligned to National and European Research priorities
- Linkages with Gov. Agencies
- Implement structures for engagement

Current focus

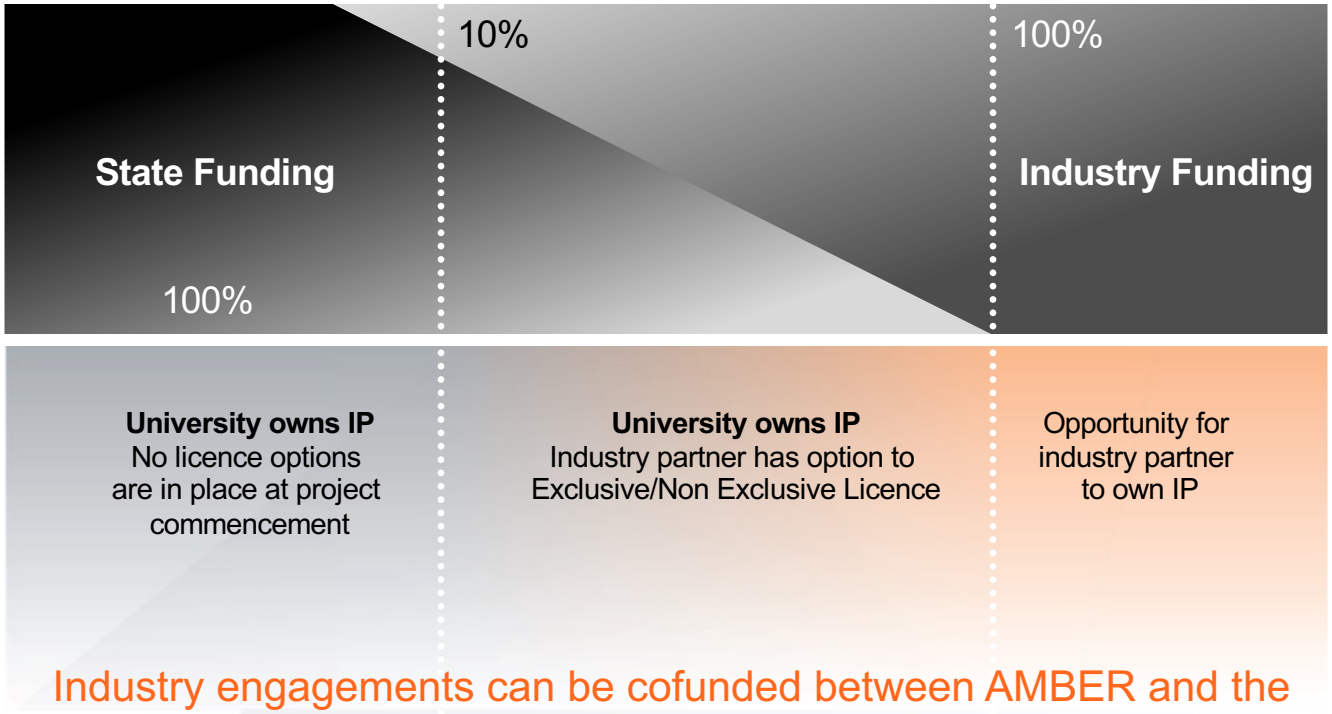
- Building strategic relationships
- Expansion of industry partner pipeline in our core areas
- Targett growth in emerging areas o importance; quantum, pharma & drug delivery, renewable energy, sustainability and circular economy



Partner & Relationship Management

- Industry Standard Program & Stakeholder management
- Financial management
- "Repeat Business" is a key metric
- Developing Strategic Partnership Model
- Portfolio & Risk management
- Focus on translation of research

Management of IP



Industry engagements can be cofunded between AMBER and the partner company (50/50) or funded entirely by the company

Scientific Impact – “Centre effect”

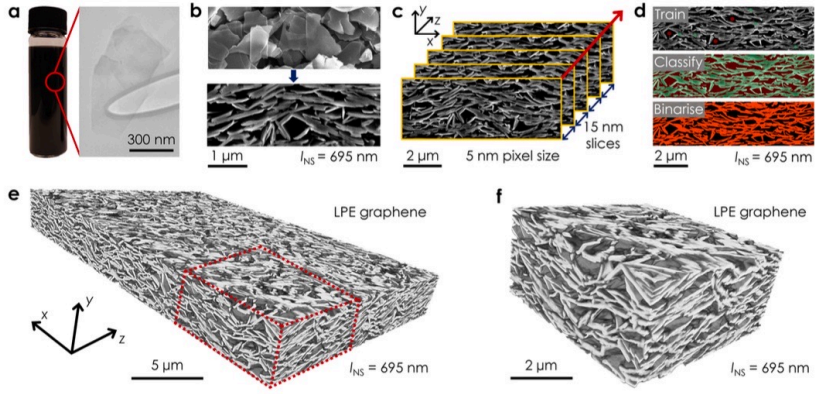
Quantitative analysis of printed nanostructured networks using high-resolution 3D FIB-SEM nanotomography

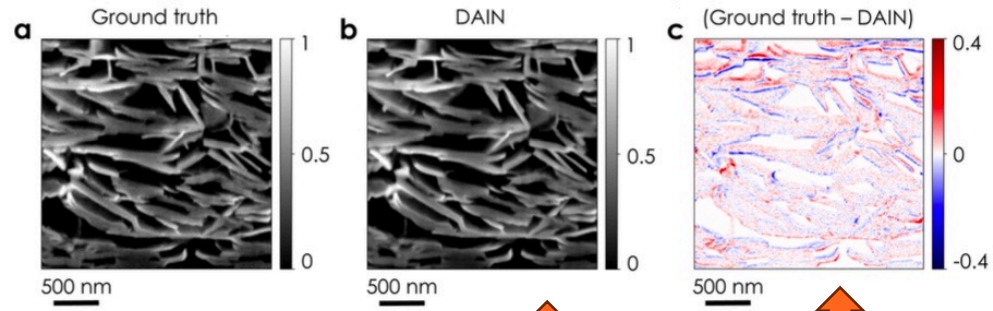
Received: 22 March 2023
Accepted: 13 December 2023
Published online: 04 January 2024

Cian Gabbett[1,3], Luke Doolan[1,3], Kevin Synnatschke[1], Laura Gambini[1], Emmet Coleman[1], Adam G. Kelly[1], Shixin Liu[1], Eoin Caffrey[1], Jose Munuera[1,2], Catriona Murphy[1], Stefano Sanvito[1], Lewys Jones[1] & Jonathan N. Coleman[1]

Nature Comm. **15**, 278 (2024)

FIB-SEM nanotomography for LPE networks





Video frame interpolation neural network for 3D tomography across different length scales

Received: 11 September 2023
Accepted: 2 September 2024

Laura Gambini[1,2], Cian Gabbett[1,2], Luke Doolan[1,2], Lewys Jones[1,2,3], Jonathan N. Coleman[1,2], Paddy Gilligan[4] & Stefano Sanvito[1,2]

Nature Comm. **15**, 7962 (2024)

New collaboration with Mater Hospital (cardiology) on coronary angiographic sequences

Economic Impacts

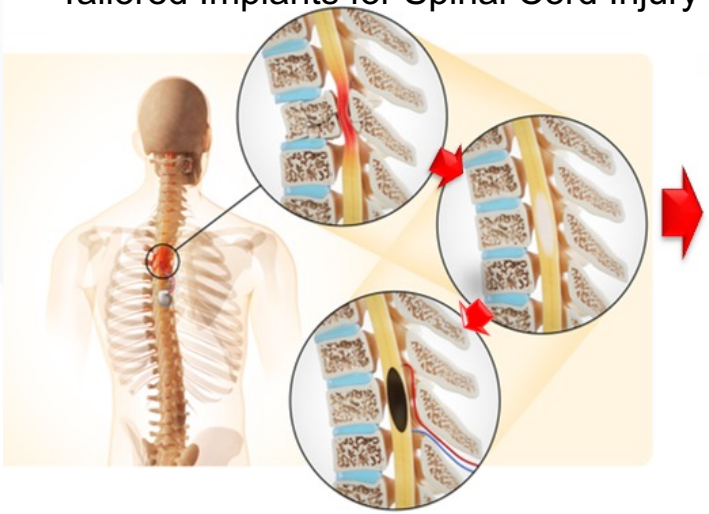
Foster strong industry partnerships to drive innovation and attract private R&D investment

- AMBER collaborative programmes and cofunding model provides access to expertise for accelerated problem solving and de-risking of early-stage R&D and technology roadmaps
- Access to a talent pipeline is as important to the company as the research engagement itself.
- The ability to demonstrate a mature research ecosystem with access to internationally leading academic research is a significant advantage to the local entities of FDI companies when competing for increased R&D charters which can define future site strategies.
- Partnerships with Internationally leading academics and research adds credibility to science led SME companies when attracting investors

**Feedback from 1:1 Interviews with AMBER partner companies*

Scientific Impact – “Centre effect”

Tailored Implants for Spinal Cord Injury



COMMUNICATION

Biohybrid Materials

ADVANCED MATERIALS

www.advmat.de

Electroconductive Biohybrid Collagen/Pristine Graphene Composite Biomaterials with Enhanced Biological Activity

*Alan J. Ryan, Cathal J. Kearney, Nian Shen, Umar Khan, Adam G. Kelly, Christopher Probst, Eva Brauchle, Sonia Biccai, Carolina D. Garciarena, Victor Vega-Mayoral, Peter Loskill, Steve W. Kerrigan, Daniel J. Kelly, Katja Schenke-Layland, Jonathan N. Coleman, and Fergal J. O’Brien**

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APPLIED materialstoday

Collagen/pristine graphene as an electroconductive interface material for neuronal medical device applications

Jack Maughan [a,b,c,d,1], Pedro J. Gouveia [a,d,1], Javier Gutierrez Gonzalez [a,d,h], Liam M. Leahy [a,d], Ian Woods [a,d], Cian O’Connor [a,d], Tara McGuire [a,d], James R. Garcia [b,c,d], Donagh G. O’ Shea [a,d], Sarah F. McComish [f], Oran D. Kennedy [a,e], Maeve A. Caldwell [f], Adrian Dervan [a,d], Jonathan N. Coleman [b,c,d], Fergal J. O’Brien [a,d,g,*]

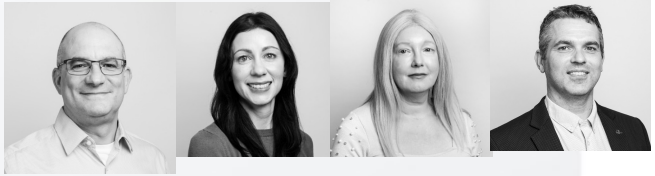
IRFU CHARITABLE TRUST

future neuro

Scientific Impact – “Centre effect”

pep+ pepsico positive

Reducing, Recycling and Reinventing PET packaging to reduce virgin material, used in PepsiCo packaging



Lignin derived biobased PET

Reinvent PET packaging through development of an early-stage proof of concept pathway towards the synthesis of full bio-based PET derived from lignin based waste material.

Barrier Coatings

a) Thin film Al_2O_3 barrier coatings to enable the extension of PET shelf life and lightweighting to reduce waste waste
b) PEF and chitosan thin film barrier coatings capable of improving cellulose material gas barrier and water resistance properties,

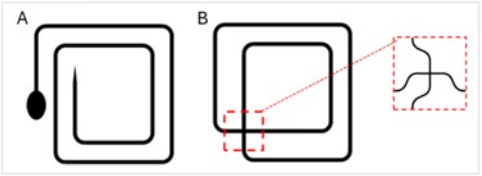
Recycled PET

Demonstrating feasibility for novel mechanical and chemical technology recycling approaches for bottle grade PET, as a pathway towards eliminating virgin plastics from bottles

4 Institutes, 6 PI’s and 7 research fellows

Economic Impacts

Foster strong industry partnerships to drive innovation and attract private R&D investment



- 1,200 ADI employees in Ireland across 2 sites in Limerick and Cork
- European regional headquarters for R&D in Limerick with a new €630M R&D and manufacturing facility planned with the creation of 600 jobs
- University collaborations a key element of the site R&D and talent strategy
- AMBER collaborating on the development of a GMR-spin valve addressing challenges associated with the design, material stacks and characterisation of closed loop domain-wall-based GMR Sensor Structures
- Proof of concept demonstrated, test structures including key features, and techniques for patterning and characterizations established.
- Presentation at ADI European Technology Conference
- Follow on collaborative engagements, involving partners from both TCD and the UL , funded based on the success outputs of the initial projects.
- Dr Niclas Teichert, (lead postdoctoral researcher) now an Analog Devices employee and is working with Prof Plamen Stamenov in the current projects

Economic Impacts

Foster strong industry partnerships to drive innovation and support SME growth.

HT MATERIALS SCIENCE

SMARTER HEAT TRANSFER FLUIDS™

Rialtas na hÉireann
Government of Ireland

Disruptive Technologies Innovation Fund

Advancing Materials for Impact

- Irish SME focussed on the development of nanofluid technologies as closed loop heat transfer fluid for commercial and industrial HVAC markets.
- DTIF project to develop second generation of the company's Maxwell Fluid based on functionalised 1D and 2D carbon materials.
- Project concluded 2024 with a product developed for market trials in Q3 2025.
- Investor funding (<€10M) and signed collaborative agreements with British Petroleum and Castrol.
- HTMS R&D team established in Dublin with six employees which will become the main R&D centre by 2027
- Company selected as one of 15 start-ups from across Europe picked to be part of Amazon Sustainability Accelerator (2024).
- AMBER is seen as integral to HTMS growth strategy and the company has made a commitment to pursue joint opportunities under national and European programmes.

Economic Impacts

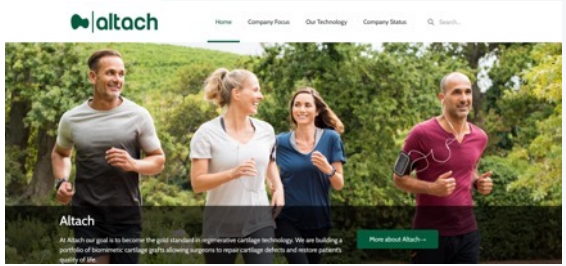
Foster strong industry partnerships to drive innovation and support SME growth.

MAGROWTEC™

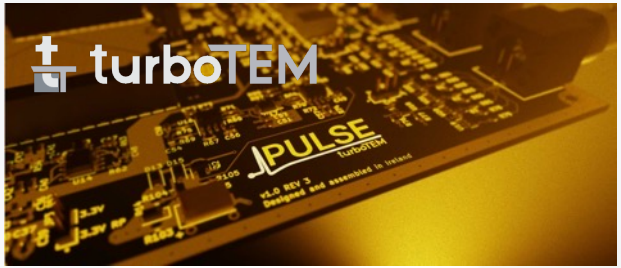
- Irish headquartered ventured backed SME with 30 employees and business operations in the US, Canada, South Africa, Australasia and Europe
- Focussed on the commercialisation of a magnetic assist technology for crop spray that provides better coverage than conventional systems and with a reduction in-spray drift by more than 80%.
- AMBER collaboration spans five projects (total value €710K)
- Provided deeper the scientific understanding of technology enabling MagrowTec to enhance the existing product line, explore new avenues of product development, and ultimately make a greater impact on the global challenges related to food waste and climate.
- Significant commercial potential with MagrowTec through optimisation of existing products and developing the technology for other applications.

Economic Impacts

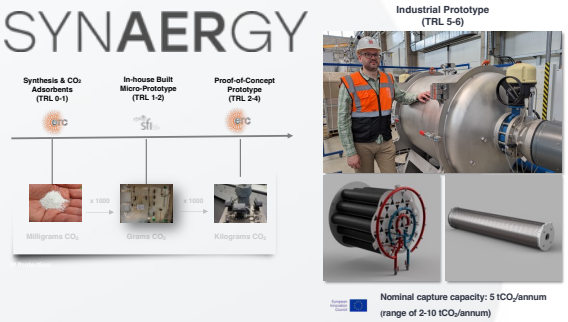
Foster strong industry partnerships to drive innovation and support SME growth.



- VC investment of €1.2 million
- Pilot Batch manufacturing with scale up planned
- Pre-clinical testing



- 3 Products to Market
- Installations at Trinity College, Cambridge University, University of Tokyo and Sandia National Labs
- Multiple awards for innovation



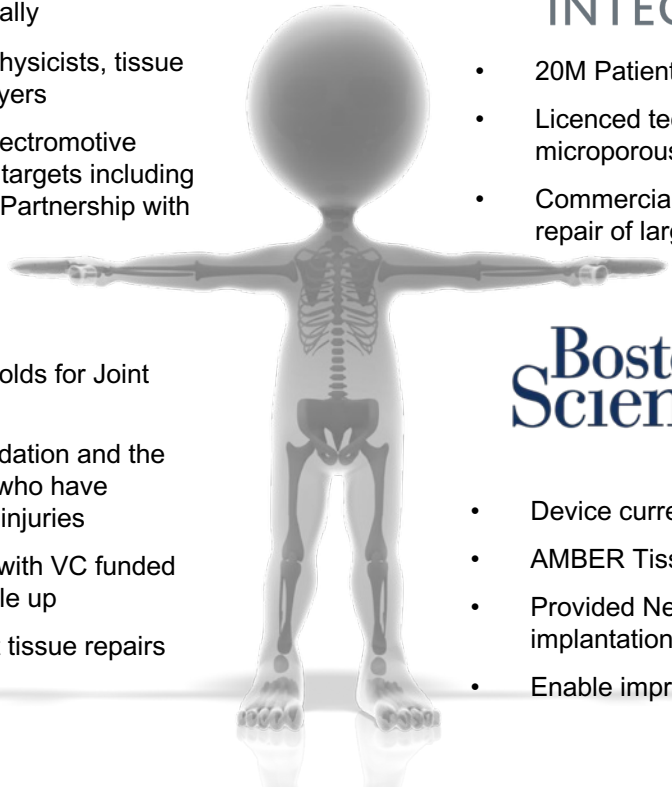
- Commercialising an atmospheric CO_2 capture,
- Supported by EIC, SFI, AMBER, ERC, Enterprise Ireland.
- Prototypes deployed at Dublin Airport with future collaborations planned for CERN and ESB

HEALTH

Developing technologies for managing and treating diseases and improve patient outcomes

IRFU CHARITABLE TRUST

- Approx 10,000 people suffer a spinal cord injury (SCI) across the EU annually
- Multidisciplinary collaboration with physicists, tissue engineers, clinicians and injured players
- Enabled a new platform based on electromotive materials extendable to new clinical targets including Temporal Lobe Epilepsy (Proposed Partnership with Future Neuro).



altach

- Extracellular Matrix Derived Scaffolds for Joint Regeneration
- Clinical ; prevention of joint degradation and the onset of osteoarthritis in patients who have sustained articular cartilage knee injuries
- Spin out company formed Altach with VC funded for manufacturing and clinical scale up
- Platform technology targeting soft tissue repairs

INTEGRA

- 20M Patients in US impacted by peripheral nerve injury
- Licenced technology on filled, bioactive molecule-enhanced, microporous collagen-based nerve guidance conduits (NGC)
- Commercial launch NeuraGen 3Dä Nerve Guide Matrix for the repair of large gap nerve defects.

Boston Scientific

- Device currently implanted in 200,000 patients
- AMBER Tissue modelling & testing collaborative project
- Provided New insights into performance of AMS-700 post implantation.
- Enable improved reliability and next generation devices

Environmental

Develop materials technologies in support of greenhouse gas (GHG) reduction targets and climate neutrality objectives

Gas Networks Ireland

Gas network material compatibility under variable Hydrogen ratios

- Introduction of green H_2 to Irelands Gas Network is part of strategy for net zero energy
- AMBER Programme to evaluate impact of green H2 on gas network and help ensure a smooth transition with minimal cost and disruption to Ireland's energy system
- Priority materials have been identified and further testing continues

SUPERNODE™

Development of sub sea long distance power transmission cables for deployment of a European Supergrid for integration of renewables,

- Alternative polymer-composite (PC) cryostat architectures to provide a net-zero contraction solution, reducing the requirement for expansion joints
- methodology for the production of porous tubes to enable LN2 evaporative cooling.

- IP assigned to Supernode. Two more assignments are in negotiation.

PEPSICO

- Bio-based PET derived from lignin-based waste material.
- Thin film aluminium oxide barrier coatings to enable the extension of PET shelf life
- PEF and chitosan thin film barrier coatings fpr cellulose packaging.
- Mechanical and chemical technology recycling approaches for bottle grade PET,.
- . IDF's are currently being drafted future work in planning

astellas

- Develop a scalable solution for recycling of blister packaging waster (approx 39 tonnes disposed of in landfill annually)

✓ Single-step process for blister layer delamination

✓ Use of bio-based and Biodegradable solvents

✓ Recovery of polymers without any modification in structure

✓ 100% ink removal from aluminium and metal recovery

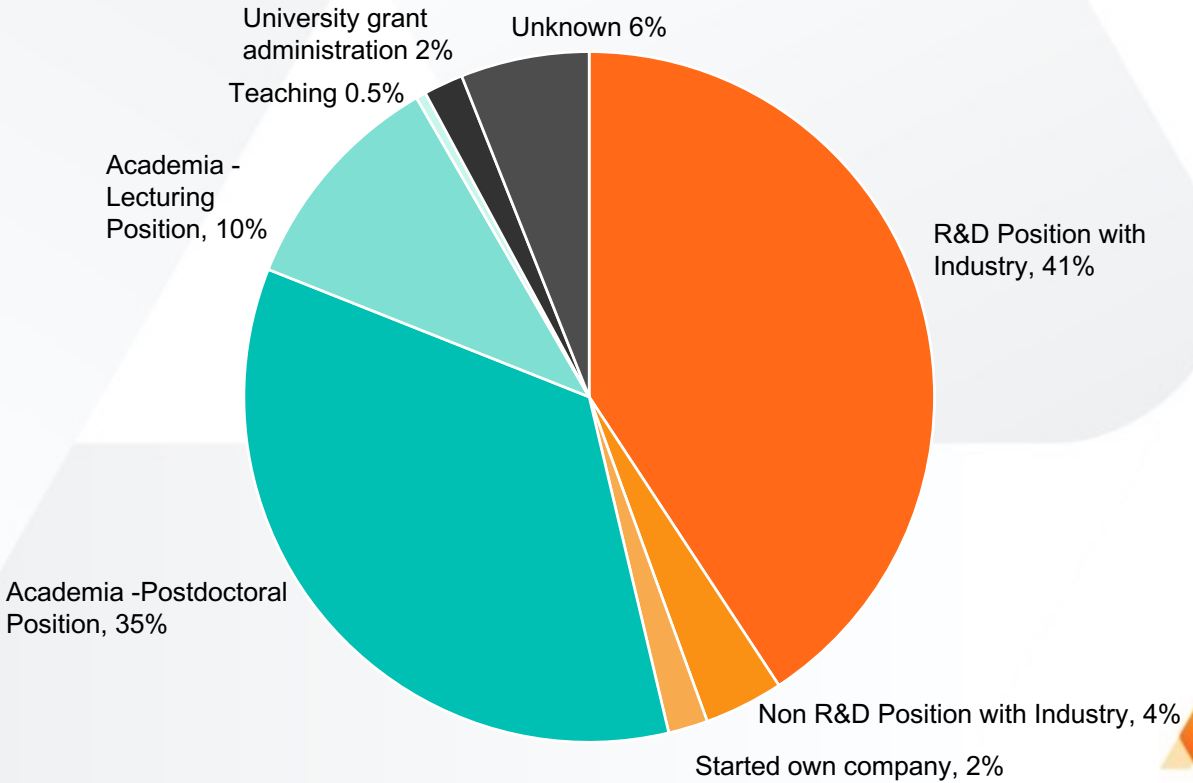
✓ Successful solvent recycling with complete delamination efficiency

Human Capacity

Develop diverse research teams providing training, support, and career pathways to empower future research leaders

Profile of AMBER Leavers 2019-2025

N= 216

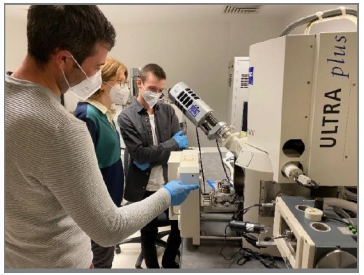


Human Capacity

The EPSRC-Research Ireland funded CDT in the Advanced Characterisation of Materials (CDT-ACM) offers a four year funded PhD training programme in the application of state-of-the-art characterisation techniques.

25 students trained in the application of state-of-the-art characterization techniques

- Cohort based model
- Extensive training programme shared between three partner universities
- First cohort just finished – Dr Annie Regan, now Postdoc in Creutz lab at Mississippi State University



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

UCL

IMPERIAL

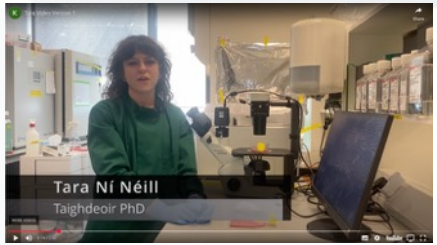
Societal

Deliver meaningful public engagement to enrich research culture and strengthen outcomes

EPE Flagship 2 – Education and Public Events

Gujarati
Hindi
Irish
Italian
Portuguese

Public engagement and education projects with underserved communities through bespoke multilingual supports



Irish Language STEM Careers Videos included in Dept of Education STEM Guidelines as best practice

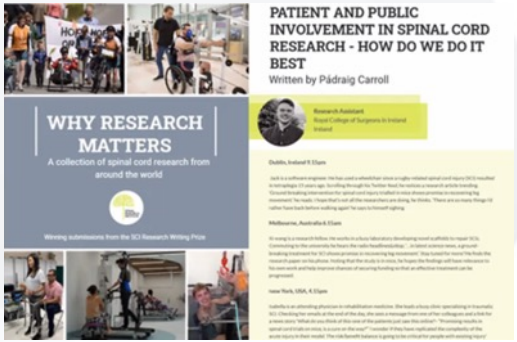
Societal

Deliver meaningful public engagement to enrich research culture and strengthen outcomes

EPE Flagship 3 – Engaged Research

Biannual PPI Panel Meetings
Sharing updates, discussing ideas and planning

Laboratory visits
Seriously-injured players visit RCSI researchers



Sharing Our Experience & Learning
Supporting others with PPI in lab research

Policy & Public Service

Enhance evidence-based policymaking, through partnerships with policymakers at local, regional, national and European levels

- Prof. Morris contribution to the Joint Committee on Enterprise, Trade and Employment debate ‘Scrutiny of EU Legislative Proposals – Net Zero Industry Act’
- Participation on North-South Dublin-Belfast Corridor Circular Economy board

- AMBER position paper “The Importance of Materials Science to Ireland” launched April 2024
- Basis for pre-budget briefing and input to EU Technology Council for Advanced Materials

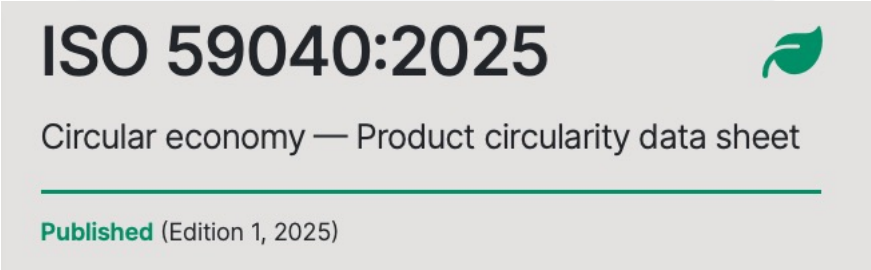
- Prof. Sanvito contribution to the development of the National Quantum Technologies strategy published Nov 2023

- Dr Claire McKenna led the development of Irelands first national standard research classification standard
- This will improve insights into the impact of public investment in research & aid future research policy development.

Policy & Public Service

Enhance evidence-based policymaking, through partnerships with policymakers at local, regional, national and European levels

IAM-I

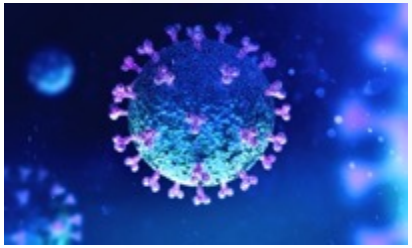


- Provides the basis for the co-operation of IAM-I association with EU on IAM4EU Co-Programmed partnership.
- Lead author for Semiconductor & ICT priorities section of SRIA with inputs from EU27 contributors (published Nov 2024)
- Successfully lobbied for inclusion of MedTech as a 5th Priority

- Prof. Morris responsible for developing terminology and definitions as well as a platform for measuring and assessing circular economy impacts.
- These measures help develop common understanding and alleviate ‘greenwashing’.

Emerging Challenges as a Catalyst for Change

Positioning AMBER to contribute to emerging threats and opportunities in public health, climate change and the environment



Highlighting **importance of fundamental scientific research** in building resilience against future pandemics and crisis

Materials Science as an enabler for a zero-carbon future impacting ICT, Energy, Transport. Consumer goods and services

The need for **sustainable high-performance materials** as a key **enabler of manufacturing within a circular economy**

The **integration of gene and cell therapy with tissue engineering** for better patient outcomes in regenerative medicine

Strategic Priorities

Maintain emphasis on research excellence

- Focus in areas of critical expertise
- Target Eu and national programmes of scale to amplify available funding
- Emphasis on Multi- and Trans – disciplinary research

Target growth in the area of digital transition, sustainability , climate change & drug/gene therapy delivery

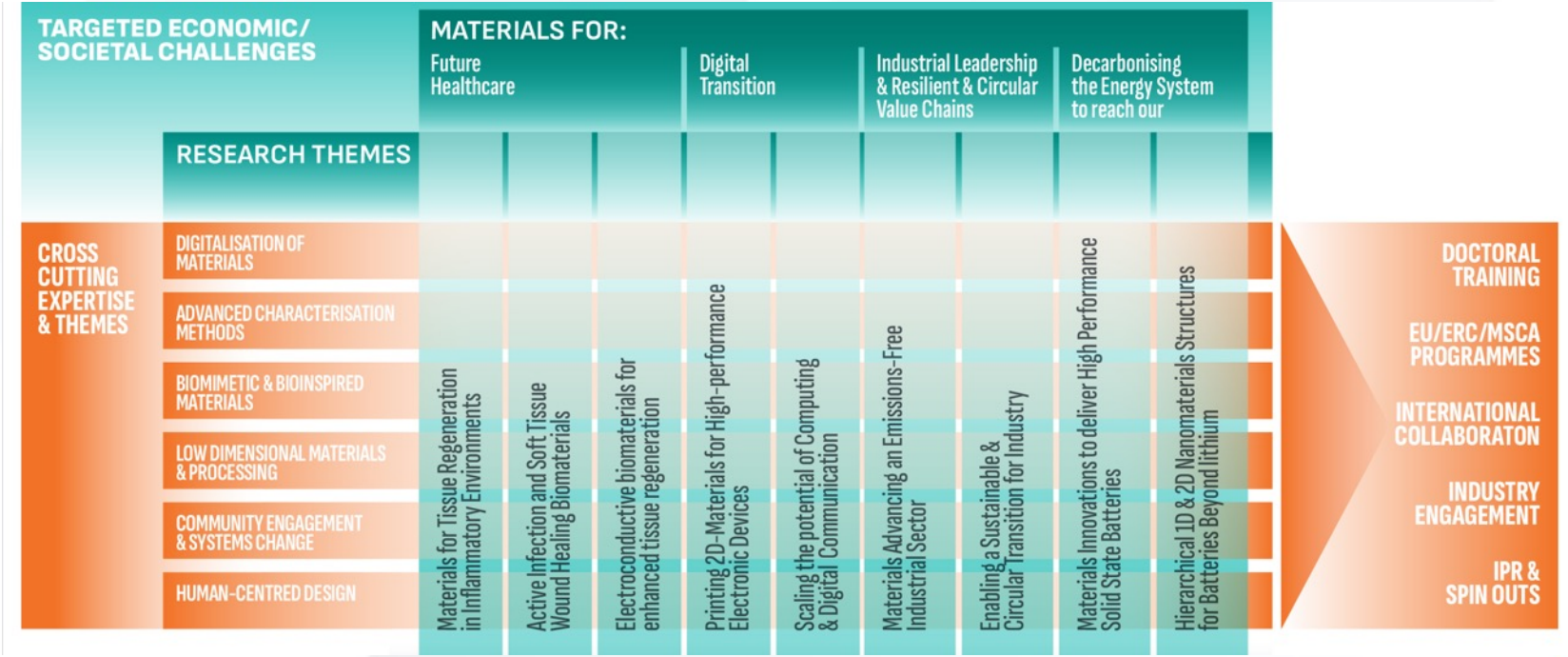
- Targeting interdisciplinary projects with Industry, EU and National funders (DAFM, North – South, SFI Spokes)

Target industrial sectors strongly aligned to our research strengths, focusing on companies with a track record in R&D investment and strategic partners of the centre

Increased focus on engagement with policy makers at National and EU parliaments

- Bringing evidence-based discussion and expertise in the areas of
- National RD& I Policy
- National and EU climate & circularity Targets

Future evolution of AMBER



Our Vision: to make AMBER the international centre of choice for multidisciplinary & disruptive materials innovation driving sustainable development and economic growth

Quantum Ecosystem at AMBER & TCD

QUANTUM RESEARCH

- Quantum Simulation for Advanced Material Discovery
- Quantum-Classical HPC Integration
- Quantum Network Science
- Fundamental Quantum Theory

QUANTUM EDUCATION

- MSc in Quantum Science & Technology (established 2021)
- PhD programmes with IBM and Microsoft
- Micro-credentials will be available

QUANTUM ECOSYSTEM

- Five founding Industry partners' IBM, Microsoft, Moody's, Horizon Quantum & Algorithmiq
- Both Algorithmiq and Quantum Horizon have established Offices in Dublin
- National Access for Irish Academia

Talents: research capacity

MSc LAUNCH

- 11 students MSc
- 10 companies engaged
- 2 X Microsoft & 1 X IBM sponsored PhD students

MSc YEAR 2

Intake 17 (~50 applicants)

QUANTUM ECOSYSTEM

algorithmiq

Algorithmiq opens in Dublin

Jan 2023

MAY 2023

TQA OFFICIAL LAUN

Nov 2022

HORIZON QUANTUM COMPUTING

Quantum Horizon opens in Dublin

Sept 2022

April 2022

Sept 2021

Aug 2021

Dec 2020

Sept 2020

Dec 2019

STRATEGIC RECRUITMENT

Orwtin Hess SFI Prof Quantum Photonics

Andrea Droghetti RS-URF Open systems spins

ERC AWARD €1.5M

Alessandro Lunghi Spins, coherence, quantum chemistry

QUANTUM ECOSYSTEM

algorithmiq

HORIZON

QUANDELA

IBM

Microsoft

Moody's

SANDBOXAQ

STRATEGIC RECRUITMENT

Felix Binder IRC Laureate Q Informatics

Mark Michinson RS-URF Open systems

MSc IN QUANTUM SCIENCE

HEA HIGHER EDUCATION AUTHORITY

IRISH RESEARCH COUNCIL An Chomhairle um Thaighde in Eirinn

Advancing Materials for Impact

IDA Ireland

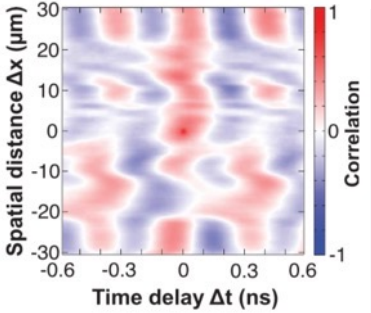
Excellence in Quantum Research

Many pockets of true excellence

Massively parallel ultrafast random bit generation with a chip-scale laser

Kyungduk Kim[1], Stefan Bittner[1,2], Yongquan Zeng[3], Stefano Guazzotti[4,5], Ortwin Hess[4,5], Qi Jie Wang[3], Hui Cao[1]*

Science **371**, 948 (2021)



Computational design of magnetic molecules and their environment using quantum chemistry, machine learning and multiscale simulations

Alessandro Lunghi and Stefano Sanvito

Nature Review Chemistry **6**, 761 (2022)

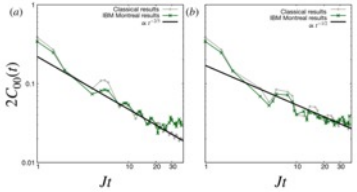
Quantum simulations with IBM

npj | quantum information
www.nature.com/npjqi

ARTICLE OPEN

Evidence of Kardar-Parisi-Zhang scaling on a digital quantum simulator

Nathan Keenan, Niall F. Robertson, Tara Murphy, Sergiy Zhuk and John Goold

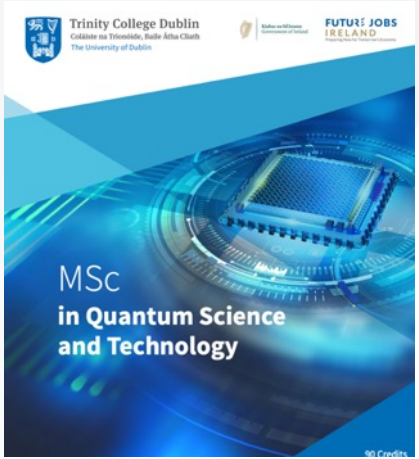


IDA Ireland

Talents: Education

Year 1: 11 App, 11 MSc
Year 2: 50 App, 17 MSc
Year 3: 130 App, 19 MSc
Year 4: …..
MSc Sponsorship from Microsoft and Sandbox

Fully gender balanced



MODULE 1: Introduction to Quantum Information Science	MODULE 2: Special topics and the quantum industry	MODULE 3: Open Quantum Systems
Introduction to quantum information theory	Current challenges and opportunities in the quantum sector	Dynamical aspects of quantum mechanics
Core concepts e.g. no-cloning, teleportation and entanglement theory	Industrial and academic speakers	Quantum technologies from an open system perspective

MODULE 4: Quantum Material Science	MODULE 5: Physical implementations of quantum technology
Harnessing quantum effects in superconducting systems	The physical principles behind the operation of quantum devices
The role of quantum materials and quantum nano-photonics in reducing the impact of thermal fluctuations and disorder	The criteria for application in technology

MODULE 6: Quantum computation and algorithm	MODULE 7: Quantum project/Internship
Introduction to quantum computation and algorithms	This module will enable students to develop key research skills and offer them the opportunity to understand how quantum researchers work in either an industrial or academic environment. Students will complete a cutting-edge research project and present their findings to the quantum researchers in the School.
Writing elementary quantum programs	

IDA Ireland

Talents: Education

Year 1: 11 App, 11 MSc
Year 2:
MSc
Year 3:
MSc
Year 4:
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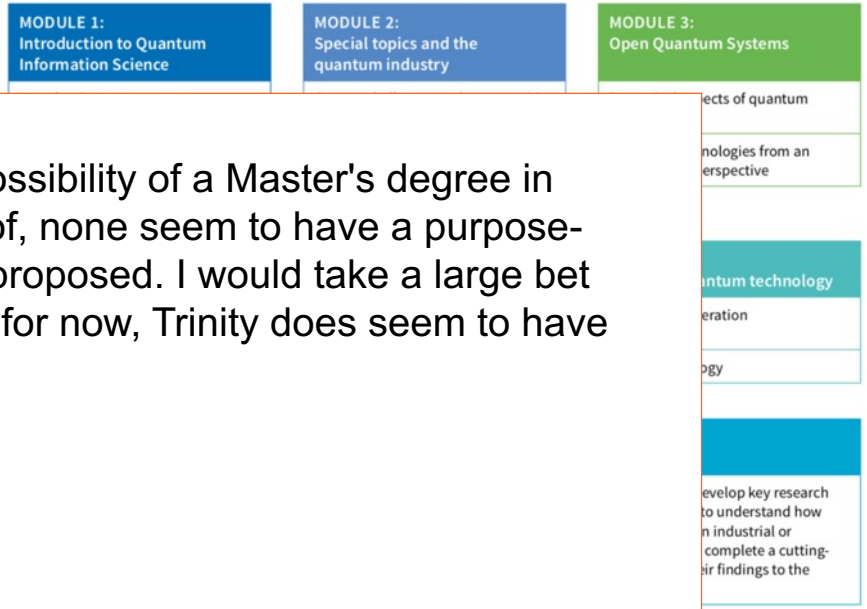

….while several of these places offer the possibility of a Master's degree in quantum information or some aspect thereof, none seem to have a purpose-designed course closely similar to the one proposed. I would take a large bet that this situation will not last very long, but for now, Trinity does seem to have the field to itself.

IDA Ireland

Talents: Education

Year 1: 11 App, 11 MSc
Year 2: MSc
Year 3: MSc
Year 4: MSc
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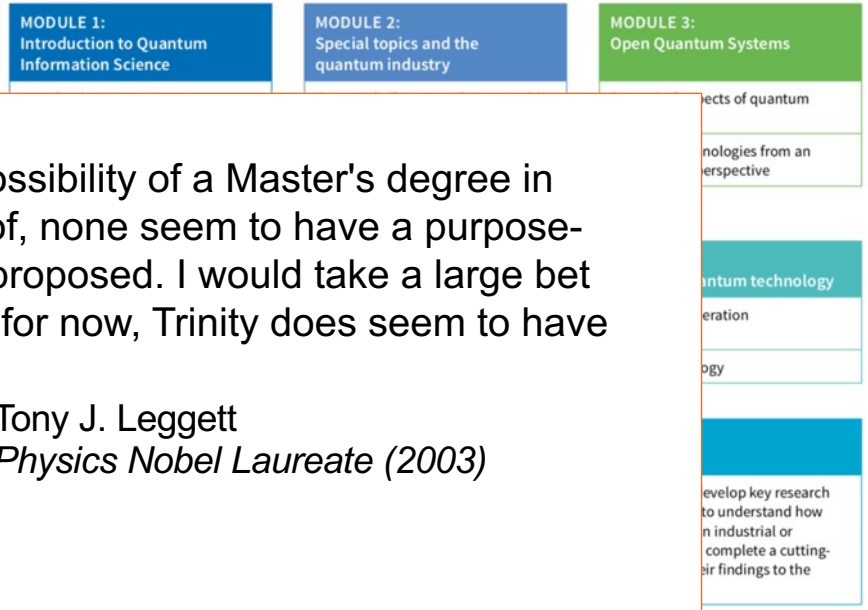

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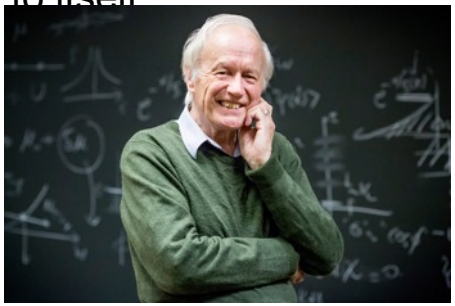

Tony J. Leggett
Physics Nobel Laureate (2003)

IDA Ireland

Innovation

AN OPEN INTELLECTUAL SPACE WHERE RESEARCHERS FROM ACADEMIA AND INDUSTRY COMBINE TO WORK ON RESEARCH AND EDUCATION PROJECTS IN QUANTUM SCIENCE AND TECHNOLOGY

IBM® Microsoft algorithmiq HORIZON QUANTUM COMPUTING MOODY'S IDA Ireland

ambercentre.ie

@ambercentre

FUNDED BY:

European Union
European Regional Development Fund

Science Foundation Ireland Sfi

Advancing Materials for Impact