US-Ireland R&D Programme project details:

Project tittle and award details	Lay Abstract
Title: Ga2O3 Understanding Growth Interfaces and Defects to enable next generation Electronics (GUIDE) **Lead applicant:** Dr Karim Cherkaoui **Co-applicants:** Prof Paul Hurley (RoI), Prof Chadwin Young (US), Dr Lorenzo Stella (NI), Prof Robert Wallace (NI), Dr Myrta Gruening (NI), Prof Robert Bowman (NI) **Lead RoI institution:** Tyndall National Institute **Value of award** including overhead: €452,508 (Direct: €348,660 + Overhead: €103,848) DfE funding £ 299,973 d+o/h NSF funding $439,603 d+o/h **Partner institutions:** **NI:** Queen's University Belfast **US:** University of Texas at Dallas	This is a three-year collaborative project to explore scientific and technological questions, which are relevant to a wide range of potential applications. The project will investigate the fundamental properties of different forms of Ga_2O_3 spanning from amorphous structure to the crystalline beta-phase, relevant to applications such as efficient, cost-effective power electronics or added functions above existing integrated circuits. In addition, GUIDE will explore the electronic properties of insulating oxides on Ga_2O_3 with varying surface orientations using a new metrology approach to characterize electrically active defect states. The project will also explore ferroelectric gate oxides on Ga_2O_3 as a potential route to introduce non-volatile memory elements into power electronic circuits. The proposal brings together complementary expertise in the growth, defect metrology and theoretical analysis of semiconductor systems through a partnership of UTD, QUB and Tyndall, and builds upon a strong collaboration developed through the US Ireland Programme over the past 12 years. This project will enable the training of graduate students in the US and Ireland and will encourage and support student exchanges between the three institutions.

Title: Full Atomistic Understanding of Solid-Liquid Interfaces via an Integrated Experiment-Theory Approach **Lead applicant:** Prof Niall English **Co-applicants:** Dr Amir Faroukh Payam(NI), and Prof Yingje Zhang and Prof Narayana Aluru (US) **Lead RoI institution:** University College Dublin **Value of award** including overhead: €453,814 (Direct: €349,999 + Overhead: €103,815) DfE funding £299,970 d+o/h NSF funding $500,000 k d+o/h **Partner institutions:** NI: University of Ulster US: University of Illinois at Urbana-Champaign, University of Texas at Austin	This project aims to achieve a thorough understanding of surfaces of electrodes in contact with electrically active liquids. It is probing, at the atomic level, how liquids are structured at these interfaces, using state-of-the-art experiments and computer simulations. These experiments and simulations provide advanced imaging of the surfaces at an atomic level, and on how this affects the electrostatic "personality" of the surface.
Title: Smart Radio Environments with Reconfigurable Intelligent Surfaces – Communications Through Blockage in Millimeter-wave systems (REFLECT-MMWAVE) **Lead applicant:** Dr Arman Farhang **Co-applicants:** Dr Dmitry Zelenchuk and Dr Muhammad Ali Babr Abbasi (NI); Dr Rong-Rong Chen and Dr Mingyue Ji (US) **Lead RoI institution:** Trinity College Dublin **Value of award** including overhead: €484,179 (Direct: €374,176 + Overhead: €110,003) DfE funding £285,080 d+o/h NSF funding $400,000 d+o/h **Partner institutions:** **NI:** Queen's University Belfast **US:** University of Utah	More and more devices are connected wirelessly. This trend continues to rise at a higher pace with the emergence of new generation of applications and services in future wireless networks. Due to the seamless connectivity and high data rate requirements in a variety of services, very high frequencies are deployed for communication. However, there are lots of challenges when very high frequency bands, e.g., millimetre wave (mmWave) bands, are deployed for communication, such as severe signal blockage. This leads to unreliable communication. Therefore, this project explores an emerging communication paradigm where the propagation of the electromagnetic waves is manipulated in a controllable fashion. This is achieved by using Reconfigurable Intelligent Surfaces (RIS) to solve the signal blockage and hence, improve the overall user experience by improving the reliability of the wireless connections. This contributes towards increased connectivity and reliability of the mmWave wireless networks of the future. REFLECT-MMWAVE project brings together multidisciplinary experts from radio frequency and analogue circuits and antenna design, signal processing, machine learning and communication networks.

Title: AI-EPOCMON: AI-Enabled Point-of-Care Monitoring **Lead applicant:** Prof Robert Forster **Co-applicants:** RoI: Prof Colin Doherty NI: Dr Saugat Bhattacharyya, Prof Liam McDaid, Dr Muskann Singh. US: Prof Gerard l. Coté, Dr Sam Mabbott **Lead RoI institution:** Dublin City University **Value of award** including overhead: €892,352 (Direct: €687,209+ Overhead: €205,143) DfE funding £299,999 d+o/h NSF funding $800,000 d+o/h **Partner institutions:** **RoI:** Trinity College Dublin **NI:** Ulster University **US:** Texas A&M University	Scientists in Dublin City University, Ulster University and Texas A&M University are developing a low-cost multi-analyte sensor technology - called AI-EPOCMON - to detect the levels of therapeutics in blood and improve the lives of people with epilepsy. The new technology can identify people who are not taking their medication as prescribed, as well as guiding clinicians on optimum drug dosage for people who are medication compliant but are still experiencing symptoms of epilepsy. Artificial intelligence will be used to maximise the information content generated by the multi-analyte sensor measurements. The technology is designed to operate at the point of need in the community providing rapid, reliable insights and reducing the need for hospital or GP clinic visits.