LIST OF FUNDED PROJECTS - RESEARCH IRELAND PATHWAY PROGRAMME – JUNE 2025

Awardee	Research Body	Co-Funder	Proposal Title	Award amount	Summary
STEM Projects					
Abeer Eshra	Maynooth University		Thermally regulated Renewable and Automated DNA Computing Devices (TRAD)	€675,609.90	The DNA Computing field has experienced an extraordinary transformation, progressing from its experimental realisation with the groundbreaking contributions of Adleman solving the Hamiltonian Problem to more recent developments like Rothemund's DNA origami. Although these developments have demonstrated the capability of DNA to serve as a foundation for computations, current approaches are significantly limited by the drawback of one-time use DNA circuits, which, to be reused, require resource-intensive replication for every computation cycle. Therefore, I propose to tackle this limitation by implementing automated renewable DNA computing systems that are robustly reusable. The methodology presents a "one-pot" system in which a program with all its plausible inputs coexists in a single test tube. To run a computation, the targeted input is activated with a preprogrammed temperature protocol exploiting distinct thermal regulation profiles based on the desired computation input. Prominently, the approach incorporates automated and preprogrammed temperature protocols, enabling smooth functioning and unlimited iterative applications. This revolutionary framework will expand the limits of DNA computing and present tremendous potential for sustainable and energy-efficient computational paradigms, thus stimulating innovative molecular computing and storage applications when adopted by other research labs, even in fields outside DNA Computing, like drug delivery, nanobiosensors, and nanobiocircuits.
Anand V.R	TU Dublin		Novel photonic biosensing platform for rapid and highly sensitive detection of cancer biomarkers	€652,306.00	Detection of cancer biomarkers plays a vital role in early disease diagnostics and treatment. However, due to various technical difficulties in current biomarker detection technologies, their potential is yet not fully explored. Recently, optical biosensors attracted significant interest due to their high sensitivity, rapid response, reliability, and potential for integration with microfluidics. Optical biosensors can be used in a label-free mode by monitoring the binding of the biorecognition element and target biomarker molecules to the sensor's surface. This research will create a new biosensing platform for rapid and highly sensitive label-free detection of breast cancer biomarkers, based on a combination of two optical methods, namely whispering gallery mode (WGM) resonant sensing and surface-enhanced Raman scattering (SERS). WGM is a powerful technique that allows for ultra-sensitive detection of minute changes in local refractive index near the sensor's surface, but it suffers from the lack of specificity to target molecules. SERS on the other hand, offers a perfect chemical specificity, but suffers from a weak response, that may lead to errors in detection. The proposal will develop a hybrid photonic biosensor capable of simultaneous measurements of SERS molecular fingerprint and WGM spectra for error free detection of the key breast cancer biomarkers.

Anthony Kiely	University College Cork		Active Quantum Closed Loop Control	€628,228.90	New advances in computation and sensing use fragile quantum mechanical effects. Fast stable operations are critical for these devices to leverage such quantum advantages. However, pre-scheduled open loop control pulses have limited stability against noise. This proposal focuses on closed loop or feedback control, which is already common in modern technologies e.g. noise-cancelling headphones which detect and cancel undesired sounds. However, the situation is more complex in quantum mechanics since measurements affect the system. Recently, continuous monitoring of superconducting circuits (a leading quantum platform in academia and industry) has been shown experimentally. I will model this scenario by developing deterministic linear differential equations for the measurement outcome resolved state of the system, accounting for both the measurement back action and the non-linear feedback control. This will outperform existing approaches, which require statistical inferences from many numerical simulations of the intrinsically random measurement outcomes. I will use this description of the dynamics (together with machine learning) to design optimal feedback control protocols for state preparation and robust state transfer. I will also determine the performance limitations of open loop control (strict mathematical inequalities) due to fundamental physical laws and experimental constraints (e.g. measurement inefficiencies, delays etc.) in superconducting architectures.
Anna Trego	University of Galway		Modelling Metabolic Stress Response of Whole Microbial Communities to Environmental Cues	€675,553.40	Microbial communities underpin the major biogeochemical cycles of Earth's soil, oceans, and atmosphere, providing ecosystem services and functions for plants, animals, and humans. However, our understanding of their structure-function relationships remains highly limited. Indeed, an ongoing challenge remains to determine, and model, the response of microbial communities to environmental change, including changing climates. Biotechnological applications, in which mixed-species consortia are applied for specific functions provide useful model systems, having clear functional parameters and offering controlled environments. Methanogenic granules, formed spontaneously during high-rate anaerobic wastewater treatment are not only unique in their abilities to transform organic wastewater pollutants to biogas, but are also highly adaptive and complex whole microbial communities. This proposal seeks to leverage their interesting and unique properties to study how whole communities of bacteria, archaea, viruses and fungi interact and respond to a wide range of environmental stresses at the genetic level. I propose to combine a unique incubation set-up, developed during my PhD with cutting-edge 'omics strategies and community modeling to identify patterns and gradients in community stress response. This set-up provides a high-throughput means of testing stress-response in whole microbial communities from the whole-community level, down to the level of individual metabolic pathways and even genes.

Des Field	University College Cork		NICE ''Nisin In MiCrobiome Editing''	€675,129.90	Clostridioides difficile is one of the leading causes of health care-associated infections and an important public health threat. The proposed study aims to explore the potential of using derivatives of the natural antimicrobial peptide nisin instead of conventional antibiotics for the targeted treatment of C. difficile without perturbing the normal gut microflora. While the prototypical nisin, nisin A, has been shown to inhibit the pathogen its' use in clinical settings is limited owing to its' sensitivity to proteolytic destruction in the upper gastrointestinal tract and its' broad activity spectrum. We propose to initially use an in-silico approach to identify novel nisin variants in bacterial genomes. Subsequently we will employ various bioengineering strategies to create an extensive bank of nisin peptide derivatives with the aim of identifying those with combinations of desirable properties. These peptides will then be characterized with respect to their bioactivity and stability and their ability to specifically target C. difficile without affecting other gut microbes will be investigated using a combination of a model of the human colon, molecular biology techniques and bioinformatics.
Dunzhu Li	Trinity College Dublin	EPA	Investigation and mitigation of surface stress-induced microplastics release from daily-use plastic products	€674,885.40	Microplastics (MPs) are a global concern due to their potential threat to the environment and human health. Recent studies confirmed that daily-use plastic products (DPPs, e.g., plastic bottles and syringes) are local and immediate sources of high-level MPs, which raises huge public concern. To date, little is known about the MPs release mechanism. Typical DPPs are semi-crystalline (crystallinity ranging 10-80%) containing amorphous and crystalline regions. We recently confirmed that the phase separation of amorphous regions in bulk plastics is largely responsible for MP release (contribution >95%) while surface stress is a fundamental driver. To protect both human and environmental health, I propose to (i) systematically investigate surface stress-induced polymer phase separation and MP release from DPPs, (ii) undertake numerical studies of surface stress and polymer phase separation and modification of DPP design and related processing conditions, (iii) design and develop prototype of typical DPPs (plastic bottles and syringes) using moulding method to lower the surface stress and suppress microplastics release, and (iv) communicate the outputs and impacts of the Pathway Project through journal publications and media reports, engagement with MP research community and regulators and to disseminate results to the widest possible local audience via participation in Bloom Festival 2027.

Edith Kubik	University College Dublin		Quantifying core formation conditions with isotopic tracers	€675,042.60	Accretion and core formation are major events that led to the present-day structure and composition of the terrestrial planets. Core formation, involving the separation of molten silicate and core-forming metal at the base of a deep magma ocean, establishes the elemental and isotopic compositions of main planetary reservoirs and importantly records the physical and chemical conditions of the core–mantle equilibrium. This project aims to quantify core formation conditions using a multi-disciplinary approach involving experimental petrology, isotope geochemistry and numerical modelling. The degree of fractionation of nickel, silicon and iron isotopes—which are well-suited as tracers due to their iron-loving and non-volatile behaviours—will be experimentally determined at conditions relevant to core formation on large rocky planets such as Mars and Earth. Using these hitherto poorly constrained fractionation factors, the conditions of core–mantle equilibration will be modelled to reproduce the observed isotopic compositions of Earth and Mars' mantles, in turn constraining (1) the composition of their inaccessible cores, (2) their early thermal histories, (3) potential origins for inner solar system isotopic variability, (4) the composition and origin of terrestrial planets' precursor components and (5) the decorrelation of core formation effects from mantle signatures allowing to reappraise the effect of other accretion-related mechanisms.
Eirini Maniou	DCU		Investigating the interplay between morphogens and tissue mechanics during neural tube formation	€676,919.90	Neural tube morphogenesis a fundamental process leading to formation of the central nervous system. It is governed by graded concentration of morphogens, secreted molecules regulating neuronal specification. The same process critically depends on mechanical forces and compliant tissue properties, but how mechanical inputs are integrated with molecular cues remains elusive to date. Through the application of advanced bioengineering methods, the project aims to reveal the interplay between morphogen signalling and tissue mechanics driving neural tube formation. Using the tractable chick embryo, we will first assess if competency of the neural tube to close is time-dependent and identify critical time windows for completion of closure. By integrating in vivo force quantification, with hydrogel microfluidics and live imaging, we will reversibly perturb mechanical forces as well as morphogens with unprecedented spatial and temporal resolution and acquire quantifiable readouts of such perturbations. The findings will be complemented by studies on human neuromesodermal progenitors, to examine if the processes we describe in chick morphogenesis are evolutionary conserved. The project has therefore the potential to uncover how dysregulation of morphogenetic processes reflects in different phenotypes of failed neural tube closure and shed light on the aetiology of congenital malformations.

Gemma Leon	RCSI University of Medicine and Health Sciences		Exploiting APC signalling to mitigate colitogenic CD4+ T-cell thromboinflammatory activity.	€646,607.50	IBD patients experience up to 6-fold increased risk of venous thromboembolism (VTE) compared to the general population, although the mechanistic basis for this increased risk is unknown. We recently identified the presence of tissue factor (TF)+CD4+CD3+ T-cells in the colons of colitogenic mice and paediatric IBD patients during active disease, and uncovered a role for inflammatory T-cells facilitating thrombin generation via TF activation. Pre-clinical studies suggest an important role for diminished protein C (PC)-pathway activity in IBD pathophysiology, and the meta-transcriptomic analysis we performed identified dysregulated expression of PC in IBD patient colonic tissue. Subsequent functional studies revealed that activated protein C (APC) signalling reduced colitogenic T-cell generation and thromboinflammatory activity. Crucially, this data suggests that APC may have a dual role in reducing T-cell-mediated inflammation and may also mitigate against increased thrombogenicity in IBD patients. Therefore, we propose to assess the thrombogenicity of IBD patient T-cells, elucidate the receptor and signalling pathway requirements for APC reduction of thromboinflammatory T-cell activity, and generate recombinant T-cell specific APC variants targeting this activity. Collectively, these data will provide new insights into the role of APC in modulating T-cell biology and identify new therapeutic approaches to treating IBD and other T-cell-mediated immunothrombotic diseases.
Ian Woods	RCSI University of Medicine and Health Sciences		MX-REGEN: Electroconductive MXene-functionalized micro-mesh hydrogels as a minimally-invasive approach to regeneration of traumatic brain injuries.	€648,192.00	Traumatic brain injury (TBI) can lead to motor and cognitive dysfunction and no reparative therapy currently exists. TBI's pathophysiology presents overlapping challenges for repair – innately-poor neuronal regrowth, scarring and impaired neuronal signalling – requiring multi-faceted solutions. Electrical stimulation (ES) shows pro-regenerative potential which it is envisaged may be enhanced by its delivery through conductive biomaterials to injured neurons. However, existing conductive biomaterials limit the use of ES for regeneration due to poor conductivity, constrained processability and scar-promoting characteristics. To overcome these limitations and effectively deliver pro-regenerative ES, MX-REGEN will develop an injectable conductive implant with immunomodulatory properties which will locally deliver electrostimulation through a self-assembling conductive fibrous microarchitecture. Discreet, ordered microfibrous mesh (micro-mesh) structures will be 3D-printed using melt-electrowriting and functionalized with highly conductive 2D MXene-nanosheets. An immunomodulatory injectable hydrogel will then be used to minimally-invasively deliver the conductive micro-meshes, which will aggregate within the lesion to form conductive circuitry. This biphasic structure will provide a scar-ameliorating interface between the electrically-active micro-meshes and injured tissue to deliver exogenous ES. MX-REGEN has the potential to revolutionise treatment for TBI, using a novel nanomaterial-enabled electrically-activated implant to provide the first effective pro-regenerative therapy for TBI patients with life-changing injuries.

Jing LI	University College Cork		Quantum Control of interacting ultracold atoms for Heat Engines	€568,170.80	Quantum heat engines (QHEs) perform a thermodynamic cycle employing quantum systems as the working medium. QHEs allow one to explore the limits and possibilities of quantum thermodynamics.The project aims to explore quantum thermodynamics by examining quantum heat engines utilizing interacting ultracold atoms. It spans from weakly interacting Bose-Bose mixture condensates to intermediate finite coupling Bose gases and strongly correlated atomic systems. The project delves into the impact of interactions, both weak and strong, repulsive and attractive, on the performance of QHEs. Additionally, it seeks to develop extended Shortcut to Adiabaticity methods to optimize the balance between efficiency and power output in finite-time engine cycles. Concurrently, it investigates the influence of temperature-dependent dynamics in Bose gases or Tonks-Girardeau gases on QHE performance. Through theoretical inquiries and collaborations, this project introduces an innovative paradigm with profound implications for energy efficiency and quantum technologies.
Jing Lyu	University College Dublin		Novel hyperbranched polymers from kinetically controlled polymerization of multivinyl monomers and their application in injectable stem cell hydrogel scaffolds for cartilage repair	€673,559.60	Cartilage tissue engineering, particularly stem cell therapy with the development of injectable hydrogels, has emerged as a promising strategy for cartilage defect repair. The principal challenge lies in creating a hydrogel that can be tuned to match the specific microenvironment in mechanical properties and cellular interactions. This project aims to develop a novel injectable hydrogel scaffold with tunable microstructure and properties based on hyperbranched (HB) polymers. The in situ formed HB hydrogel system is hypothesized to effectively retain stem cells and recapitulate the physiological and biological environment of the knee joint for enhancing cartilage defect repair. Initially, this study will elucidate the kinetically controlled ATRP mechanism of multivinyl monomers towards HB structure formation with the help of Monte Carlo simulation. Subsequently, PEG-based HB polymers will be tailor-synthesized. These polymers will in situ crosslink with thiolated collagen to form 3D scaffolds mimicking natural cartilage tissue to support the growth of ADSCs. The anticipated outcome of this project is the development of a stem cell “niche” injectable hydrogel scaffold system using structurally and functionally adaptable HB materials. This system will be characterized by adjustable mechanical properties, biocompatibility, and biodegradability, making it an ideal candidate for minimally invasive cartilage regeneration techniques.

Lily Keane	University College Cork		Unravelling extrinsic developmental vulnerabilities of diffuse midline gliomas	€676,457.20	Why certain regions of the brain are vulnerable to oncogenic transformation at critical periods of development is largely unknown. This is particularly the case for diffuse midline glioma, H3K27M mutant (DMG). DMG is a completely fatal and aggressive brain tumour that occurs in the pons, during early childhood. Despite recent efforts, standard therapy remains isolated to radiation and new therapeutic strategies are desperately needed. There is growing evidence that disrupted developmental programs are at the root of paediatric brain tumours. Therefore, we hypothesised that the extrinsic environment of the developing brainstem could play an essential role in DMG whereby key signals are highjacked by the tumour. Indeed, preliminary data suggests that microglia, the macrophages of the brain, are essential for DMG progression. In depth data mining of human DMG patient single-cell data revealed a microglia activation state similar to CD11c+ microglia found in the cerebellum during early development. Furthermore, we found that signals via the gut-brain axis regulated this activation state in the developing brainstem. This project aims to, (i) further characterise microglia diversity and gut-brain axis signals in the developing brainstem and (ii) investigate how modulating the gut microbiome may impact microglia diversity and DMG tumour development.
Rekha Gautam	Tyndall National Institute		Noninvasive Optical Assessment of Bone Quality	€660,623.61	The escalating prevalence of bone-related disorders, notably fragility fractures (FF), necessitates innovative approaches for early detection and intervention. Existing methods like Dual-energy X-ray absorptiometry (DEXA) offer limited insight into bone quality, highlighting the need for techniques which can assist DEXA providing additional molecular information. Raman spectroscopy provides comprehensive molecular profiling of bone, including matrix elements and minerals. However, its accuracy and robustness in quantifying molecular information beneath turbid layers like tissue are limited due to challenges, variation in sampling volume owing to optical attenuation, limited depth sensitivity and contamination from top (tissue) layer. This project (NOBEL) innovates by enhancing the depth sensitivity of inverse spatially offset Raman spectroscopy (iSORS) system through optimized wavefront shaping (WFS) techniques, maximizing excitation light deposition on hidden bone targets. Further, a novel framework that corrects for optical attenuation using diffuse reflectance data and photon migration models, enhancing the accuracy of subsurface Raman data quantification is developed. By amalgamating these innovative methods, NOBEL aims to pioneer a technique that revolutionizes noninvasive biochemical profiling of bone health. This advancement holds promise in significantly reducing FF risk and associated economic burdens. Moreover, it opens avenues for personalized preventive strategies and early interventions, ultimately improving public health outcomes.

Marco Rosario Capodiferro	Trinity College Dublin		ArchEvo: exploring the evolution of Archaic Introgression through the analysis of Eurasian and American ancient genomes	€631,197.20	The identification of introgressed genomic regions from archaic hominins (Neanderthals and Denisovans) in non-African modern humans, significantly altered our understanding of the evolution of our species. This “archaic introgression” introduced new genetic variation that facilitated human adaptation to novel environments. However, the characterization of its impact on modern humans has relied on studying the genomes of contemporary Eurasian populations. A comprehensive model of archaic introgression’s evolution inside the human genome, and its impact during the rapid peopling of diverse environments in the Americas, represent two significant knowledge gaps in human population genomics. We propose to investigate the temporal and spatial evolution of archaic variation (ArchEvo) in modern human populations by exploring ancient genomes from multiple geographical regions, including Americas. With our newly validated approach, leveraging imputation, we will analyse thousands of ancient genomes across time and space. Identifying the quantity and genomic location of introgressed regions, along with potential selection signals across temporal and geographic dimensions, will advance our knowledge of the human genome's functionality and shed light on past adaptations to environmental changes. The project results will aid in integrating Indigenous Americans, often marginalised into population genomics, into archaic introgression investigations and promoting further research on ancient American DNA.
Niamh Ryan	Trinity College Dublin		A multi-ancestry telomere-to-telomere genomic investigation of neuropsychiatric pedigrees	€676,345.32	Few clinically-actionable genetic variants have been confirmed for neuropsychiatric disorders. Whole-exome and whole-genome short-read sequencing (SRS) are commonly used to identify risk variants, but focus on protein-altering variants, as the most easily mapped to function. However, we know that ~10% of the human genome is made of “dark” regions, inaccessible to SRS technologies. This includes genes relevant to neuropsychiatric research, preventing researchers from identifying clinically-relevant variants. We also know that the genomic landscape of diverse human populations is not well represented by the Genome Reference Consortium human reference genome. Long-read sequencing (LRS) is an emerging technology that can resolve dark regions, allowing telomere-to-telomere genomic analysis and the investigation of otherwise hard-to-identify variants (including structural variants, variants in repetitive sequences, and gender-specific effects). This innovative project will use LRS to investigate neuropsychiatric pedigrees from diverse populations, aiming to expand the range of clinically-actionable variants. This project will also investigate the differences in variant discovery for individuals across ethnic populations using different LRS read-mapping and genome assembly methods; and reference genomes (GRCh38, T2T-CHM13 and Pangenome assemblies). This work will adopt a more global perspective on genetic risk variants to enhance biological understanding of these conditions, ultimately improving diagnostics and therapeutics.

Nicolas Luca Celli	Dublin Institute for Advanced Studies (DIAS)		IMAGFib: multiscale seismic IMAGing with optical FIBre telecom cables	€589,005.54	Understanding the structure of the crust is key to monitor geohazards, locate natural resources and understand the earth's geological history. Large, dense networks of seismic sensors can produce high-resolution images of the subsurface, but they are difficult and expensive to deploy, especially in key study areas such as cities and the oceans. In this project, we aim to compute new, multiscale images of the crust harnessing a new technology that turns the many optical fibre cables used for telecommunications into long, dense seismic arrays (Distributed Acoustic Sensing-DAS). Firstly, we will investigate how geological features traverse the whole crust by using DAS on hundreds of kilometres of existing commercial telecom cables across Ireland and the Irish sea and develop tools to use it for shallow-to-deep, multi-scale passive seismic imaging. Secondly, we will investigate fibre-optic seismology beyond DAS, including long-range interrogation technologies, sensitivity to low-frequency signals and sensing the oceans' state and underlying earth structure. The new data and models will provide insights on how surface geology connects to deep crustal features, key for geothermal exploration. We will also explore the potential and limitations of onshore-offshore fibre-optic seismology, paving the way for its use on the thousands of kilometres of telecom cables.
Oliver Roberts	University of Galway		Good Vibrations – Studying the Seismic Vibrations of Highly Magnetized Neutron Stars (AstroMagnets)	€663,959.90	Magnetars are the smouldering remnants of an explosion of a star >10x more massive than our Sun. The resulting neutron star has a mass 1.5x that of our Sun, condensed into a diameter of ~15 km, spinning once on its axis every several seconds, with a magnetic field 10 trillion times stronger than an average fridge magnet. Magnetars produce episodic bursts, intermediate flares and rarely, giant flares. Cataclysmic giant flares saturate current instrumentation in orbit. Consequently, the spectral and temporal behaviour of the flare and hints of its emission mechanism have remained elusive. However, extra-galactic magnetar giant flares, masquerading as short GRBs, offer tantalizing clues of these exotic objects. Additionally, mysterious fast radio bursts (FRBs) have been linked to galactic magnetar bursts, though it's unclear why they occur, and how their emission correlates with observed emission over the X-ray and gamma-ray wavelengths. In this proposal, we aim to develop infrastructure with current and future flying NASA and ESA missions and global radio networks to better understand the connection between FRBs and magnetar flares/bursts, through timing analysis of their starquakes, as well as monitoring active galactic magnetars, and testing new hardware and methods required to observe magnetars from space.

Purabi Bhagabati	DCU	EPA	PEForm: Polyethylene furanoate (PEF) a Sustainable Polymer – Pioneering Circular Bioeconomy in Barrier Food Packaging	€668,138.90	While food packaging is essential for food security, and plastic food packaging offers additional benefits over other materials [1], it has so far come at a cost. It is now universally realised that plastic-led pollution has had a significant negative effect on our climate. Highly unsustainable, fossil-fuel based plastics such as polyethylene terephthalate (PET) have been used excessively for food packaging, and while recycling is available, it is not the solution. PET cannot be indefinitely recycled, and when it is recycled, the mechanical properties are diminished making it less and less useful at each cycle. Moreover, it has been shown that only 23% of PET is actually recycled at all, with the rest being sent to landfill or incineration [2]. Polyethylene furanoate (PEF) is a fully bio-based polymer that is both recyclable and compostable; however, the technical challenge of synthesis and manufacturing has limited its development so far. The PEForm project will address this by producing PEF with the required molecular weight and architecture to be used in food packaging. The project will reduce the amount of material used in packaging, test its shelf-life enhancing capacity, test the compostability/recyclability of the materials, and demonstrate the scalability of the manufacturing process.
Sabir Hussain	Tyndall National Institute		Two-dimensional Semiconductor–Ferroelectric Heterostructures for Disruptive Memory Storage Applications	€675,894.80	The surge in demand for remote learning, working, and entertainment has sparked an unprecedented rise in global data creation, surpassing the growth rate of storage capacity. Existing memory storage technologies are nearing their physical storage limits, necessitating the development of innovative materials to address this challenge. Bridging the evolving memory storage gap hinges on the advancement of novel materials. This targeted proposal integrates functional ferroelectric materials with two-dimensional (2D) semiconductor materials to facilitate memory devices with enhanced gate dielectric reliability. By closely associating with the depolarisation field in the ferroelectric layer, I anticipate improved charge separation/mobility in the 2D semiconductor, leading to increased current ON:OFF ratio, expanded memory window, and reduced power consumption. These attributes enable these devices to function as non-volatile memory devices that are significantly advanced over the current state-of-the-art. The proposed research endeavours to establish a pathway for novel device structures and functionalities, encompassing memory-based computing architectures, photoelectric devices, and next-generation low-energy-consumption integrated circuits.

Shree Krishnamoorthy	Tyndall National Institute		Nascent - long-wavelength Near infrAred optical Signals for Continuous non-invasivE Nascent life well-being moniToring	€665,953.40	Nascent life, the period just before birth, during labour, and through the first week of life, remains the most precarious. Two in every thousand babies suffer after-effects of pre-term hypoxia and die. While tremendous progress has been made recently in improving neonatal care, the World Health Organisation (WHO) recognizes that better monitoring methods are needed to further improve healthcare for these babies. This underlines that - An early, and continuous, monitoring of hypoxia-related distress (e.g. using spectroscopy) would be a disruptive change in proactive quality clinical care for nascent life. NASCENT will demonstrate a novel technique called STIR for spectroscopic pH measurement, a gold standard for hypoxic distress. STIR has the potential to enable non-invasive, sample-free (bloodless), and continuous measurements of tissue pH. In NASCENT, we will demonstrate a proof-of-principle of the STIR technique in aqueous phantom. STIR is employing the coherence properties of RF-modulated lasers and probe the water absorption bands around 1480 and 1900 nm. It will enable measure pH in range 7.1-7.6 with accuracy of 0.01 units in aqueous phantoms of 2 mm thickness. The technique will be the first-ever to achieve the required 10 kHz spectral resolution in liquid samples within the 1350-2500 nm wavelength ranges.
AHSS Projects					
Brenda McNally	University of Galway	EPA / SEAI / Met Éireann	Tackling Climate Misinformation in Ireland: An Evidence Base and Novel Resources for Journalists and Communications Professionals (CliME)	€624,193.60	According to the UN IPCC rampant misinformation is delaying climate action. This is because it confuses the public about the need for urgent action and weakens democratic debate about the necessary responses. However, tackling climate misinformation is a complex challenge. Research has identified a shift from climate denial to delay discourses aimed at stalling climate policy responses, the role of a well-funded network of actors in its online dissemination, and the mainstreaming of delay discourses and misleading claims in legacy media. While the majority of studies examine individual-level correctives to address online climate misinformation, little is known about the professional-level factors that influence its proliferation in legacy media. Therefore, research that examines climate policy misinformation in news media and the power structures that facilitate this are now necessary. This project will carry out an in-depth, qualitative analysis of climate policy misinformation in Irish news media and strategic communication. It will identify and assess the current forms of misinformation about decarbonising agriculture (2020 – 2025) and examine the socio-cultural factors that influence their (re)production in news media. The findings will support the co-creation of educational resources with journalists and communications professionals as well as recommendations for higher education and policymakers.

Camille Nadal	University College Dublin		A Life with Endometriosis: Empowering Individuals through Technology (Tech4Endo)	€674,309.90	Endometriosis is a prevalent chronic condition affecting over 190 million people worldwide, impacting 1 in 10 women. Associated with severe, debilitating pain, endometriosis occurs when tissue that normally develops in the womb grows outside of it. Despite its prevalence, there is no known cure, and in Ireland alone, endometriosis is estimated to cost €2.9 billion annually. The Tech4Endo project pioneers an initiative to empower people affected by endometriosis by fostering the co-creation of technological solutions to address their unmet needs and enhance their quality of life. While commercial technologies for endometriosis primarily consist of pain management devices and menstrual cycle and pregnancy trackers, endometriosis impacts various aspects of a person's life, including daily functioning, mental health, finances, relationships, and self-perception. Therefore, the opportunities for innovating in this space are abundant. Tech4Endo aligns with the UN Sustainable Development Goal 3 encouraging multisectoral and gender-sensitive approaches to address inequalities and build good health for all. By embracing a transdisciplinary and participatory approach, Tech4Endo prioritises the representation and accommodation of a diverse range of lived experiences linked to endometriosis. Emphasising empowerment and inclusion, Tech4Endo will develop tailored solutions for managing endometriosis, ultimately improving the lives of individuals affected by the condition.
Ciara Mahon	DCU		Attune: Codesigning and evaluating a novel digital intervention to improve body image and wellbeing among adults	€614,253.12	Body dissatisfaction is an established public health concern and there is a pressing need for effective, accessible, and scalable digital health solutions to improve body image and psychological wellbeing among young adults. This research aims to develop Attune - the first gender-inclusive, multicomponent, digital programme of its kind – which will advance our understanding of how to harness e-technologies to support young adult body image. Attune will be iteratively codesigned through workshops with a multidisciplinary team of experts (body image, nutrition, movement science, digital health) and members of the public. We will experimentally assess acceptability and effectiveness of each module (micro-intervention), each of which contains an active ingredient (e.g., self-compassion) designed to produce immediate improvements in body image. Attune will be composed of a suite of effective micro-interventions and will contain progress monitoring features that allow participants track their progress through the course and share engagement and outcome data to enable programme evaluation. We will prototype test and pilot the feasibility of Attune before evaluating its preliminary effectiveness in improving body image outcomes. Progress monitoring metrics will be analysed to identify 'what works for whom' in terms of improving body image, which may inform more personalised approaches to supporting body image.

Ciaran Arthur	University of Galway		Connect 4: Uncovering Knowledge Exchange within the Early Medieval Insular World through Linguistic Idiosyncrasies in Obscure Letters, Words, Phrases, and Texts	€687,422.63	Connect 4 will establish a new corpus of linguistically opaque texts in manuscripts produced in Insular centres across early medieval Britain, Ireland, and Europe (ca. 600-1100) that have defied scholarly interpretation. Obscure texts that employ ancient and foreign languages, strange words, exotic alphabets, and cryptic signs are prevalent in early Insular manuscripts, particularly in charms, amulets, and remedial texts, ciphers, and riddles. Obscure writing was a phenomenon integral to early medieval intellectual, religious, and scientific culture. Connect 4 will compile, classify, and reinvestigate texts that are highly obscure in meaning through either scribal error or deliberate obfuscation. Its digital repository will provide a thematic, multidisciplinary tool to cross-compare, critically analyse, and attempt to solve meanings in these mysterious texts. Identification of linguistic idiosyncrasies and patterns within this corpus will expose sources, reveal cross-cultural, international exchanges of ideas within the Insular world, and advance original interpretations. A series of published case studies will launch this new, interdisciplinary field within Medieval Studies, leading to genuinely ground-breaking discoveries in a wide range of linguistically opaque texts that were written at a time contemporary with significant developments in intellectual approaches to language, religion, science, historiography, and cryptography in the early medieval Insular world.
Deirdre Foley	Trinity College Dublin		TÚS: Pregnancy and Giving Birth in Ireland, 1950-2020	€591,951.17	TÚS is the first comprehensive historical investigation into the experience of pregnancy and childbirth in the Republic of Ireland, 1950-1990. This is the most transformative period on record in terms of where, when, and how often women gave birth. State provision of maternity care expanded dramatically in this period but remains under-examined by historians. Drawing on archival, medical, and statistical sources, TÚS will create a substantial open-access oral history database, a public and digital exhibition and a podcast series. In doing so, TÚS recovers and highlights women's voices and experiences of pregnancy and childbirth, from detection to delivery. From 1950-2020, hospital births increased substantially. The average family size decreased, the typical age at which mothers gave birth for the first time rose, and births outside of marriage increased, as did the diversity of birthing mothers in terms of ethnicity and nationality. Employing an intersectional methodology, TÚS analyses the differing experiences of women according to their social class, marital status, urban/rural location, race/ethnicity, religion, sexuality and ability in a network of maternity institutions historically dominated by Catholicism. The project's outputs will place this subject within the wider context of shifting historical attitudes towards the pregnant body, women's health and welfare.

Evan Boyle	University College Cork	SEAI	UrbanClimateCollab: Fostering Collaborative Partnerships for City Climate Action	€644,502.20	Transdisciplinary research (TdR) which integrates knowledge and methodologies from multiple disciplines and stakeholders beyond academia to address complex problems beyond the scope of any single field is recognised as crucial in achieving climate action. TdR approaches with practice stakeholders, such as local/ municipal authorities, are crucial to asking relevant research questions that can lead to identifiable benefit and stimulate interaction beyond silos to address complex challenges. Yet, an understanding of how to design, implement, and manage such partnerships for climate action remains poorly understood. UrbanClimateCollab will answer the central research question 'How can city-university partnerships in Ireland be improved to achieve urgent climate action?'. The two overarching aims of the project are: to (1) improve transdisciplinary research practice for universities in partnership with cities to deliver societal impact on climate change; and (2) provide evidence to inform Irish policy on supporting CUPs and bottom-up urban climate action. To meet these aims, UrbanClimateCollab will (1) investigate best practices for partnership between cities and universities, (2) experiment with methods for engaging with a range of different stakeholders within cities, and (3) build policy recommendations to enhance collaborative responses to climate change at the urban level.
Jesse Patrick Harrington	Dublin Institute for Advanced Studies (DIAS)		The Lives and Miracles of St. Laurence O'Toole	€627,243.40	This project proposes to edit and translate key historical and literary sources from their unedited medieval Latin manuscripts, concerning a crucial figure of medieval European political and religious history, St. Lorcán Ua Tuathail (Laurence O'Toole, c. 1128–80). Laurence was one of the most significant churchmen of medieval England, France, and Ireland, a central figure in the twelfth-century renaissance, church reform, and English invasion of Ireland, and one of only two Irish churchmen from his century to be the subject of a biography by his contemporaries. No fewer than six medieval Latin biographies ('Lives') of St. Laurence survive from England, France, and Ireland, as well as three extensive medieval collections of miracles from his burial shrine in France. These provide a unique record of medieval cultural, religious, and social history, and of the European cultural memory of an Irish saint. Many of these texts and manuscripts have never been edited, translated, or explored in any detail. This project will contribute new, complete, critical editions, and translations of the three miracle collections and the six Lives, to coincide with the major commemorative anniversaries in France and Ireland of St. Laurence's canonisation (1225–2025), birth (1128–2028), and death (1180–2030).

John Greaney	University College Dublin		Contemporary modernisms: the reconstitution of Europe and the fate of the avant-garde (acronym: CONTMODS)	€674,663.90	CONTMODS interrogates how modernism has re-emerged as a cultural descriptor in the twenty-first century. In counterpoint to the internationalisation of modernism, which extends it into the present, this project analyses how modernism has become a form of cultural nationalism in Europe. CONTMODS thus reintegrates European history into modernist studies to investigate how post-war geopolitics, cultural soft power and the ideologies of modern Europe inform what modernism means today. Particularly, CONTMODS explores how modernism, once an exilic avant-garde movement, has operated as a mode of soft nationalism in post-war Europe, such that expatriates like James Joyce and Rainer Maria Rilke have become national and European heritage figures. In turn, it examines how a renationalised modernism paradoxically serves as a basis to a European identity that excludes non-Europeans, and as a cultural justification for Europe's borders. CONTMODS draws on an impressive research network to produce Europe-wide implications. It develops case studies to establish comparative frameworks for analysing the fate of modernism across Europe. I will examine Irish and English modernisms and lead the comparative dimensions. A PhD student will research another European context. A monograph, edited volume and book series with Edinburgh UP will develop comparative analyses of contemporary European modernisms.
Jonathan Briody	RCSI University of Medicine and Health Sciences		Empowering Voices, Enhancing Outcomes: Co-creating an Open Source Health Economic Model for National Decisions on Care in Alzheimer's Disease and Dementia in Ireland.	€647,476.90	The aim of this study is to create an open-source health-economic model for Alzheimer's disease and dementia (AD) in Ireland that accurately reflects the attitudes and preferences of people with AD (PwAD) and their family caregivers. I will collect and analyse data from PwAD and their family caregivers using various methods, including a systematic literature review to identify the lived experience of the costs of AD, a psychometric analysis of the health-related quality of life of PwAD and their caregivers using AD-specific questionnaires, a thematic analysis of interviews with PwAD and their caregivers to gain insight into their experiences and challenges relating to AD, and a preference elicitation technique known as the analytic hierarchy process to capture the values and trade-offs of PwAD and their caregivers for different care options. I will use data from these methods to develop a health-economic model, which will compare the costs and benefits of different care options for AD. I will then test the model with a real-world example of an intervention that PwAD and their caregivers have chosen. Subsequently, I will make the model publicly accessible through an online platform, where anyone can use it or modify it to suit their needs.

Jonathan Harris	DCU		Diaspora Diplomacy and the Migration-Development Nexus	€638,718.00	States increasing view diasporas as key diplomatic and developmental resources, and the role they play in global politics is the focus of a growing number of policy interventions and reappraisal in the fields of political geography, international relations and diplomacy studies. In Ireland's context of increasing nativist-populist public discourse and Brexit-related territorial questions, research is urgently needed to better understand how diaspora networks act diplomatically, to broker geopolitical connections, support development goals and mediate conflict. While interdisciplinary literature on the 'migration-development nexus' largely focuses on short-term economic questions, the innovative concept of 'diaspora diplomacy' highlights the longer-term geopolitics of diaspora mobilisation. This project brings these divergent literatures into conversation, bridging the theory and practice gap in diaspora engagement. It does so through a cross-border study that will highlight the ways that differing citizenship regimes, governance structures and engagement policies interact with diaspora networks - both the Irish abroad and those diasporas that call Ireland home. It will map the diaspora diplomacies of three significant and growing diasporas of postcolonial states (Brazil, India and Algeria), and critically review Ireland's own diaspora strategy, to identify lessons for domestic as well as foreign policy, improving migration governance and development outcomes globally.
Julius-Cezar Macarie	University College Cork		NIGHTWORK_FOOTPRINT: A Synthesis of Contemporary CapitalismS Across Nightshift Cities	€676,282.00	This proposed research theorises 'post-circadian capitalism'. Building on previous research, the project examines thus theorises the role of nightwork in contemporary capitalism and aims to develops a socially-just model of nightwork for Ireland and beyond. Post-circadian Nights will explore if and how labour history addresses the formation of this capitalist 'post-circadian' phase, whereby it disrespects the physical, biological, and social needs of workers. The project also builds on recent studies that 'grasp[s] the relational and contradictory dimensions of capitalism'. Moreover, it draws on studies of nightworkers in both global cities (e.g. London), whereby lacking choice (Jarrow Insights 2023), equals unseen degrees of marginalisation. HoweverYet, little is known about the choices nightworkers have in smaller, regional urban settings—these are the protagonists of this project. To achieve the overall goals in this project, the PI will conduct ethnography in multiple locations (e.g. Birmingham, Rotterdam, Budapest and Montreal). The PhD student will carry out policy analysis, archival work and interviews with nightworkers in one city (e.g. Limerick). This timely project will offer important critical insights and interventions to influence positively not only existing nighttime economy policy frameworks, but also explore new possibilities for emerging urban policies emphasising nighttime boosterism.

Matteo Leta	University College Dublin		Staging Otherness: The Representation of "Gypsies", Turks, and Moors in Italian Renaissance Comedies and their European Translations (c.1500-1650)	€601,669.20	Amidst the contemporary discourses surrounding diversity and inclusion, exploring the historical roots of our perceptions of the "other" becomes increasingly imperative. Renaissance Italy is analogous to present-day Europe in many respects. It witnessed a confluence of cultural encounters, hosting a significant number of refugees, while emerging as a hub for corsair activities and slave trade. But how were the "others" represented in this period? What are the similarities between the representations of different "others" and what are the factors that conditioned these representations? This project aims to examine the portrayal of "Gypsies", Moors, and Turks in Italian Renaissance comedies and their European translations. Through an interdisciplinary analysis of over twenty comedies and their translations, this project will demonstrate that despite relying on ethnic stereotypes for comedic effect, their widespread popularity indicates a significant societal contemplation of diversity, highlighting a pressing need for coexistence during the 16th and 17th centuries. The research will consider the single plays, their position in relation to other comedies and the changing political background. A new understanding of relations with "others" will emerge, which will allow us to comprehend the emergence of early forms of xenophobia and offer examples and strategies for coexistence still relevant today.
Michael Lydon	University of Galway		Knowing the Score: An Analysis of the Gender Balance of Opera Productions on the Island of Ireland (2000-25)	€568,563.60	In 2023, research into the gender balance of contemporary music found that only 1 of the 152 operas produced on the island of Ireland from 2004-19 was sole authored by a woman (Lydon, 7). This research will quantify the extent to which imbalances exist in Irish opera and qualify the socio-cultural, political and economic factors that have supported inequality. Building upon research that assesses the gender balance for publicly funded composer opportunities (Lydon, 2023), gender in Irish theatre (Donohue, et al., 2017), and gender inequality in music industries in Ireland (Hanlon, 2023), the project will provide insight into the experiences of and barriers to access experienced by women in Irish opera. The study will assess the gender balance of the key creative and leadership roles for Irish opera productions from 2000-25. This includes the following roles: composer, conductor, director, libretto, set designer, costume designer, and sound designer. The outputs of this research will include a series of articles in high impact journals and a series of ready-to-implement research-informed equality initiatives. Ultimately, this research will stimulate sustainable and systemic changes in Irish opera, thus enriching creativity and culture.

Sarah Schaefer	University of Limerick	EPA	Posthumanist sociolinguistics and journalistic practices: Reporting on climate change in Irish and German media	€613,968.27	In view of the increasing severity of weather events and unprecedented meteorological extremes, climate journalism aims to inform and warn audiences about climate change and promote ways of mitigating global warming. These efforts have so far, however, shown too little effect, and European broadcasters are frequently criticised for their human-centred coverage and misrepresentations of climate change. Despite this criticism, there is a significant lack of knowledge about the interrelation between anthropocentric discourses and transmodal (i.e. linguistic and semiotic) reporting practices of radio journalists in climate coverage. Through a comparative study of Irish and German radio based on linguistic ethnography and a transmodal analysis of media messages, this project examines how journalists reporting on climate issues try to engage with and inform about the topic of climate protection. In this context, it sheds light on issues that lead to misrepresentations of climate change in Irish and German media to foster a meaningful engagement of journalists with climate change. By developing new approaches for climate-oriented communication based on posthumanist sociolinguistic perspectives, it responds to timely concerns about how humans conceive of their place in socio-ecological environments. The project's results are disseminated through academic publications and outreach activities for media stakeholders.
Úna Britton	DCU		Developing physical literacy as a support structure for physical activity in children who are blind or vision impaired.	€665,597.60	Aim: Develop an evidence-informed support structure to promote physical activity (PA) among children who are blind or vision impaired (BVI). Background: Physical inactivity contributes to 20-30% of the non-communicable disease burden globally. Compared to children without disabilities, those with a disability are at even greater risk of insufficient PA and subsequent negative health outcomes. Low PA levels in children who are BVI are compounded by poor cardiovascular endurance, poor motor skills and unique barriers to PA, specifically in accessing PA using active or independent travel. Physical literacy is the foundation for living an active life, supporting positive health outcomes. There is a critical need to enhance physical literacy and increase capacity for independent travel in children with BVI to support greater engagement in overall PA. Objectives: 1) develop a tailored physical literacy intervention for children with BVI, 2) contribute to the development and evaluation of a programme to increase active/independent travel, and 3) audit current physical literacy resources to evaluate for BVI inclusiveness, creating a foundation for a physical literacy resource repository. Target Outcome: Developing a PA support structure will directly benefit the health and well-being of children who are BVI through improving physical literacy and PA opportunities.