

## LIST OF FUNDED PROJECTS

Awardee	Research Body	Proposal Title	Award Amount	Summary
<b>AHSS Projects</b>				
Peter Deeney	University College Cork	End of Life Decisions for Wind Farms: An Opportunity for Climate Action and for Energy Communities	€528,056	Wind farms require a huge amount of investment up front, with relatively small operating costs, followed by an expensive decommissioning operation at the end. This means that the value of the wind farm falls during its life. The owner needs to know when it is opportune to upgrade the wind farm, and the local community may want to know how much would be a fair price to buy into the wind farm. This project solves problems for the community and the wind farm developer by developing decision support tools to assess a fair price for the wind farm.
Niamh Wycherley	Maynooth University	Power and patronage in medieval Ireland: Clonard from the sixth to twelfth centuries	€495,846	This project proposes a detailed case study of one medieval Irish institution of strategic importance, the Church of Clonard. It addresses unresolved research problems about how the Church became one of the most powerful institutions in Ireland, and how exactly it operated. Key to answering these questions is an analysis of the co-dependencies between Church (represented by ecclesiastical leaders) and State (represented by local, provincial, and national aristocracies). The implications of the project are potentially far reaching, showing us to what extent our current perceptions of class, identity, gender, and government, are formed by developments of the medieval period.
Arpita Chakraborty	Dublin City University	They are Here Too: Gendered Violence in the South Asian Immigrant Community in Post-COVID Ireland	€551,600	Domestic violence remains one of the most significant challenges to achieving gender equality under the sustainable development goals in Ireland. This project will improve understanding of domestic violence within the South Asian migrant community in Ireland, focusing on the socio-culturally specific forms of exclusion survivors face. The project will propose policy changes as well as create a community space called ASHA where survivors can communicate with each other. This space will put into praxis the suggested changes in an experimental version.

Eavan O Dochartaigh	National University of Ireland, Galway	Exploring the Arctic Archive: Recovering Documentary Visual and Literary Sources of the Circumpolar North in the Long Nineteenth Century	€550,610	This project explores the images and associated texts documenting the western Arctic environment (in Alaska, Canada, Greenland, and the Nordic countries) in the long nineteenth century (1789-1914) during a period of intense exploration. The project carries out archival research in museums, institutes, and libraries around the world to recover little-known drawings, sketches, and small paintings. Such documents show biodiverse and inhabited places that sharply contrast with the icy realm in people's imaginations. The work will use archival resources to challenge the persistent image of the Arctic as a "frozen wasteland" and aims to increase public understanding of the region.
Pieterella Pieterse	Dublin City University	Unsalairied health workers in Sierra Leone: What impact does their unpaid status have on their lives and on the health services they deliver to populations?	€551,600	In Sierra Leone, which has some of the worst rates of maternal and child mortality in the world, almost half of the health workers do not receive a salary. This research focuses on exploring how health workers cope without salaries, and what impact this has on their ability to carry out their work. The presence of so many unsalaried health workers is thought to have a negative influence on Sierra Leone's wider society, on access to healthcare, on health worker migration and on reducing corruption among public service providers. This research aims to highlight the need to prioritise this issue.
Rowan McLaughlin	Maynooth University	A deep history of Ireland for the Information Age	€484,342	This project will use the results of 10s of thousands of archaeological excavations that have been done in recent decades. Statistics and data science to will be employed to arrive at new data-driven models of Irish population history, land use, and human responses to climate change. It builds on the PIs expertise and reputation in Irish archaeology, and will consolidate his already extensive knowledge of numerical techniques and their application to archaeological and spatio-temporal problems. It will enable Ireland, which has an outstanding and openly available archives of archaeological information, to become a world-leader in research of this kind.
Drew Thomas	University College Dublin	Applying Artificial Intelligence to the Printing Press: Transforming Visual Communication During the Protestant Reformation	€477,455	Images have great power to rile emotions and spread ideas. Nowhere is this clearer than in the Protestant Reformation, Europe's first mass media event. When Martin Luther published his German New Testament translation, it was banned immediately due to its scandalous illustrations vilifying the Pope. This research project will use a supercomputer and artificial intelligence to investigate how different religious groups during times of conflict and turmoil embraced and exploited visual communication in their printed literature and propaganda. By examining 68,000 books, it will push the boundaries of

				modern historical research and develop new ways of exploring our cultural heritage.
Sean Kenny	University College Cork	External Shocks and Fiscal Sustainability	€507,613	Ireland's economy is presently emerging from a dual economic shock (Covid 19 and Brexit). The purpose of ESFS is to measure how Irish public finances, themselves sensitive to economic conditions, have responded to previous external shocks. To do this, ESFS focuses on the most comparable turbulent period (1938-58) and measures the impact of uncertainty shocks on Ireland's economy and the state's cost of borrowing via the daily prices of government bonds. The objective of the project is to offer current policy makers a framework to base spending and borrowing decisions, depending upon the degree of prevalent uncertainty in the economy.
Frank Simons	Trinity College Dublin	Mesopotamian Psychiatry	€552,080	This project would revolutionise the study of Mesopotamian psychiatry, writing anew the first chapter in the history of that discipline. After the first two years, it would provide a much-needed critical edition of the most important source (Šurpu), and by the end it would produce two further monograph-length studies (one by me, one by the PhD student), which would be the first book-length treatments of Mesopotamian psychiatry. This can be expected to generate considerable interest within academia and beyond at the international level, contributing significantly to raising Ireland's profile in the medical humanities.
Amanda Dillon	Dublin City University	The New Illuminators: Women in Search of Spiritual Authority and Resilience	€495,817	Bible Journaling and Qur'an Journaling are an emerging trend among women readers of these books. As part of their own spiritual practice and engagement with these spiritual writings, women journal, in words, drawings and other creative means, sometimes directly in the printed book itself. Traditionally, male authority figures have determined the meaning of these scriptures. They have also used them to undermine women's place in religious communities, denying them roles in spiritual leadership. This project analyses these journaled pages to discover how this practice, advances women's spiritual authority. What happens when women become the primary interpreters of their own texts?

Nicole Volmering	Trinity College Dublin	Early Irish Hands: The Development of Writing in Early Ireland	€551,489	Many everyday items, such as the shape of a book and the letters in it, were actually designed in the Middle Ages. Irish script, made famous by the Book of Kells, has a long history was actively used well into the 20th century. Early Irish Hands and creates new technologies for studying how this script developed and how it was used outside Ireland. The project will also publish training tools for students, schools, and the public to learn how manuscripts were made and how to read them.
Robert Power	University College Dublin	The Evolution of Dietary Diversity and the Transition to Agriculture in Europe	€536,482	The Neolithic period was one of the most important changes in global prehistory. New foods tied people to the land, and farming and sedentism replaced mobile hunter-gathering. However, it is unclear how these new food systems responded to climate fluctuation, soil degradation and large-scale movements of peoples. This project will evaluate dietary breadth through microscopic food remains trapped in dental calculus to test assumptions about Neolithic lifeways in Europe, allowing novel detection of diet. The results will have implications for understanding the inexorable spread of agriculture globally and the sustainability of Neolithic life within transformed landscapes.
Tatiana Vagramenko	University College Cork	History Declassified: The KGB and the Religious Underground in Soviet Ukraine [HIDE]	€551,300	Europe rests on the legacy of totalitarian regimes. Ukraine’s European integration has highlighted the significance of the historical experience of Soviet-era state violence for processes of democratization and pluralism in society today. Based on in-depth reconsideration of recently opened Soviet-era secret police archives in Ukraine, this project offers the first concentrated study of previously classified information on the state persecution of religious minorities. The originality of the project lies in its linkage of the legacy of state repression and cultural opposition to dictatorship in Soviet Ukraine with contemporary concerns related to European enlargement and processes of transitional justice in Ireland.
Yunfan Lai	Trinity College Dublin	Gyalrongic unveiled: Languages, Heritage, Ancestry	€533,045	Linguists have long been struggling in understanding the evolution of Sino-Tibetan languages, some even pessimistically describe them as “leaves fallen from a tree” — one never knows which branches they belonged to. My goal is putting these leaves back onto their branches, starting from Gyalrongic languages, a subgroup of Sino-Tibetan. They offer copious linguistic information about Sino-Tibetan ancestry for linguists to make comparisons and hypotheses. Using modern technology and traditional theories, I will show the languages’ genetic positions and reconstruct how their common ancestor

looked like. Additionally, the project will help with the preservation and dissemination of these vulnerable languages.

Neill O'Dwyer	Trinity College Dublin	Performative Investigations into Extended and Augmented Reality Technologies (PIX-ART)	€539,909	PIX-ART will address a gap in scholarship, at the cusp of extended reality (XR) technologies and performance studies, that requires new theorisation and critique by developing a cultural theory of XR using the theoretical and scholarly practices of scenography – a sub-sector of the performing arts focusing on the practice, conceptualization, execution and/or analysis of work using technical and design-led methodologies. The goal is to practically and theoretically encapsulate the rapidly developing technical milieu using hybrid, interdisciplinary critical tools that can furnish emerging and future generations with an original and useful model for analysing the brave new world of XR.
John Brown	Maynooth University	Anti-neoliberal parties and popular movements: Andean and Southern European cases in Comparative Perspective	€552,500	Democracy faces a legitimacy crisis, with “populists” emerging to the right (nativist/xenophobic/conservative) and left (progressive/internationalist/anti-neoliberal) of mainstream party-systems. My research offers a cross-regional comparative analysis of the impacts on party system of processes led by anti-neoliberal parties (ANPs) in Southern Europe and the Andes. Moreover, I explore the nature/evolution of relationships between ANPs and popular movements whose protests (on the streets and via the ballot box) opened space for the election of ANP-outsiders in the first place. Ultimately, I address whether ANPs offer a genuine response to the contemporary crisis of democracy, or whether they are destined to wither away.
Jane Conway	National University of Ireland, Galway	Characterizing the contribution of metacognitive deficits to socio-cognitive impairments in neurodevelopmental & mental health disorders.	€550,962	Social misjudgements can have negative outcomes, from momentary awkwardness to chronic problems that affect one’s health and wellbeing. Difficulties in understanding other people’s thoughts and feelings are a symptom of many neurodevelopmental and mental health disorders. However, making a mistake but realizing that you have made an error is a step towards more accurate social inferences. This ability to evaluate the reliability of your own thoughts is called metacognition. This project examines the role metacognition plays in social skills by studying its relationship with mental health problems, and by investigating whether metacognitive training improves social judgements.

## STEM Projects

Maria Rodriguez Aburto	University College Cork	Deciphering the role of early life microbiota in neuro-glia-vascular development and contributions to neurodevelopmental disorders.	€551,602	Brain relies on stable environment, maintained by interactions between blood vessels and neural cells. These interactions constitute communication interfaces between periphery and brain. One source of peripheral signals is the gut-microbiota –the microorganisms populating our guts. Though altered microbiota is associated with mental disorders, causal mechanisms are largely unknown. I hypothesise that gut-microbiota modulates neurovascular communication during brain development through circulating microbial signals, consequently affecting brain environment. By manipulating perinatal gut-microbiota, I will observe the impact on neurovascular interactions and identify microbial signals that mediate these. This novel project will shed light on the role of gut-microbiota in shaping neurodevelopment.
Patrick Kavanagh	Dublin Institute for Advanced Studies	Probing the evolution of cosmic dust in the iconic supernova SN1987A and extragalactic young stellar objects with the James Webb Space Telescope	€549,198	Cosmic dust plays a crucial role in star-formation, acts as a building block for planet-formation, and contains the organic compounds that lead to life as we know it. Therefore, understanding the evolution of cosmic dust is understanding the evolution of the Universe and life itself. This project will use observations with the most advanced space-based observatory ever built, the James Webb Space Telescope (JWST), to perform unprecedented studies of dust produced in the once-in-a-lifetime supernova SN1987A and investigate the how stars and their planets formed during the most intense period of star-formation the Universe has ever seen.
Mario Cabrero Manresa	University College Dublin	Investigating the mediators and mechanisms that govern inflammatory responses on fibroblasts and the impact of fibroblast-macrophage interactions in inflammatory bowel disease	€552,500	Fibroblasts are abundant cells that form part of many tissues including the intestinal tract, but their functions during health and in disease are not well understood. In recent years, several exciting studies have suggested that fibroblasts may have a central role in maintaining a healthy intestinal tract and that impaired fibroblast behaviour could lead to inflammation. However, the mechanism by which these cells play such roles are not known. My research will analyze how fibroblasts participate in inflammatory bowel disease and explore strategies to target their pathogenic functions in the intestinal tract

Jennifer Cookman	University of Limerick	in situ Crystallisation and Electron Crystallography of Pharmaceutical Crystals using Liquid Phase Electron Microscopy	€551,528	<p>Chemical compounds used as ingredients for pharmaceutical products can come in different shapes and sizes called polymorphs. Generally, only a few of these are useful active ingredients and the others are too difficult to produce but could have better properties to improve current treatments.</p> <p>Using an electron microscope, we will recreate the environment these compounds are produced in. We will dramatically slow down the process of crystallisation to observe precisely how these molecules, suspended in liquid, come together to create the building blocks of these important crystals we know as medicines, focus this work on drugs such as anti-depressants.</p>
Eric Conway	Trinity College Dublin	Developing precision medicine strategies to target ASXL1 gain-of-function mutant acute myeloid leukemias.	€551,500	<p>Acute Myeloid Leukemias (AML) are often caused by alterations in 'epigenetic' genes, which control how other genes are turned on and off. Mutations that shorten the ASXL1 gene are one example of mutations in 'epigenetic' genes. Patients with ASXL1 mutations have poorer survival rates and are more likely to develop resistance to chemotherapy. But how ASXL1 promotes AML is not well understood. This project aims to uncover precisely how ASXL1 turns cancer related genes on or off. This information is critical in order to determine how to specifically treat AML patients with these mutations, compared to patients with normal ASXL1.</p>
Sarah Guerin	University of Limerick	Crystal Clear: Standardisation of Eco-Friendly Amino Acid Piezoelectrics	€548,301	<p>Billions of piezoelectric sensors are produced every year to interconvert electrical and mechanical energy and enable the medical device, infrastructure, automotive and aerospace industries, but with a huge environmental cost. The majority of piezoelectric sensors contain Lead Zirconium Titanate (PZT), the fabrication of which requires toxic lead oxide. Prominent lead-free alternatives are heavily processed, and require expensive, non-renewable materials. Biomolecular crystals are also piezoelectric, but can be grown at room temperature with no by-products. Crystal Clear will take on the challenge of developing biocrystals as organic, low-cost, high-performance sensors, to out-perform and phase-out inorganic piezoelectrics with dramatically reduced environmental impact.</p>

Florian Le Pape	Dublin Institute for Advanced Studies	Seismo-acoustic sensing of the changing North Atlantic Ocean and climate	€542,436	Ocean waves continuously generate Earth's vibrations or seismic noise at the seafloor that are observed all over the world. In this project, the goal will be to investigate how such vibrations also referred to as ocean seismic noise are sensitive to long term weather and climate fluctuations, by combining ocean wave and seismic models with present and historical seismic observations. The ocean seismic noise's sensitivity to changes in the North Atlantic's Ocean temperature and storm track through time will be evaluated in order to define the seismic fingerprint of climate change in the North Atlantic.
Daniela Freitas	Teagasc	Farm-to-Gut: a game-changer project to identify super Irish oats	€552,499	Oats are good for your heart, but did you know you would need 4 to 24 tablespoons of rolled oats every day to reap the benefits? The reason is large differences in the nutritional composition of the different varieties of oats. Teagasc is studying how well modern and ancient varieties of oats grow and respond to climatic changes in Ireland. Farm-to-Gut will study their nutritional benefits and select the healthiest variety of Irish-grown oats so that you can have a healthy heart without worrying about counting tablespoons of oats for your porridge every morning.
Dania Movia	Trinity College Dublin	Extracellular vesicles in Non-Small-Cell Lung Cancer - Finding allies among the enemies	€551,630	Non-small-cell lung cancer is the most common type of lung cancer and a deadly disease. Despite new and more effective drugs have been approved in the last years for the treatment of this disease, almost all patients inevitably develop drug resistance after a first response. However, when resistance is identified early, patients' prognosis significantly improves. Evidence shows that extracellular vesicles, tiny particles that are naturally released from cancer cells, might be used as a non-invasive tool to monitor drug resistance acquisition in real-time. "How" is still an open question. My project addresses precisely this, using an innovative animal-free research methodology.
David McNulty	University of Limerick	ALTERNATE: Advanced Lithium-Sulfur Batteries as a Beyond Lithium-Ion Energy Storage Technology	€549,252	Lithium-ion batteries are the most commonly used type of rechargeable battery in consumer electronics. The limited performance of today's commercial batteries is common knowledge, with the majority of handheld devices (e.g. smartphones) requiring to be charged every day. Lithium-ion batteries are struggling to keep up with modern technology and there is a growing need to find alternative types of rechargeable batteries. Lithium-sulfur (Li-S) batteries stand out as a promising alternative, which can offer greatly improved performance compared to traditional lithium-ion batteries. In this work, we will



develop advanced Li-S batteries containing innovative materials that will increase battery operating time.

Tom Hodgkinson	RCSI, University of Medicine and Health Sciences	Regeneration of articular cartilage through biomaterial-controlled in situ cell reprogramming to recover youthful epigenetic information	€552,140	Cartilage degeneration causes significant pain and decreased quality of life but has no effective treatment. Regenerative medicine aims to engineer materials that stimulate tissue repair. However, this is complex in cartilage due to its specialised composition and load-bearing function. Furthermore, older people are most affected by cartilage degeneration but their cells have a reduced capacity to repair. To overcome these issues, this project will develop a scaffold integrating two materials, to support load bearing but promote cell-mediated repair. To enhance scaffold effectiveness it will release gene delivery technology that targets age-related cartilage cell damage to rejuvenate their youthful, regenerative potential.
Loanda Cumba	Dublin City University	MultiMAT – Development of Functional 3D printable advanced (bio)inks.	€547,406	At present, the range of multicomponent printable conductive materials available is limited and there is scope for the development of more interesting innovative bioactive materials that can increase the array of analytes that can be monitored by the possibility of incorporating different classes of biomolecule, e.g., proteins, enzymes, and nucleic acids. MultiMAT will enable 3D sensor platforms to be printed in a single step at a low temperature allowing the stable incorporation of bioreceptors in the core material. It can open up a new range of applications from sensors for medical devices to nerve and even neuron regeneration.
David G. Madden	University of Limerick	Automated nanoparticle SYNthesis viA Process analyTICal technology driven pathwayS - SYNAPTICS	€551,300	Metal-organic frameworks (MOFs) are three-dimensional porous frameworks made up of interchangeable metal and organic components that have the potential to revolutionise global energy and medical therapeutics. The versatile nature of MOF construction has drawn comparisons to construction toys such as Meccano and Lego, except on a molecular scale. Despite their potential, challenges remain with regards to the manufacturing of MOF nanoparticles in a manner that can be considered suitable for industrial scale production. This research will utilise advanced process control tools used by the pharmaceutical and petrochemical industries to develop automated and scalable processes for the manufacturing of MOF nanoparticles.

Anton Walsh	Munster Technological University	InfraRed Laser Sensing for IRish AGRicultural Emissions (IRLS-AGRE)	€542,150	Agricultural emissions include greenhouse gases, which cause climate change, and air pollutants, which cause illness. To reduce emissions effectively, you first need to be able to measure them with high accuracy. This is difficult for agricultural emissions, as there are many hot spots on farmland which need to be monitored and the settings are harsh on the sensor technology. We will develop new types of sensors specifically for agricultural settings, targeting the three most important gases, methane, nitrous oxide and ammonia. The sensors will be benchmarked against commercial sensors and trialled in the field, on a farmland setting.
Linda Katona	University College Cork	Functional circuit mapping of gut-vagal influence in the brain	€543,983	My research focuses on how gut microbes influence our social interactions (e.g autism), interfere with how well we remember (e.g dementia / Alzheimer's disease) and affect our mood and motivation (e.g depression). Information from our gut gets transferred to our brain through the vagus nerve. In response to stress and changes in the environment, the communication between microbes, gut and brain breaks down leading to mental health conditions. Using a novel combination of methodologies that I developed, I aim to map out different brain pathways likely mediating the gut's influence on our behaviour. My experiments have exciting potential health benefits.
Silvia Nagy	Dublin Institute for Advanced Studies	A complete double copy dictionary and its applications	€507,095	Modern theoretical physics is governed by two seemingly different frameworks: general relativity, describing gravity via the geometry of space time, and gauge theory, governing particle physics (with electromagnetism as a well-known example). Despite the astounding accuracy of their predictions, they remain notoriously incompatible. However, recent, tantalising hints have emerged that the two separate theories may have deep, mathematical connections. My proposal deals with the "double copy": the observation that gravity corresponds to the product of two gauge theories. I am developing this, both at the formal, mathematical level, and with a view to applications to cosmology.
Nanasaheb Thorat	University of Limerick	Plasmonic Nanomedicine Coupled Biomolecular Fingerprinting of Brain Cancer	€551,901	Mitochondrial dysfunction is well known to be associated with brain cancer, but less well known is the role that copy numbers in mitochondrial DNA might play in the cancer management. PHOTOBRAIN proposes an alternative approach of a engineered human three-dimensional (3D) mini-brain tumor model (inspired from recent evidence of 3D brain model that can predict the how the brain develops and what goes wrong in neurological disorders). PHOTOBRAIN advancing the state of the art of tumor energy metabolism that is a biochemical

				fingerprint of aggressive brain cancer cells which represents one of the “hallmarks of cancer”
Trent Rogers	Maynooth University	Arbitrary nanoscale shapes self-assembled from a fixed monomer set	€551,000	Manufacturing structures with nanoscale precision has important implications for various technologies including drug delivery and the manufacturing of microprocessors. A convenient method for manufacturing nanostructures is to “program” the DNA sequences of synthetic DNA strands so that they autonomously coalesce to form the target structure. Ubiquitous methods for building DNA nanostructures require a set of structure-specific DNA strands, and every position in the structure needs a DNA strand with a unique sequence. We propose a new approach for manufacturing arbitrary nanostructures using a fixed set of DNA strands that will eliminate ordering delays as well as monetary and labor costs.
Chris Kavanagh	University College Dublin	Perturbative Analysis of the Two Body Problem in General Relativity in the Small Mass-Ratio Limit	€519,548	The detection in 2015 of tiny ripples in space and time known as gravitational waves opened a new era of astronomy. My research aims to develop the precise mathematics needed to detect the faint gravitational wave signals released when colossal galactic centre black holes millions of times the mass of our sun capture and absorb smaller black holes. These signals give detailed measurements of the dark cores of galaxies which are invisible to other forms of observational astronomy, unveiling the properties of galaxies throughout the lifetime of the universe and testing the limits of Einstein’s theory of gravity.
Lingli Zhou	University College Dublin	Controls on high-grade stratiform Co mineralisation in the Central African Copperbelt (CRITICAL)	€551,900	Metals are tremendously important to the development of a society. They can be found in everything from electronics, vehicles and homes, to energy supplying infrastructure. Yet, everything indicates our need for metals will increase in the future. The very characteristic for metals is that their raw materials, minerals, can only be mined where ‘Mother Earth’ has them. And they are not evenly distributed in the earth’s crust. CRITICAL will look into the areas that are particularly enriched in cobalt minerals and understand why that happens and how we can find more cobalt to help the world decarbonise.

Kevin Daly	Trinity College Dublin	Herd Health: The pathogen and health consequences of small ruminant domestication and zoonosis	€552,006	Livestock animals were domesticated roughly 10,000 years ago in southwest Asia, but little is known about how this impacted their health (inbreeding, infectious disease), despite their underpinning of farmer societies. Further, livestock-to-human disease transmission (e.g. Brucellosis) was and remains a concern for human and animal welfare. The project will obtain pathogen and animal DNA from ~10,000 year old teeth, bone, dung, dirt, and fetal remains from the Zagros Mountains in Iran, in order to understand how sheep and goat genetic health and infectious microbes changed during their domestication and how this affected the evolution of human-infecting pathogens.
Valeria Nico	University of Limerick	Hybrid Multi-Axial Nonlinear Vibrational Energy Harvesting	€551,121	In the environment there is often an abundance of kinetic energy in the form of ambient vibrations that can be converted into electrical power through energy harvesting techniques. It is proposed to develop a novel small scale vibrational energy harvester that can harvest broadband multi-axial vibrations. The device will use piezoelectric materials and an arrangement of magnets and coils to generate power from the ambient vibrations. The harvester can be used to indefinitely power wireless sensor devices for IoT applications – for example remote monitoring of industrial machinery, railway monitoring, smart agriculture or even wearable devices.
Venus Keus	Dublin Institute for Advanced Studies	MOREHIGGS: Measuring Observables to Refine Extensions of the HIGGS Sector	€520,393	What is the universe made of? From astrophysical observations, we know that roughly 4% of our universe is made of luminous matter, that is matter we know and see around us in everyday life. Around 70% of the universe is filled with the mysterious "dark energy" which is responsible for the expansion of the universe. The other 25% is what is called "dark matter", a type of particle that we cannot see. The aim of this project is to find out how the universe came to being and how did it end up looking like it does now.
Soumya Mukherjee	University of Limerick	Ionic Ultramicroporous Polymer Adsorbents for Energy-efficient Purification of Commodity Chemicals	€550,850	The energy footprint of the chemical industry is disproportionately high, accounting for ca. 15% of global energy consumption. The state-of-the-art for commodity purifications (e.g. carbon capture, fresh water purification, light hydrocarbon separation and toxic gas remediation) is energy-intensive and accounts for around 50% of this footprint. Crystalline physisorbents can reduce this footprint but are limited by cost, performance and/or stability issues. POLYSORB will take an innovative, high risk/high reward approach to addressing the UN SDG's related to energy sustainability. Specifically, ionic

ultramicroporous (< 0.7 nm) (usually amorphous) polymers, IUPs, will be designed and developed for several high volume gas/water purifications.

Donna Rodgers-Lee	Dublin Institute for Advanced Studies	Energetic particles: from embedded to exposed exoplanets	€516,583	Thousands of planets outside of our solar system, known as exoplanets, have been detected. My research will contribute to our understanding of the exoplanets that are most likely to develop life. My project aims to study the effect of energetic particles, a type of harsh radiation, on exoplanets at different stages of their lives using numerical models. Energetic particles coming from the exoplanet's host star and the Galaxy can drive chemical reactions to form prebiotic molecules, the building blocks of life, on other worlds. I will model a number of exoplanets scheduled for observations with the James Webb Space Telescope.
Viviana Marzaioli	Trinity College Dublin	Decoding the impact of joint micro-environment on monocyte molecular signatures and function: 'Impact for prediction of disease pathotype and disease outcome'.	€552,199	Inflammatory Arthritis, such as rheumatoid (RA) and psoriatic arthritis (PsA), is a leading cause of disability that affects up to 2% of the Irish population. It is estimated that the cost of treating inflammatory Arthritis patients in Ireland is ~€20,000 per patient/year. Current medicines don't work for all patients and may cause infection, so new more cost effective treatments are needed. The current project focuses on identifying the cellular mechanisms that differentiate RA and PsA response and progression. This approach will allow identification of new disease markers and drug-candidates for the treatment of RA, PsA and possibly other autoimmune diseases.
Özlem Sarikaya Bayram	Maynooth University	Dissection of the epigenetically controlled gene network in aflatoxigenic fungi to improve agricultural productivity and food safety	€551,600	Fungal and consequently mycotoxin contamination of food materials lead to unacceptable losses of crop production and investment, yet global demand for food is increasing. Better understanding and control of mycotoxin contamination is imminently required. The mold <i>Aspergillus flavus</i> produces aflatoxins which contaminate oil-rich grains and cause liver cancer. We have discovered a protein complex that is essential for aflatoxin production on oil-rich seeds. Understanding the target genes of the complex will lead to improved Agricultural productivity by providing knowledge on how to prevent or control mycotoxin contamination on crops and how to increase food safety for better nutrition and health.

Monica de Gaetano	University College Dublin	Synthetic Lipoxin-A4 mimetics: novel therapeutic approaches to target residual inflammatory risk in Atherosclerosis-Associated Diabetes Complications	€552,201	Atherosclerosis is a life-long condition. It is essentially due to an inflammatory reaction that drives accumulation of fats and cell debris into the vessel wall, blocking the blood flow. Diabetes accelerates this process. In this context, the role of substances naturally produced by our body to turn-off inflammation has emerged. However, their use as drugs is limited, due to their rapid breakdown in the body. Therefore, longer-lasting molecules, acting like the natural substances, have been created. This project will test if such substances protect against developing diabetic atherosclerosis.
Junli Xu	University College Dublin	Understanding the impacts of micro(nano)plastics released from plastic products using spectral imaging	€550,682	The direct release of micro(nano)plastics from plastic products during daily usage is the major route for human exposure. However, the adverse effects of these contaminants on human health are far from understood due to analytical challenges. Therefore, the project proposes a multidisciplinary approach to accurately and efficiently quantify micro(nano)plastics released from commercial plastic products in a high throughput manner. The project will unravel the impacts of micro(nano)plastics on human health by integrating knowledge from diverse areas such as mathematics, engineering, materials science, and life science. It is a key enabler combining scientific excellence with high potential academic and social impacts.
Alison Connolly	National University of Ireland, Galway	EIRE - nEonicotinoid Insecticide exposuREs: an environmental and occupational exposure study of neonicotinoid insecticides	€551,301	Neonicotinoid insecticides (NNIs) are used intensively worldwide, and there are growing concerns regarding their possible adverse health effects on humans, as minimal information is available about the magnitude of NNI exposures. EIRE 'nEonicotinoid Insecticide exposuREs' study aims to measure NNI exposures among gardeners working with these products, their families, bystanders and the general population. The research requires the refinement of an analytical method to measure NNIs and their breakdown products in human urine. EIRE will revolutionise our understanding of human NNI exposures and their pathways and stimulate intervention development, such as public health policy, to eliminate or reduce exposures.

Damien Haberlin	University College Cork	Using biotelemetry to understand the interactions of elasmobranchs (sharks, skates, and rays) with offshore renewable energy devices	€544,099	The development of offshore renewable energy is accelerating in Ireland with the Government targeting at least 5 GW of energy production by 2030. This means that substantial infrastructure including undersea cables, which will create an electromagnetic field (EMF), and moorings and wind turbines, which will create artificial reefs. This proposal will use animal tracking technology to investigate the effect of EMF and artificial reefs on shark behaviour and movement. A better understanding of these potential impacts will ensure the sustainable development of the offshore energy industry, helping Ireland to reduce greenhouse gas emissions and meet climate change commitments.
Maria Kotlyar	Munster Technological University	A novel integrated photo-thermal spectroscopic method for monitoring bacterial growth and assessing antimicrobial effects	€548,960	The continuous monitoring of bacterial growth is an essential process undertaken in academic research and clinical environments to provide valuable information on the nutritional and energy requirements of microbes, as well as to identify conditions that impact their survival and have an antimicrobial effect. We will build a new trace gas sensor that will monitor the metabolic activity of bacteria via the carbon dioxide expired. The sensor is based on photothermal spectroscopy and will use a robust silicon based Fabry-Perot cavity to enhance light absorption and a photonic integrated circuit to read out the induced change in refractive index monitor.
Joshka Kaufmann	Marine Institute	Contemporary evolutionary dynamics of Atlantic salmon and their scope for adaptation to multiple anthropogenic stressors including climate change	€551,600	Current rates of planetary destruction are leading to unprecedented declines in natural populations and a sixth mass extinction is underway. Understanding species' potential to adapt to such change is crucial for their conservation and management. Here, we aim to understand: how quickly species can evolve to human-driven environmental change, the genetic mechanisms underpinning such responses, and how multiple stressors interact to affect adaptive potential. To do so, we will analyse genetic change in a pedigreed Atlantic salmon population, monitored over 60 years. This knowledge will help provide advice for conservation and management of this iconic species under future climate scenarios.

Elaine Corbett	University College Dublin	A new human-computer interface for assessing neuromuscular-cognitive interactions in decision making	€548,186	Our ability to translate perceptions into appropriate, well-timed actions is a fundamental building-block of behaviour. When playing tennis one chooses between alternative actions not just by judging the oncoming ball's trajectory— one must also consider their body's position and momentum. This project will probe how actions interact with perception in decision making. I will record noninvasive brain signals while people interact with a new human-computer interface directly through their muscle activity. Then, a new computational modelling approach that incorporates these signals will provide an unprecedented window on how perceptual decisions are intertwined with movements, and inform future neurorehabilitation strategies.
Sigrid Dupan	University College Dublin	Sensory feedback for upper limb prosthetics	€543,474	Even the most advanced prosthetic devices currently on the market do not provide sensation. This means prosthetic users do not receive information about the objects they interact with, or the position of their own hand. As a result, many stop wearing their device. The aim of this project is to increase what people are able to achieve with their prosthesis, and how much they wear it by providing sensation. As the needs of prosthesis users might change over time, we will work together with them, and determine the best sensation for different stages of use.
Yvonne Ryan	University of Limerick	Understanding Mercury in Ireland and Working Towards Net Zero: Developing a Metabolic Inventory of Mercury Added Products and Mercury Containing Wastes in the Built Environment (BE-MAP)	€434,500	Mercury is toxic to humans and the environment. To manage hazardous wastes effectively, we need to know when, where and how much will arise. This research aims to identify mercury waste and mercury added products in the built environment with a particular focus on lighting containing mercury. The findings of this research will contribute to an overall mercury metabolism for Ireland. This will enhance safety for those encountering mercury in the built environment, help form treatment plans for these products and will ultimately protect human and environmental health.



