Full list of 2018 SFI Career Development Awards

Awardee Name	Research Body	Project Title	Lay Abstract	Co-Funded	Award Amount
Brian Rodriguez	UCD	Electrochemical force microscopy and quantum sensing of the solid-liquid interface: improving batteries through nanoscale electrochemical imaging	Critical to the operation of batteries is a thorough understanding of the role of local electric charge. To measure this electric charge, we will develop highly-sensitive imaging techniques with a resolution 10,000 times smaller than a human hair. These techniques will help improve how much energy a battery can store with knock-on implications for extending the battery life of smart phones and increasing the driving range of electric cars.	SEAI co-funded	€498,713
Sharon Glynn	NUIG	A New Dimension to Ancient Enemies: Targeting Nitrosative Stress and Human Endogenous Retrovirus K Improved Diagnosis, Chemoprevention and Treatment of High Grade Breast and Prostate Cancer	This project proposal focuses on how ancient HERV-K viruses in our DNA interact with iNOS, an enzyme that controls wound healing, and lead to development of aggressive breast and prostate cancer. These cancers are difficult to treat and cause 1100 Irish deaths yearly. By better understanding how HERV-K drives cancer, we will have the potential to identify new ways to prevent and treat these cancers. Also we will investigate if HERV-K blood tests are better at indicating which men need to be tested for prostate cancer. Currently only 40% of men with elevated PSA are found to have prostate cancer.		€504,565
Annie Curtis	RCSI	MacroCLOCK - Circadian Control of Macrophage Mitochondria: A New Approach in the treatment of Chronic Inflammatory Disease	Inflammation is a key target in the treatment of chronic inflammatory disease (including heart disease, diabetes and cancer). Within our cells we have a daily timekeeping system called the molecular clock or body clock. MacroCLOCK will determine if the clock within a key inflammatory immune cell called “the macrophage” is affecting the inflammatory response. Specific biological pathways will be investigated in macrophages and across human data and will provide unique opportunities to manage inflammation. MacroCLOCK will inform us as to WHO we treat, HOW we treat and the TIME-OF-DAY we treat individuals with chronic inflammatory conditions.		€504,286
Andrew Parnell	UCD	Industrial supervised learning	The twin disciplines of statistical and machine learning have led the ‘big data’ revolution. With only the basics of programming knowledge, anyone can take a large data set and create a predictive model. However, these standard prediction models perform poorly for many common problems faced by industry. In this project I propose to develop four different extensions of the standard toolkit for specific situations, each of which is a PhD project, and includes backing from several industry partners. The outputs of each project will be licensed to these partners to enable them to compete better on the international stage.		€409,200
Oran Kennedy	RCSI	Subchondral Bone Microdamage in Post Traumatic OA: Novel Subchondral-Specific Therapies	A common injury among young active people is a torn Anterior Cruciate Ligament (ACL) in the knee. This can be fixed quite successfully in most cases by a surgical procedure. However whether it is fixed or not, about 60% of patients develop post-traumatic osteoarthritis (PTOA)		€476,529

			within 10 years. So, a 20-year old ACL patient can develop PTOA by age 30. We think that by looking more closely at other injured tissues in the joint (particularly the bone) we can target specific areas with simple drugs and thus can prevent PTOA. We will then develop exciting new treatments to prevent PTOA.		
Matthias Moebius	TCD	2D nanosuspensions for printed electronics – how small can you go?	In recent years printed electronics has emerged as a game changing technology that enables low-cost, scalable manufacturing of electronic circuits by conventional industrial printing methods such as inkjet printing. Possible applications are numerous and range from flexible displays to sensors for the Internet of Things. Even though inkjet printing is a well-established technology, the use of it in the context of printed electronics poses new challenges such as nozzle clogging and poor control of the film structure. The aim is to optimise this process for nanosheet suspensions, which are promising candidates for conducting inks due to their low cost.		€494,513
Georgios Iosifidis	TCD	SoftEdge: Architectures and Algorithms for Software-Defined Edge Systems	From augmented reality applications to the Internet-of-Things and mobile data analytics, a plethora of services today change fundamentally the way we communicate with each other and interact with our surroundings. These developments, albeit exciting for the users, raise unprecedented challenges for wireless networks, hence calling for a paradigm shift in their design. SoftEdge proposes a new class of system architectures, aiming to harness resources at the edge, i.e. close to demand. Therefore, it will enable mobile operators and service providers to deliver high-quality communication and computing services to the users in an economically efficient and environmentally-friendly fashion.		€468,528
Le Nam Tran	UCD	Green and Secure Transmission Techniques for Future Wireless Networks	In this project we will develop holistic approaches to solve the energy crisis and security concerns in wireless networks. Nowadays, the global ICT industry consumes more than 10% of the world's energy. Data transmitted wirelessly can be easily intercepted by eavesdroppers. Today's wireless systems are far from addressing these timely problems. In this project we will apply advanced mathematical tools to derive efficient algorithms to reduce energy consumption, and to secure data privacy. The research team will draw on large-scale deployment of low-power nodes equipped with some decentralised mechanism and unique fading characteristic of wireless channels to provide data security.		€413,661
Gavin Collins	NUIG	Next-generation trace elements exploitation (TEX) in microbial communities at the scales of genomes, cells, biofilms and new biotechnology	Anaerobic digestion (AD) is applied in biotechnologies to convert wastes to biogas. Trace elements (TE) are actively dosed into AD systems to improve microbial activity and biogas production, but little is known about the microbiology of TE-microbe interactions, or whether dosing is even very effective. In this project, we will explore the influence of TE dosing on the activity of individual species, and on more complex groups of species. We will work with industrial partners to develop diagnostic tools, which may be used by operators to determine TE deficiency – or efficient TE dosing – at their at AD plants.		€504,358

Tobias Engel	RCSI	The ATP-gated purinergic P2X7 receptor as a novel target for the treatment of drug-refractory epilepsy	Epilepsy affects ~50 million people worldwide. Major challenges in epilepsy treatment include ~30% of patients who remain unresponsive to medication, difficulties in correctly diagnosing seizures and predicting the emergence of epilepsy. Current treatment, even where effective in suppressing seizures, has no impact on disease progression and can cause severe adverse effects. Research by the applicant has identified a receptor (P2X7) found in the brain to be involved in the generation of seizures and progression of epilepsy. This project will further advance treatment based on P2X7 and identify specific biomarkers to diagnose seizures, predict epilepsy and inform treatment choice.		€504,729
Kieran Meade	Teagasc	The Bovine Epigenome and Susceptibility to Mycobacterial Disease	Despite costly national eradication schemes mycobacterial infections are proving difficult to eliminate resulting in reduced profitability of already low-margin farm enterprises. These diseases threaten our brand image on international markets and are also linked to human infection. Based on my novel results, I believe that epigenetic mechanisms (chemical switches) suppress the activation of genes which prevents the ability of cattle to fight infection, and also the detection of diseased cattle. Profiling these changes in live cattle will identify the marks associated with disease and in conjunction with a novel nanosensor will contribute to improved detection of TB.		€473,769
Marcus Claesson	UCC	A translational 'omics' approach for predicting treatment outcome in newly-diagnosed children with ulcerative colitis	Ulcerative colitis is increasing globally and cause bloody diarrhoea and abdominal pain in children. Half of the children diagnosed will relapse within six months, requiring immuno-suppressant drugs. To avoid giving every child immuno-suppressants at diagnosis relapse-prediction is key. We hypothesize that intestinal bacteria, combined with expressed human genes and local modifications of intestinal DNA, possibly for children with a certain genetic makeup, can determine from the outset which children will relapse. We will examine these molecular data from three biopsies each of 50 newly-diagnosed children, and develop a predictive tool. Important bacterial genes will be further examined in a mouse model.		€504,426
Tomasz Piwonski	Tyndall National Institute	Novel widely tunable swept sources, based on synchronized multi-section slotted semiconductor lasers for Optical Coherence Tomography	Optical coherence tomography (OCT) is an imaging technique which enables the acquisition of real-time, high-resolution cross sections of scattering media. It is best known for delivering images of biological tissues however its areas of applications is growing and now includes e.g. nondestructive material testing. The core element of this technique is a light source whose properties directly affect quality of acquired images. The aim of this project it to utilize advanced optical techniques to develop and improve performance of semiconductor lasers source used in OCT thus allowing new application areas to be realised on the back of improved device performance.		€493,483
Brijesh Tiwari	Teagasc	Novel technological interventions for biofilm	The World Health Organization has identified antimicrobial resistance as one of the greatest threats to human health and endorsed a global action plan for tackling this challenge, which includes encouraging research and development of new antimicrobial agents. Biofilms present a major global challenge in the fight against product contamination due to significant resistance to current		€497,501

			antimicrobial treatments and developing antimicrobial resistance against key antimicrobial agents. To address this challenge the Ultrafilm project aims to deliver a novel technological solution for the eradication of biofilms via the application of low temperature atmospheric pressure plasmas in combination with airborne acoustic technology.		
Dara Stanley	NUIG	Food in the future; sustainable crop pollination in a changing world	Bees, and other pollinators, are crucial for the production of at least 30% of our food. Global bee declines have led to concerns over the sustained crop production, with a number of potential causes highlighted. However, little research has connected these causes of decline with the delivery of pollination services to crops. In this project I will combine field observations, lab manipulations and predictive modelling to address key knowledge gaps in how climate change and pesticide use can affect crop pollination, and predict how climate change and pesticide use may affect the sustainable pollination of our crops in the future.		€443,653
Sheila McBreen	University College Dublin (UCD)	Gamma-ray Investigation of the Full Transient Sky (GIFTS)	Gravitational waves (GW) were detected time in 2015 opening up an uncharted realm of astrophysics. There is an urgent need for gamma-ray space missions to aid the search for counterparts of the GW sources. The current fleet of missions is reaching the end of it's lifecycle but the need can be met quickly by a coordinated fleet of small satellites called `CubeSats'. We propose to fly a UCD detector in a high-altitude balloon flight to verify its performance and subsequently design and construct a larger detector for a CubeSat. We will collaborate with NASA and the University of New Hampshire.		€500,804
Ning Liu	University of Limerick (UL)	Electrically pumped all-inorganic LEDs and lasers by colloidal nanorod heterogeneous assembly	The goal of this project is to develop a novel technology based on solution synthesized semiconductor nanorod assembly for the fabrication of low cost, high performance LEDs and lasers that can be easily integrated with regular electronic devices. Once the new technology is successfully developed, it will substantially advance the development of nanocrystal based LEDs: a promising paradigm for the next generation thin-film display technology. With the global flat-panel display market expected to reach a value of US$155.4 billion by 2020, the economic and social impact of this technology will be huge.		€501,125
Russell McLaughlin	Trinity College Dublin (TCD)	Detecting the dark matter of neurodegeneration: repeat expansions in amyotrophic lateral sclerosis	Amyotrophic lateral sclerosis (ALS) is an incurable, rapidly fatal neurodegenerative disease. For effective treatments to be developed for ALS, there is urgent need to better understand its underlying genetic causes. The most significant causative gene identified to date is called C9orf72, in which an unconventional mutation known as a repeat expansion (RE) causes neurodegeneration. Several lines of evidence strongly implicate undiscovered REs as potentially the most important class of mutation in ALS; however, this has remained unexplored due to technological constraints. This study will exploit recent advances in genomic science to find new REs in ALS to better understand neurodegeneration.		€480,000
Ronan Courtney	University of	Ecological engineering solutions for the long-term and sustainable	Significant amounts of wastes are produced during the lifetime of a mine and pose environmental risk once the mining company closes. Establishing vegetation covers on		€492,269

	Limerick (UL)	management of mine processing wastes	the wastes can improve the visual impact and prevent erosion risk. However, properties of the wastes can be inhibitory to vegetation and soil biota; this is problematic as long-term effectiveness of vegetation covers depends on healthy soil. This project will design a strategy for rehabilitating mine wastes that will promote healthy soil populations with sustainable vegetation. In this work, new methods will be developed to demonstrate that metal toxicity does not pose an environmental risk.		
Conor Murphy	National University of Ireland, Maynooth (NUIM)	HydroCast: Seasonal Hydrological Forecasting for Ireland	Widespread floods in December 2015 and November 2009, together with growing pressures on water resources highlight the need to invest in developing seasonal forecasting approaches to inform strategic management of water in Ireland. This research will leverage and advance significant recent developments made in this area internationally by benchmarking approaches to seasonal hydrological forecasting for Irish catchments. Predictive skill from approaches of varying complexity ranging from lagged relationships of river flows with large scale climate drivers, to use of the latest seasonal forecasting models will be assessed. Ensemble techniques that combine the information content of different approaches will be developed.		€487,147
Stefan Schulz	Tyndall National Institute (TNI)	Nitride-based light emitters: From carrier localization and non-radiative recombination processes to quantum transport and device design	Due to their unique potential for energy efficient solid-state lighting, this proposal focuses on the semiconductor family gallium nitride and indium nitride and their respective alloys. Despite their great success already and extensive research activities around the world on gallium nitride-based systems, we are just beginning to understand their fundamental properties and the impact they have on device performance. This proposal aims, accompanied by collaborations with leading national and international partners, both from academia and industry, to provide theoretical guidance for the design of energy efficient next generation optoelectronic devices for solid state lighting, e.g. light-emitting diodes (LEDs).	SEAI co-funded	€585,620
Padraig Cantillon Murphy	Tyndall National Institute (TNI)	Intelligent Magnets for Surgery 4.0	Surgery 4.0 is the future of surgery, where better clinical results are achieved with less external incisions. Magnets present tremendous potential for Surgery 4.0 due to their ability to move and anchor devices during surgery. Magnets can also have therapeutic applications when coupled magnets are used to re-connect organs after surgery. To date, this potential has been unfulfilled due to concerns for the safety and control of magnetic devices. This project aims to address the need for intelligent magnetic systems in Surgery 4.0, leading to safer and more reliable surgical technology for better patient outcomes.		€462,000