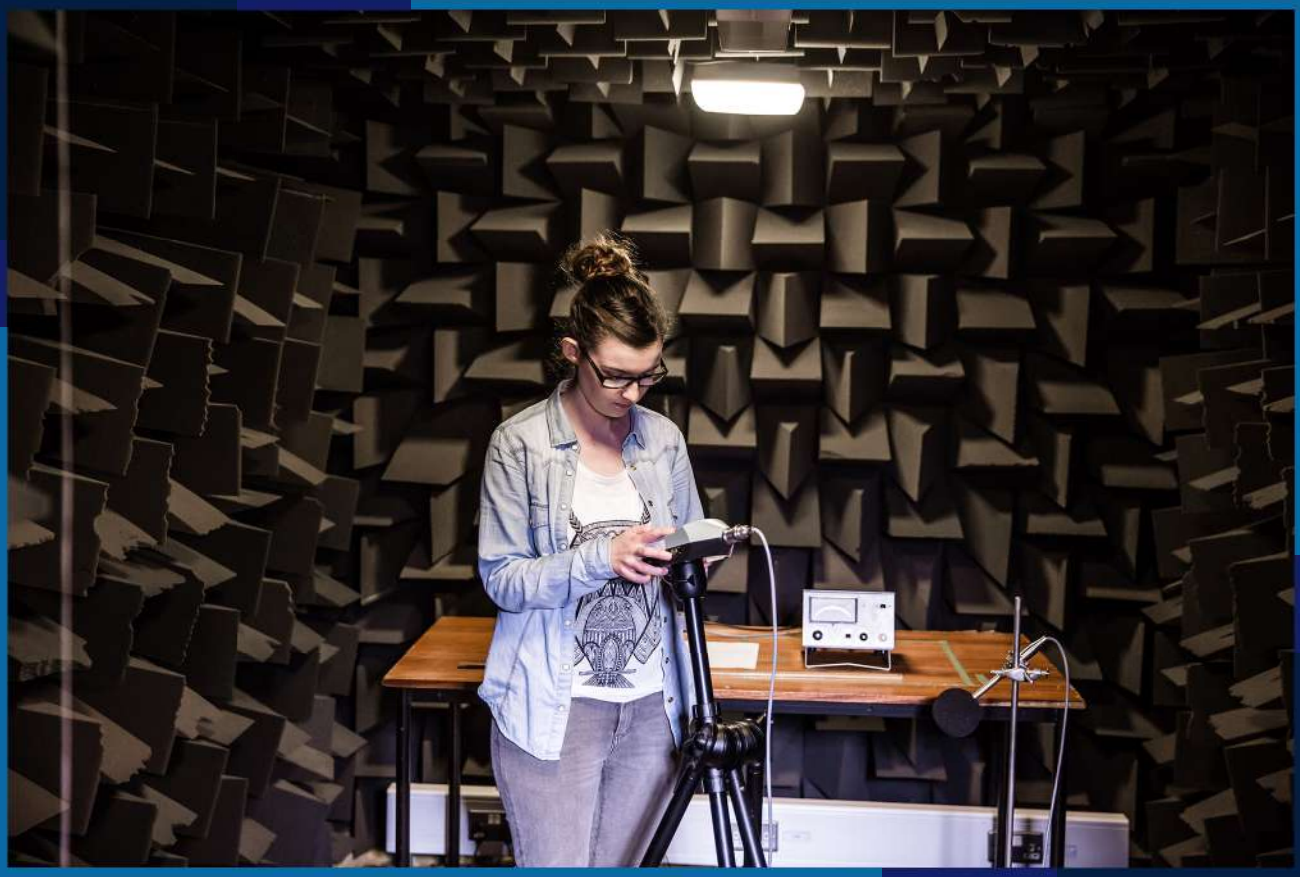
Ulster University

School of Engineering

Annual Report
1st August 2019 -31st July 2020

Contents



1. Foreword:

Research Director

Professor Dewar Finlay

In presenting the Annual Report for the School of Engineering for the academic year 2019-2020, I am happy to report yet another very successful year for our research activities with particular success in winning research grants, quantity of doctoral thesis completed, development of research collaborations nationally and internationally with renowned universities, research institutes and industries and also our involvement with outreach research activities. The past year has seen us continue to work towards our vision to exploit our unique ability to merge the disciplines of technology, engineering and science to create world leading research impacting highly important global challenge areas and promoting healthy and sustainable futures for all citizens.

Our current research activities are conducted in a vibrant, collaborative research environment consisting of a multi-disciplinary group of over 150 researchers (academic staff, contract researchers and PhD researchers). Our work is broadly conducted in two overarching themes relating to the Nanotechnology and Integrated Bioengineering Centre (NIBEC) and Advanced Future Materials and Manufacturing (AFMM).

During the period covered by this report, we have seen sustained activity across all our research themes. This is evidenced by research income of over £3.2M, 8 successfully completed doctoral research programs and the publication of more than 120 peer reviewed journal articles. The period has also seen continued growth in our academic staff base with the appointment of a Professor of Advanced Materials along with a new Lecturer in Electronic Engineering. These appointments consolidate our broader strategic plan for growth which, over this past six years, has seen a 100% increase in the total number of staff designated has having significant responsibility for research (SRR). This growth has been fueled by strategic investments in staffing of the key areas of Healthcare Technology and Advanced Manufacturing.

Research activity at NIBEC continues to address key challenge areas including new health technologies, functional biomaterials and tissue engineering, plasma science and nanotechnology, and clean technology and safe water. This work has been underpinned with significant research income during the period from a range of sources that include EPSRC, EU Horizon 2020, National Institute for Health (US), Interreg and Invest Northern Ireland.

Notable initiatives during the period include the continuation of the SAFEWATER (£4.71M GCRF-EPSRC) project that focuses on the development of low-cost technologies for safe drinking water in developing regions. The project is now in its technology deployment phase with field trials of NIBEC developed water purification technology currently being conducted in Columbia, Brazil and Mexico. The reporting period has also seen the kick-off of several new initiatives that complement the core SAFEWATER initiative, including: 'SAFEWATER Translate'(GCRF-EPSRC-£840) which is focused on the future exploitation of the SAFEWATER project developments and REWATERGY (H2020), a Marie Curie European Industrial Doctorate (EID) training network focusing on the water-energy nexus.

Health Technology Research has also featured strongly during the 2019-20 period with the continuation of several major initiatives that include the Interreg funded (€8.4m) Eastern Corridor Medical Engineering (ECME) Centre, a researcher training focused platform with 23 PhD researchers now enrolled, 8 of whom are registered at Ulster. NIBEC has continued to build on its long track record of providing a platform for healthcare technology commercialisation as evidenced through the securing of a second round of funding for the Connected Health Innovation Centre (CHIC). This £3.4M investment is an extension of the current provision and provides a continuation of a platform for academia/industry engagement in healthcare technology innovation. The period has also seen Ulster kick-off its involvement in the EU (H2020) funded SHAPES project which has a total project budget of € 21M. The project, which is led by National University of Ireland Maynooth, is focused on health technology for Smart & Healthy Ageing. Ulster's involvement comes of the back of a strong track record in EU funded projects on heath technology research (e.g. CHESS, PATHway, IC-Health and WastCARD.)

Plasma and Science and Nanotechnology research at NIBEC has attracted in excess of £1M in research funding during the reporting period. This includes funding (EPSRC-SFI-£600,00) to support research on an ocean microlab for autonomous dissolved inorganic carbon depth profile measurement and DfE-US-Ireland R&D Partnership funding of £300k to establish a Centre-to-Centre International Collaboration on Advanced Photovoltaics for Electrode Manufacturing and Indoor Power Applications with partners in Arizona State University and Dublin City University.

In addition to research focused income there have also been significant developments in securing substantive funding to support capital equipment purchases. In relation to materials characterisation, the period has seen the final stages of installation of a new EPSRC funded (£1.1m) state-of-the-art X-ray Photoelectron Spectroscopy (XPS) system along with the installation of a new EPSRC funded (£200k) X-Ray Diffraction system at NIBEC. In addition, School of Engineering researchers are delighted to have played a part in the setting up of a new province wide EPSRC (£2.1m) Kelvin-2 High Performance Computing facility in partnership with Queen's University Belfast.

In relation to our work in the area of Advanced Future Materials and Manufacturing, a significant body of externally funded research has continued over the year. A large body of work has been undertaken as part of the Interreg funded (€8.7m) North West Centre for Advanced Manufacturing (NWCAM). NWCAM is delivering fifteen individual doctoral level R&D projects by applying advanced manufacturing technologies to enable the development of new and innovative products and processes. The program aims to create a step change in our global manufacturing competitiveness and strengthen regional economic development and impact. This activity is complimented by a number of other externally funded projects that include the EPSRC funded Novel High Performance Polymeric Composite Materials for Additive Manufacturing of Multifunctional Components project, along with a number of projects funded by the NI Advanced Engineering Composites Centre, e.g. the AERO AM2 project. Throughout the reporting period, significant work has continued to provide industrially relevant activity leading to world class impact via our partnership in the NIACE facility based at the Spirit Aerospace (previously Bombardier Aerospace) in Belfast.

In addition to progress within the above themes, we have exploited our research, where possible, in response to the Covid -19 Pandemic. Specifically, an Engineering Covid-19 Research Task Force was formed which has led to significant successes in key areas of the response to the challenge of understanding and countering the effects of the SARS-CoV-2 virus. Examples include the co-development of a new Covid-19 Antibody LF diagnostic device that has attained FDA/MHRA/CE approval and global sales; modelling and design of new respiratory aerosol covers for PPE which has led to technology transfer to Vitamaterials who now sell these visors and development of computational models to assist in epidemiological modelling to predict progression of the outbreak. Engineering Staff have also

been appointed to a range of government advisory roles to aid and oversee the launch of the NI Track and Trace (Stop-Covid-19 App) as well as providing input into the Covid-19 Modelling activity overseen by NI's Chief Scientific Officer. EPSRC and NIH related funding have also been secured to use Near Infrared (NIR) spectroscopy to detect the SARS-CoV-2 virus and to optimise nanoparticle- photonic coupling within LF diagnostics.

Looking forward to 2020-21 and beyond we are actively engaged to a number of major developments that will shape our research in future. Fundamental to this will be our move to the new State of the Art Ulster University Belfast campus which is planned for mid-to-late 2021. We are excited about the new opportunities that this new, state-of-the-art environment will provide. In particular, our alignment with the Belfast Region City Deal, specifically the Center for Digital Healthcare Technology (CDHT) and the Advanced Manufacturing and Innovation Centre (AMIC) and our involvement in the Strength in Places (SIP) initiatives will be enhanced by these new facilities. With specific regard to latter we look forward to updating you in our next report on our involvement in the Artemis SIP project which is due to get underway in 2021.

Further details of our research, facilities, staff profiles and research expertise can be found at School of Engineering - Ulster University Departments or by contacting Charly Mifsud (Academic Excellence Executive Assistant) at Email: c.mifsud@ulster.ac.uk; Ph: +44 28 9536 7635.

Professor Dewar Finlay
Research Director, School of Engineering.

2. Research Students

The following research students were registered on research degree programmes during 2019-20.

Surname	Thesis Title
Abdullah, -	SAFEWATER: Sensors for the detection of faecal contamination in drinking water
Afkhami, Arsalan	SAFEWATER: Household based water disinfection systems
Ahmad, Abrar	Drone based hotspot: an internet-on-the-go service for disaster management
Alessi, Bruno	Novel materials for third generation solar cells
Alkharabsheh, Salem	Development of novel mechanisms based on photo and electrodisinfection and decontamination of wastewater and drinking water
Antony Samy, Anto	Development of simulation models for additive manufacturing of polymers
Barber, Robert	Flexible skin sweat electrochemical sensing utilising laser induced graphene
Bigham, Teri	Safewater - Novel Biosensors For The Detection Of Waterborne Microbial Pathogens
Bloomfield, Noel	Development of overmolded parts in injection moulding
Casimero, Charnete	Design of smart catheter systems for the prevention of infection
Clarke, James	The development of a flexible modelling tool to enable the choice of the most cost effective manufacturing route for a given process in this case liquid moulding of a polymer composite to give a finished product
Corduas, Francesca	Development of novel smart scaffolds as potential strategies for skin wound healing
Cortes, Maria Ana	Photo-reactor design and modelling
Dahale, Monali	Development of a novel textile/composite for improving crashworthiness
Dalton, Brendan	Analysis of thermal degradation in composite tooling materials
Davidson, Scot	Advancements in Biomedical Signals Using Artificial Intelligence for Real-Time Detection and Classification of Epileptic Seizures
Devine, Amy	Autonomous Smart Patches: New Approaches to Controlled Drug Delivery
Donnelly, Nicola	Examining the perceived benefits and limitations of patient-centered monitoring solutions for the patient and healthcare professional
Dooley, Christopher	Peptide functionalised gold nanoparticles for cancer treatment
Dsouza, Slavia Deeksha	Advanced Materials for Next Generation Solar Cells
Duffy, Sean	Development of multifunctional PEEK composite materials
Duraisamy, Shanmugha Sundaram	2D MoS2 -layered Materials and their hybrids for electrocatalytic water splitting
Gillies, Aaron	Design and modelling of complex multi composite structures for airbourne applications
Hadia, Rohit	Advanced algorithms for CG Data analysis - Aterial fibrillation (AF) detection in the wearable device setting
Hardman, Andrew	Advanced multi-axial composites and microvascular networks
Harkin, Ryan	Optimisation of the laser sintering of metal parts for medical products
Harley, Anna	Development of process simulation models for metal laser sintering
Hegarty, Catherine	Remote telemetry of oxidative stress processes in the management of stroke: Acquisition and processing of metabolomic data
Hendawy, Nourhan	Surface chemical kinetics with low temperature atmospheric pressure plasma for plasma medicine applications in cancer treatment
Hussein, Hussein	Advanced Materials (ADM-07) - Nanofluids for solar thermal applications
Janjua, Ghalib Muhammad Waqas	Electronic/Biomedical Engineering - Blood Pressure Monioring
Jennings, Michael	The delevelopment of a new intergrated diagnostics (biomarkers and ecg) via computational techniques for higher sensitivity detection of heart attacks

Kambley, Ankur	Metal quantum dots and clusters for energy applications
Karakasidis, Anastasios	Hierarchical carbon-fibre reinforced polymer (CFRP) composites utilising graphene nanoflakes
Kashyap, Apoorva	Low energy plasma radiotherapy – could this be a route to gentle and effective treatment of cancer or antibiotic resistant microbes?
Khalid, Hessan	Exsolution of nanoparticles by plasma processing
Li, Shiyao	Improving the electrical conductivity of thermoplastic composites for aerospace and automotive structures
Lin, Wenyan	Investigation of the processing and properties of PVA filaments for the formation of microvascular channels in carbon fibre reinforced composites
Lowry, Naomi	The development of bioactive materials for orthopedic implant devices
Manzoor, Faisal	The Development of Conductive Polymer Composites for Medical Device Applications
McAlister, Olibhear	An investigation of thoracic impedance and various physiological parameters in development of algorithms to optimise cardiopulmonary resuscitation (CPR) effectiveness
McCallan, Niamh	Data-Driven Techniques and Multidimensional Analysis of Biomedical Signals for Detection and Classification of Epileptic Seizures
McFlynn, Patrick	Development of hollow microneedle arrays for transdermal biosensing and drug delivery
McGlynn, Ruairi	Plasmas: nanomanufacturing with atmospheric pressure plasmas
McKillop, Stephen	iBioactive coatings
McLarnon, Liam	Development of optically transparent nanofibrous biomaterial scaffolds for ophthalmic tissue engineering
McMichael, Stuart	Photocatalysis: Solar Water Splitting
Meenagh, Aidan	In vitro cellular models to study the effects of waveform stimulation of cardiac tissues
Menagh, Gareth	Electroconductive electrospun polymeric biomaterial matrices for the fabrication of 3D retinal tissue
Moore, Michael	Printing of Biological Cells: 3D Printing of Biological Cells for Tissue Engineering Applications
Moses, William	Optimisation of composite properties in the third dimension-Composite reinforced composites
Neale, Geoffrey	Improving the energy absorption capability of 3D woven composites for aerospace and automotive structures
Nguyen, Chi	Non-Orthogonal Multiple Access for 5G and Beyond Systems
Nielsen, Anne-Mette	SAFEWATER - Integrated water and sanitation in architectural design for sustainable housing in developing regions
O'Donnell, Kieran	3D printing of biological cells for tissue engineering applications
Owen, Kathryn	The Use of Ultrasound Derived Carotid Intima-Media Thickness to Predict Coronary Artery Disease
Padmanaban, Dilli Babu	Plasma synthesis of advanced nanoscale oxides for photovoltaics
Rababah, Ali	Development of multi parameter models for rapid disgnosis and treatment of cardiovascular disease
Ralph, Calvin	Development of complex composites using novel materials
Rawlinson, Sean	New approaches to the design of electrochemical immunosensors
Rioja Cabanillas, Adriana	Investigation and development of electrocatalysts and electrochemical cells for the production of hydrogen from wastewater
Rogan, Fiona	The assessment and development of biphasic and pulsed waveforms for the treatment of ventricular fibrillation to minimise the level of post shock myocardial dysfunction and damage
Saeed, Khalid	Development of novel materials and techniques for additive manufacturing

Shah Mansouri, Tahereh	Machine learning and patterning recognition in a new sensor systems for chemical-biological detection and biomedical applications
Singh, Anukriti	Clean water: visible light active photocatalytic materials for solar water purification
Singhal, Amit	Photocatalysis: Solar phtotcatalytic disinfection of water
Stinson, Harley	Additive Manufacture via Cold Metal Transfer
Ullah, Jawad	The Influence of Additives on the Processing and Properties of Polymers for Medical Device Applications
Wallace, Kerry	SAFEWATER - Innovative water disinfection technologies
Ward, Joanna	Nanotopography for dynamic platelet assay applications
Ward, Richard	Design and development of additive manufacturing process machinery for production of larger structures
Wilson, Shannon	Titania topography for control of cell response to bioactive calcium phosphate coatings
Zhang, Xushuo	Point-of-Care Lateral Flow analysis for cystatin C-based kidney function diagnostics

Graduated December 2019

Student Name	Thesis Title
McGlynn, Ruairi	Development of atmospheric-pressure plasma processes and systems to tailor nanomaterials properties to application requirements
Ralph, Calvin	Developing an understanding of short basalt fibre - polypropylene composites and adhesion improvement
Lowry, Naomi	The development of bioactive materials for orthopaedic implant devices
Cortes, Maria Ana	Photocatalytic reduction of CO2
Lin, Wenyan	Investigation of the processing and properties of PVA filaments for the formation of microvascular channels in carbon fibre reinforced composites

Graduated July 2020

Student Name	Thesis Title
Padmanaban, Dilli babu	Manipulating metal oxides properties by plasma based synthesis methods
Neale, Geoffrey	Improving the energy absorption capability of 3D woven composites for aerospace and automotive structures
Ward, Joanna	Nanotopography of PS/PMMA polymer demixed surfaces for dynamic platelet assay applications

3. Publications

Details of all Publications by the School of Engineering are on the Ulster University's Institutional Repository- PURE https://pure.ulster.ac.uk/. This section reports those outputs published over the period of this report and classified as either journal articles, books/chapters in books and published conference papers.

3.1 Journal Articles

Aguas, Y., Perez, M. H., Martinez-Piernas, A. B., Aguera, A., Fernandez-Ibanez, P., Nahim-Granados, S., Polo, I., 2019, Reclamation of Real Urban Wastewater Using Solar Advanced Oxidation Processes: An Assessment of Microbial Pathogens and 74 Organic Microcontaminants Uptake in Lettuce and Radish, Environmental Science and Technology, vol. 53, no. 16, pp. 9705-9714.

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Ali, R., Mehta, P., Arshad, M., Kucuk, I., Chang, M. W., Ahmad, Z., 2019, Transdermal Microneedles - A Materials Perspective, AAPS PharmSciTech, vol. 21, no. 1.

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Arshad, M. S., Hassan, S., Hussain, A., Abbas, N., Kucuk, I., Nazari, K., Ali, R., Ramzan, S., Alqahtani, A., Andriotis, E. G., Fatouros, D. G., Chang, M. W., Ahmad, Z., 2019, Improved transdermal delivery of cetirizine hydrochloride using polymeric microneedles, DARU, Journal of Pharmaceutical Sciences, vol. 27, no. 2, pp. 673-681.

Arshad, M. S., Shahzad, A., Abbas, N., AlAsiri, A., Hussain, A., Kucuk, I., Chang, M. W., Bukhari, N. I., Ahmad, Z., 2020, Preparation and characterization of indomethacin loaded films by piezoelectric inkjet printing, Pharmaceutical Development and Technology, vol. 25, no. 2, pp. 197-205.

Bashirpour, M., Poursafar, J., Kolahdouz, M., Hajari, M., Forouzmehr, M., Neshat, M., Hajihoseini, H., Fathipour, M., Kolahdouz, Z., Zhang, G., 2019, Terahertz radiation enhancement in dipole photoconductive antenna on LT-GaAs using a gold plasmonic nanodisk array, Optics and Laser Technology, vol. 120.

Bhalla, N., Pan, Y., Yang, Z., Farokh Payam, A., 2020, Opportunities and challenges for biosensors and nanoscale analytical tools for pandemics: COVID-19, ACS Nano, vol. 14, pp. 7783-7807.

Bhattacharya, G., Fishlock, S., Pritam, A., Roy, S. S., McLaughlin, J., 2020, Recycled Red Mud-Decorated Porous 3D Graphene for High-Energy Flexible Micro-Supercapacitor, Advanced Sustainable Systems, vol. 4, no. 4.

Bo, Z., Thornburg, N. E., Peng, L., Moreno, J. J. G., Nolan, M., Marks, L. D., Notestein, J. M., 2019, Direct Visualization of Independent Ta Centers Supported on Two-Dimensional TiO2 Nanosheets, Nano Letters, vol. 19, no. 11, pp. 8103-8108.

Bougarrani, S., Sharma, P., Hamilton, J., Singh, A., Canle, M., El Azzouzi, M., Byrne, J., 2020, Enhanced Photocatalytic Degradation of the Imidazolinone Herbicide Imazapyr upon UV/Vis Irradiation in the Presence of CaxMnOy-TiO2 Hetero-Nanostructures: Degradation Pathways and Reaction Intermediates, Nanomaterials, vol. 10, no. 5, pp. 1-22.

Boyle, C., Skillen, N., Gunaratne, N., Sharma, P., Byrne, J., Robertson, P., 2020, The use of titanium dioxide nanotubes as photoanodes for chloride oxidation, Materials Science in Semiconductor Processing, vol. 109.

Brennan, P., Jing, M., Awuah, A., Finlay, D., Blighe, K., McLaughlin, J., Wang, R., Moore, J., Nesbit, M. A., Trucco, E., Spence, M., Moore, T. C. B., McNeil, A., 2019, Quantitative assessment of the conjunctival microcirculation using a smartphone and slit-lamp biomicroscope, Microvascular Research, vol. 126, pp. 1-9.

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Davis, J., Casimero, C., Hegarty, C., Mc Glynn, R., 2020, Ultrasonic exfoliation of carbon fiber: electroanalytical perspectives, Journal of Applied Electrochemistry, vol. 50, pp. 383-394.

Davis, J., Hegarty, C., Dixon, D., Dooher, T., McKillop, S., 2019, Composite Microneedle Arrays Modified With Palladium Nanoclusters for Electrocatalytic Detection of Peroxide, IEEE Sensors Letters.

Davis, J., Hegarty, C., McKillop, S., Smith, R., Mathur, A., Mc Glynn, R., 2019, Microneedle Array Sensors Based on Carbon Nano Particle Composites: Interfacial Chemistry and Electroanalytical Properties, Journal of Materials Science, vol. 54, no. 15, pp. 10705-10714.

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Hajari, M., Ebadi, A., Farshchi Heydari, M. J., Fathipour, M., Soltani, M., 2020, Dielectrophoresis-based microfluidic platform to sort micro-particles in continuous flow, Microsystem Technologies, vol. 26, no. 3 , pp. 751-763.

Haq, A. U., Buerkle, M., Askari, S., Rocks, C., Ni, C., Svrcek, V., Maguire, P., Irvine, J. T. S., Mariotti, D., 2020, Controlling the Energy-Level Alignment of Silicon Carbide Nanocrystals by Combining Surface Chemistry with Quantum Confinement, Journal of Physical Chemistry Letters, vol. 11, no. 5, pp. 1721-1728.

Haq, A. U., Lucke, P., Benedikt, J., Maguire, P., Mariotti, D., 2020, Dissociation of tetramethylsilane for the growth of SiC nanocrystals by atmospheric pressure microplasma, Plasma Processes and Polymers, vol. 17, no. 5, pp. 1-11.

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3.2 Books/Chapters in Books

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3.3 Published Conference Papers

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Ng, K. Y., Frisk, E., Krysander, M.,2020, Design and Selection of Additional Residuals to Enhance Fault Isolation of a Turbocharged Spark Ignited Engine System, IEEE.

4. Research Funding

Ongoing and Active Research Projects, notably:

Unit of Assessment Member	Title of Award	Funding Body	Value	Project Dates
Prof JAD McLaughlin Dr PJ McCullagh Dr N Soin Prof CD Nugent Dr J Synott Dr I Cleland Prof D Finlay	Connected Health and Innovation Centre (CHIC)	Invest NI	£9.3M	2013 -2022
Prof JAD McLaughlin Dr AR Boyd Prof B Meenan Prof CD Nugent Prof J Davis Prof D Finlay Prof R O'Kennedy, DCU Prof B Caulfield, UCD Dr R Bond	Eastern Corridor for Medical Engineering (ECME) Project	INTERREG VA	£2.71M (Part of an £8.4M cross-border centre award)	2017 -2022
Prof A McIlhagger Dr E Mancuso Dr Shaun McFadden Dr Z Ullah Prof E Harkin Jones Dr D Dixon Dr D McCracken Dr JP Quinn Dr E Archer D Tormey, IT Sligo	North West Centre for Advanced Manufacturing (NW CAM)	INTERREG VA	£3.22M (Part of an £8.7M cross-border centre award)	2017-2022
Prof D Mariotti Prof PD Maguire Prof JAD McLaughlin	XPS-UPS system with in situ processing	EPSRC	£1.1M	2018-2020

Prof JAD McLaughlin Prof PD Maguire Prof B Meenan Prof D Finlay Dr D Guldenring Dr D McEneaney, Craigavon Area Hosp Prof J Davis Dr P Catherwood Prof OJ Escalona Dr PSM Dunlop Dr D Dixon Dr AR Boyd Dr G Burke Prof P Papakonstantinou Prof JA Byrne	Biodevices Proto-Typing Lab	INVEST NI	£7.3M	2015-2020
Prof JA Byrne Prof JAD McLaughlin Dr P Fernandez-Ibanez Dr A Brown Prof J Davis Dr NG Ternan Dr G Burke Prof JSG Dooley Prof D Finlay Dr R Price Prof M Keenan Prof HM McNulty Prof R O'Connell Dr PSM Dunlop Dr M Ng Dr D Dixon Dr M Brennan Dr MS Gallagher	SAFEWATER – Low cost technologies for safe drinking water in developing regions	EPSRC	£4.71M	2017-2021

Portfolio of Research Grants awarded during period 1 August 2019 - 31 July 2020

Unit of Assessment Member	Title of Award	Funding Body	Value
Dr E Archer Dr A McIlhagger Dr D Dixon Dr C Ralph Prof A Long, University of Nottingham	Controlled Micro Integration of Through Thickness Polymeric Yarns	EPSRC Future Composites Manufacturing	£49,942.00
Prof JAD McLaughlin Dr N Soin Prof D Finlay Dr I Cleland Dr PJ McCullagh Prof CD Nugent Dr J Synnott	CHIC Phase 2 CORE - Connected Health Innovation Centre	Invest NI	£441,640.00
Prof JAD McLaughlin Dr N Soin Prof D Finlay Dr I Cleland Dr PJ McCullagh Prof CD Nugent Dr J Synnott	CHIC Phase 2 Research - Connected Health Innovation Centre	Invest NI	£2,917,596.00
Dr P Fernandez-Ibanez Prof JA Byrne Dr B van Limpt, Delft IMP Dr K Reynolds, ProPhotonix Dr L Torrente, University of Cambridge Mr F Rogalla, FCC Aqualia Prof J Marugan, Universidad Rey Juan Carlos University	REWATERGY	CEC-H2020-MSCA-ITN	£247,536.00
Prof OJ Escalona Prof JAD McLaughlin Dr D McEneaney, Craigavon Hospital Mr P Crawford, Vet Consultant	Minimal Tissue Heating Effects Technology for Wireless Energy Supply to Implanted Ventricular Assist Devices in the Treatment of Heart Failure	Heart Research UK	£248,436.00
Dr A McIlhagger	The Virtual Reality Demonstrator (VR Project)	NI Advanced Engineering Competence Centre	£64,840.00

Prof P Papakonstantinou Prof J Davis	DFE CAST: Flexible skin sweat electrochemical sensing utilizing laser induced graphene	Abbott Diabetes Care	£42,180.00
Prof JA Byrne	Novel dielectrics - bridging	AVX Coleraine Ltd	£30,826.00
Prof JAD McLaughlin Prof JSG Dooley Dr M Brennan Dr P Fernandez-Ibanez Prof JA Byrne Araya G Yesus, Uni of Mekelle Catalina Hererra, CTA Dr BM Shrestha, Kantipur Dr F Reygadas, Cantaro Azul Dr M Teferi, Uni of Mekelle Dr S Kumwenda, Washted Dr T Asmelash, Uni of Mekelle Dr Z Zerihun, Uni of Mekelle Juan C Munera, CTA Laila G Botero, Uni of Medellin Luis JM Jaramillo, Uni of Medellin Lyda P Sabogal Paz. Uni of Sao Paulo Margarita H Perez, Uni of Medellin Nabaraj Adhikari, Med Micro	SAFEWATER Devices: Translation and Implementation (SAFEWATER Translate)	EPSRC GCRF- Hub 2017	£836,675.00
Prof OJ Escalona Prof M Sinclair Dr J Bates Dr U O'Connor Bones Prof JAD McLaughlin Dr D McEneaney, SHSCT Dr T Araujo, Oswaldo Cruz Institute Dr V Herrera, Uni Autonoma de Bucaramang Dr V Irazola, Instituto de Efectividad Prof B Alarcon de Noya, Sociedad Venezol Prof C Puerta-Bula, Pontificia Uni Javer Prof F Torrico, CEADES Foundation (NGO) Prof M Miles, London Sch of Hyg & Trop	Addressing maternal and neonatal cardiac morbidity and mortality due to congenital infection of Chagas and Zika-virus diseases in LMICs	Department for the Economy-GCRF	£45,000.00

Prof D Mariotti Prof PD Maguire B Corbett, Tyndall Institute, Cork C Hansberg, Arizona State Uni D Brabazon, Dublin City University E Pelucchi, Tyndall Inst, Cork G Hughes, Dublin City University I Matthews, Massachusetts Inst of tech IM Peters, Massachusetts Inst of Tech R King, Arizona State Uni S Bowden, Arizona State Uni S Goodnick, Arizona State Uni Z Holman, Arizona State Uni	Center to Center (C2C) International Collaboration on Advanced Photovoltaics: Electrode Manufacturing and Indoor Power Applications	DfE (US-Ireland R&D Partnership)	£299,350.00
Prof J Davis	Managing a healthy heart through personalised sodium tracking	Innovate UK via ICURe Programme	£23,480.00
Prof B Meenan Dr A McIlhagger Dr AR Boyd Dr N Bhalla Dr PSM Dunlop Prof D Finlay Prof JA Byrne Prof JAD McLaughlin Prof P Papakonstantinou	EPSRC Capital Award for Core Equipment - Multi-User XRD	EPSRC	£100,000.00
Prof HM McNulty Dr R Price Dr S Gaihre Dr M Morgan Mr PD O'Gorman Dr Fermin Reygadas, Ci-Founder & Director Ms Ane Galdos Balzategi, Knowledge Manager Ms Catalina Herrera Barrientos, Environment Ms Sweta Rawal, Research Officer, SAIFRN Prof Margarita Hincapie Perez, Leader Un	Improving Assessment of Child Growth in LMIC: Design and Evaluation of a Novel Technology using Transdisciplinary Approaches (ImpACTT)	Department for the Economy-GCRF	£45,000.00

Prof D Finlay Dr S Davey Prof JAD McLaughlin Dr MP Donnelly Dr R Bond	SHAPES - Smart and Healthy Ageing Promoting Empowering Systems	CEC-H2020-DT TDS-01-2019	£352,706.00
Dr Shaun McFadden	NUCLEATE	EPSRC	£29,992.00
Prof D Coyle Prof AJ Bjourson Prof V Molkov Prof JAD McLaughlin Mr S Orr, Catalyst Inc Mr S Trotter, Dell Corporation Ltd Prof R Woods, QUB	Northern Ireland HPC - Kelvin-2	EPSRC	£494,698.00
Prof JA Byrne	Novel dielectrics - bridging (Jan-Jun 2020)	AVX Coleraine Ltd	£51,987.00
Dr N Bhalla	Nanoplasmonic-potentiometric imaging integrated with dual-mode sensing	The Royal Society	£12,000.00
Prof PD Maguire Prof D Mariotti	EPSRC-SFI: An ocean microlab for autonomous dissolved inorganic carbon depth profile measurement	EPSRC	£602,640.00
Prof D Mariotti Prof PD Maguire B Corbett, Tyndall Institute, Cork C Hansberg, Arizona State Uni D Brabazon, Dublin City University E Pelucchi, Tyndall Inst, Cork G Hughes, Dublin City University I Matthews, Massachusetts Inst of tech IM Peters, Massachusetts Inst of Tech R King, Arizona State Uni S Bowden, Arizona State Uni S Goodnick, Arizona State Uni Z Holman, Arizona State Uni	Center to Center (C2C) International Collaboration on Advanced Photovoltaics: Electrode Manufacturing and Indoor Power Applications	DfE (US-Ireland R&D Partnership)	£299,350.00
Prof JA Byrne	Novel dielectrics - bridging (Jul-Sep 2020)	AVX Coleraine Ltd	£21,500.00

Prof D Mariotti Bo Zheng, Zhejiang University	Plasma-assisted controlled growth of vertically-oriented graphene and understanding of its energy storage mechanism in supercapacitors	Royal Society Newton Advanced F'ship	£74,000.00