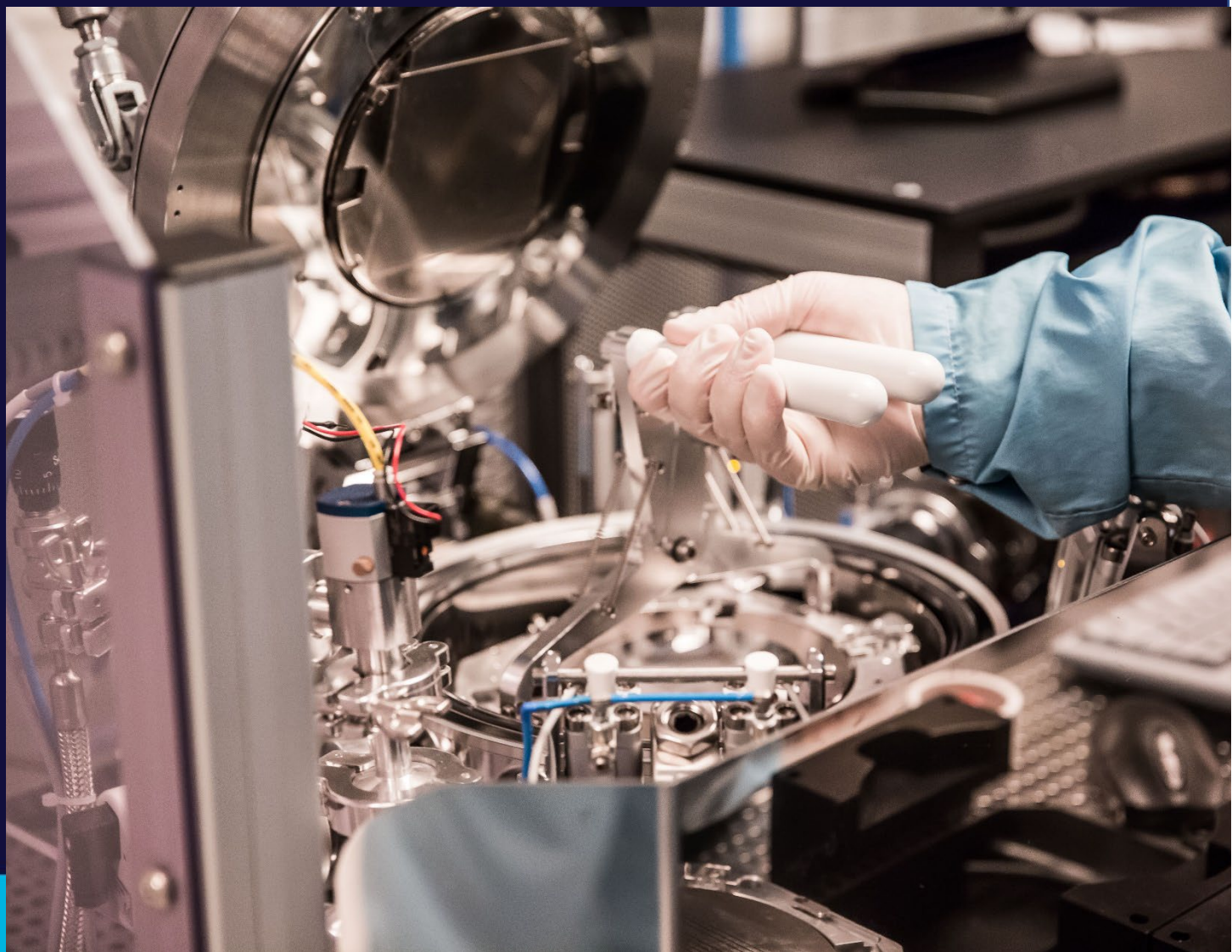


School of Engineering



August 2020 - July 2021

Annual Report
For Research & Impact





1. Foreword:

Professor John Byrne

Research Director

In presenting the Annual Report for Engineering for the academic year 2020-2021, it is encouraging to report yet another successful year for our research activities. This last year was particularly challenging with restrictions and uncertainties caused by the COVID-19 pandemic. Our current research activities are conducted in a vibrant, collaborative research environment consisting of a multi-disciplinary group of over 150 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). Our researchers rose to the challenge of COVID-19, repurposing to the fight against COVID-19 or by adapting to continue to deliver high impact research while under restrictions. This is evidenced by research income awarded of £4.7M, 8 PhD Researcher graduations, and the publication of more than 102 peer reviewed journal articles in the reporting period. A major achievement within the reporting year was the completion of the REF2021 submission with a 100% increase in the number of staff returned. This growth has been fuelled by strategic investments in staffing of the key areas of Healthcare Technology and Advanced Materials & Manufacturing. We are confident that the Engineering submission will be positively received, and we look forward to the publication of the REF outcomes on 12 May 2022.

Research activity at NIBEC continues to address key challenge areas including new health technologies, functional biomaterials and tissue engineering, plasma science and nanotechnology, and safe water. This work has been underpinned with significant research income during the period from a range of sources that include UKRI, EPSRC, EU Horizon 2020 and the Royal Society.

The GCRF UKRI SAFEWATER project (£4.9M EPSRC) focused on water solutions for marginalized communities in the Global South. The team have successfully initiated field trials of water technologies in rural communities of Colombia and Mexico, and an extension of 6 months until end of June 2022 has been granted to allow completion of the project. The GCRF Global Research Translation Award, SAFEWATER Translate, (£837 k EPSRC) has focused on the development and commercialization of portable IoT devices for the detection of water contamination. Related water research projects EU H2020 MSCA EID REWATERGY and EU H2020 PANIWATER have continued to generate positive outcomes. Funding from the Royal Society for an International Collaboration Award (£225k) was secured with the University of Sao Paulo to investigate low-cost technologies for drinking water in Brazilian rural communities.

Health Technology Research has also featured strongly during the 2020-21 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, 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 with over 35 industry members. 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 from the back of a strong track record in EU funded projects on health technology research (e.g. CHESS, PATHway, IC-Health and WastCARD.) Finally, the £5M Biodevices Laboratory Project had now completed with significant technology transfer to Radox, a range of IP developments and the engagement with over 100 new companies. Large rapid proto-typing facilities have been set up underpinning numerous projects throughout the School of Engineering. Engineering has also secured further funding from EPSRC to support capital equipment purchases with the purchase of a new atomic force microscope (£250k) and optical microscopes (£165k).

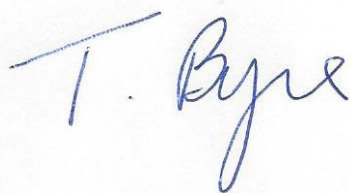
In relation to our work in the area of Advanced Future Materials and Manufacturing (AFMM), a significant body of externally funded research has continued over the year. A large body of work has been undertaken as part of the Interreg funded (€8.7M) North-West Centre for Advanced Manufacturing (NWCAM). 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 and a new relationship within NIACE with the UK National Composites Centre and funding from Invest Northern Ireland for core NIACE staff. A major achievement was the initiation of the UKRI Strength in Places project (£2.124M to Ulster) Decarbonisation of Maritime Transportation. The project, led by Artemis Technologies, (SIPF investment £33M) builds on Belfast's maritime heritage and world-leading expertise in advanced manufacturing and renewable energy to develop zero emissions hydrofoil ferries and a maritime transport system of the future. It is helping to make Belfast Harbour one of the world's most environmentally friendly regional ports. The project is expected to create more than 1,000 new jobs in the region over 10 years and boost the local economy by £129 million. Further projects in hydrogen have been funded through CASE and Innovate UK to support these zero emission strategies.

At the start of the COVID-19 pandemic, an Engineering Covid-19 Research Task Force was formed which has led to successes in key areas of the response to the challenge of understanding and countering the effects of the SARS-CoV-2 virus. Examples included 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 within local government 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 research the use of Near Infrared (NIR) spectroscopy with artificial intelligence to detect the SARS-CoV-2 virus and further work to optimise nanoparticle- photonic coupling within LF diagnostics. A new Integrated Diagnostics Laboratory has been set-up between the Schools of Engineering, Computing and L&H Sciences. Following on from the success of diagnostics development and validation, £400k was awarded by HERC-DfE to fund this new cross faculty laboratory with enhanced computing and diagnostic equipment to boost research and industry engagement in this area of national importance.

Looking forward to 2022 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 Ulster University Belfast campus which has already begun and should be complete by Summer 2022. We are excited about the new

opportunities that this new, state-of-the-art environment will provide. This will align with two major developments for research within Engineering funded under the Belfast Region City Deals. The £43M Centre for Digital Healthcare Technology (CDHT) led by Ulster will provide a world-class space for academia, industry and clinicians to come together to innovate and boost the productivity of the Life and Health Sciences sector, as well as medical device and related sector activity in Northern Ireland. It will bring together internationally leading Computing-SERG (AI to IOT), Engineering-NIBEC (Digital Health Technology to diagnostic devices) and Biotechnology strengths (Molecular Diagnostics) leading to multidisciplinary research focused on many of the world's key challenges including rising healthcare costs and healthy ageing. The £96M Advanced Manufacturing Innovation Centre (AMIC) is aimed at securing Northern Ireland's manufacturing future and will be a springboard for manufacturing innovation in Northern Ireland. AMIC will operate at the interface between academia and industry, by creating new opportunities for innovative manufacturing in the Belfast City Region. The involvement of both Queen's University Belfast and Ulster University will ensure that real-world industrial challenges based on market need are solved through cutting-edge research. AMIC builds on 50 years of sustained innovation and industry support through the Northern Ireland Technology Centre (NITC), the Polymers Processing Research Centre (PPRC) and the more recent university-industry partnership, NI Advanced Composites and Engineering (NIACE), and will consolidate and enhance these existing facilities.

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](tel:+442895367635).

A handwritten signature in blue ink that reads "T. Byrne". The signature is written in a cursive style with a large, sweeping initial "T" and a long, trailing flourish.

Professor John Byrne
Research Director, School of Engineering.

2. Research Students

The following research students were registered on research degree programmes during 2020-21.

Name	Thesis Title
Abdullah, -	SAFEWATER: Sensors for the detection of faecal contamination in drinking water.
Afkhami, Arsalan	SAFEWATER: Household based water disinfection systems.
Alkharabsheh, Salem	Development of novel mechanisms based on photo and electro disinfection and decontamination of wastewater and drinking water.
Antony Samy, Anto	Development of simulation models for additive manufacturing of polymers.
Aston, Will	Industrialised manufacturing processes for 3D printable biomedical sensor devices.
Barber, Robert	Flexible skin sweat electrochemical sensing utilising laser induced graphene.
Bigham, Teri	Safewater - Novel Biosensors For The Detection Of Waterborne Microbial Pathogens.
Corduas, Francesca	Development of novel smart scaffolds as potential strategies for skin wound healing.
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.
Dempsey, Cody	Development of advanced preforming technologies for use in complex marine structures.
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.
Fairooz, Towfeeq	Assessing the role of deep-learning in image-analysis of biosensing colour changing elements.
Gallagher, Courtney	Computer Modelling of Phase Change in Monotectic Metal Alloys.
Harkin, Ryan	An Investigation into the Powder Bed Fusion Process for Ti6Al4V Components.
Harley, Anna	Development of process simulation models for metal laser sintering.
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.
Jennings, Michael	The development of a new integrated diagnostics (biomarkers and ecg) via computational techniques for higher sensitivity detection of heart attacks.
Kambley, Ankur	Metal quantum dots and clusters for energy applications.
Kashyap, Apoorva	Low energy plasma radiotherapy – could this be a route to gentle and effective treatment of cancer or antibiotic resistant microbes?.
Khalid, Hesan	Exsolution of nanoparticles by plasma processing.
Li, Shiyao	Improving the electrical conductivity of thermoplastic composites for aerospace and automotive structures.
Macartney, Robyn	Electrospun Polymer Biomaterials for Periodontal Regeneration in Type 1 Diabetes.
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.
McCartney, Ben	An investigation into paediatric out of hospital cardiac arrest and resuscitation; role and optimisation of PADs.
McFerran, Aoife	Multi-Functional Layered Nanocomposite Coatings for Bioactive Tissue Scaffold Development.
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	Conductive PCL-Graphene 3D scaffolds for functional cardiac tissue models.
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.
Newell, Reuben	Design of complex structural composite preforms through advanced material understanding.
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.
Rababah, Ali	Methods for signal processing and interpolation of body surface ECG signals and the impact on the inverse reconstructed cardiac electrical activity.
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.
Scott, Cameron	Water Security and Ecosystem Surveillance: Design of Sensors for Remote Drone Systems within Marine and Freshwater Environments.
Shah Mansouri, Tahereh	Machine learning and patterning recognition in a new sensor systems for chemical-biological detection and biomedical applications.
Singhal, Amit	Photocatalysis: Solar photocatalytic 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, Richard	Design and development of additive manufacturing process machinery for production of larger structures.
Zhang, Xushuo	Point-of-Care Lateral Flow analysis for cystatin C-based kidney function diagnostics.

Graduated December 2020

Name	Thesis Title
Alessi, Bruno	Microplasma synthesis and emergent optoelectronic properties of nanoparticles.
Singh, Anukriti	2D heterostructured photocatalytic materials for water treatment and disinfection.
Wilson, Shannon	Titania nanotopography for control of cell response to bioactive calcium phosphate coatings.

Graduated July 2021

Name	Thesis Title
Casimero, Charnete	Design of Smart Catheter Systems for the Prevention of Infection.
Clarke, James	A feature-based cost model framework for 3D woven composites.
Hegarty, Catherine	Development of Microneedle Systems for Transdermal Sensing: New Routes to Assessing Cardiovascular Health.
Janjua, Ghalib	Cuffless blood pressure measurement: Comparison and validation study of the arterial waveforms.
Karakasidis, Anastasios	Hierarchical carbon-fibre reinforced polymer (CFRP) composites utilising directly grown graphene nanoflakes.

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

Acheson, J, Robinson, L, McKillop, S, Wilson, S, Morton, J, Meenan, BJ & Boyd, A 2020, 'TOFSIMS and XPS characterisation of strontium in amorphous calcium phosphate sputter deposited coatings', *Materials Characterization*.

<https://doi.org/10.1016/j.matchar.2020.110739>

Acheson, JG, McKillop, S, Ward, J, Roy, A, Xu, Z, Boyd, AR, Lemoine, P, Kumta, PN, Sankar, J & Meenan, BJ 2021, 'Effects of strontium-substitution in sputter deposited calcium phosphate coatings on the rate of corrosion of magnesium alloys', *Surface and Coatings Technology*, vol. 421, 127446.

<https://doi.org/10.1016/j.surfcoat.2021.127446>

Afkhami, A, Marotta, M, Dixon, D, Ternan, NG, Montoya-Jaramillo, LJ, Hincapie, M, Galeano, L, Fernandez-Ibanez, P & Dunlop, PSM 2020, 'Assessment of low-cost cartridge filters for implementation in household drinking water treatment systems', *Journal of Water Process Engineering*.

<https://doi.org/10.1016/j.jwpe.2020.101710>

Ali, A, Khan, N, Abu-Tair, M, Noppen, J, McClean, SI & McChesney, I 2021, 'Discriminating features-based cost-sensitive approach for software defect prediction', *Automated software engineering*, vol. 28, no. 11.

<https://doi.org/10.1007/s10515-021-00289-8>

Ali, A, Zaman, A, Sayed, E, Evans, D, Morgan, S, Samwell, C, Hall, J, Sohail Arshad, M, Singh, N, Qutachi, O, Chang, M-W & Ahmad, Z 2021, 'Electrohydrodynamic Atomisation Driven Design and Engineering of Opportunistic Particulate Systems For Applications in Drug Delivery, Therapeutics and Pharmaceuticals', *Advanced drug delivery reviews*, vol. 176, 113788.

<https://doi.org/10.1016/j.addr.2021.04.026>

Ali, R, Mehta, P, Monou, PK, Arshad, MS, Panteris, E, Rasekh, M, Singh, N, Qutachi, O, Wilson, P, Tzetzis, D, Chang, M-W, Fatouros, DG & Ahmad, Z 2020, 'Electrospinning/ electrospaying coatings for metal microneedles: A design of experiments (DOE) and quality by design (QbD) approach', *European Journal of Pharmaceutics and Biopharmaceutics*, vol. 156, pp. 20-39.

<https://doi.org/10.1016/j.ejpb.2020.08.023>

Alibakhshikenari, M, Virdee, BS, Salekzamankhani, S, Aïssa, S, See, CH, Soin, N, Fishlock, SJ, Althuwayb, AA, Abd-alhameed, R, Huynen, I, Mclaughlin, JA, Falcone, F & Limiti, E 2021, 'High-isolation antenna array using SIW and realized with a graphene layer for sub-terahertz wireless applications', *Scientific Reports*, vol. 11, no. 1, 10218.

<https://doi.org/10.1038/s41598-021-87712-y>

Alrousan, D & Dunlop, PSM 2020, 'Evaluation of ozone-based oxidation and solar advanced oxidation treatment of greywater', *Journal of Environmental Chemical Engineering*, vol. 8, no. 5, 104309.

<https://doi.org/10.1016/j.jece.2020.104309>

Alrousan, D, Afkhami, A, Bani-Melhem, K & Dunlop, PSM 2020, 'Organic Degradation Potential of Real Greywater Using TiO₂-Based Advanced Oxidation Processes', *Water*, vol. 12, no. 10, 2811.

<https://doi.org/10.3390/w12102811>

Arya, F, Hyde, T, Henshall, P, Eames, P, Moss, R, Shire, S & Uhomobhi, J 2021, 'Fabrication analysis of flat vacuum enclosures for solar collectors sealed with Cerasolzer 217', *Solar Energy*, vol. 220, pp. 635-649.

<https://doi.org/10.1016/j.solener.2021.02.040>

- Asadi, F, Shahnazari, R, Bhalla, N & Payam, AF 2021, 'Clinical evaluation of SARS-CoV-2 Lung HRCT and RT-PCR Techniques: Towards risk factor based diagnosis of infectious diseases', Computational and Structural Biotechnology Journal. <https://doi.org/10.1016/j.csbj.2021.04.058>
- Asimakopoulou, E, Zhang, J, McKee, M, Wiecek, K, Krawczyk, A, Andolfo, M, Kzlecki, T, Scatto, M, Sisani, M, Bastianini, M, Karakasidis, A & Papakonstantinou, P 2020, 'Effect of Layered Double Hydroxide, Expanded Graphite and Ammonium Polyphosphate additives on thermal stability and fire performance of polyisocyanurate insulation foam', Thermochemica Acta, vol. 693, 178724. <https://doi.org/10.1016/j.tca.2020.178724>
- Askari, S, Mariotti, D, McGlynn, R & Benedikt, J 2021, 'Air-Cathode with 3D Multiphase Electrocatalyst Interface Design for High-Efficiency and Durable Rechargeable Zinc–Air Batteries', Energy Technology, vol. 9, no. 5, 2000999, pp. 2000999. <https://doi.org/10.1002/ente.202000999>
- Barani, M, Rahdar, A, Sargazi, S, Amiri, MS, Sharma, P & Bhalla, N 2021, 'Nanotechnology for inflammatory bowel disease management: Detection, imaging and treatment', Sensing and Bio-Sensing Research, vol. 32, 100417. <https://doi.org/10.1016/j.sbsr.2021.100417>
- Barber, R, Cameron, S, Devine, A, McCombe, A, Pourshahidi, LK, Cundell, J, Roy, S, Mathur, A, Casimero, C, Papakonstantinou, P & Davis, J 2021, 'Laser induced graphene sensors for assessing pH: Application to wound management', Electrochemistry Communications, vol. 123, 106914, pp. 106914. <https://doi.org/10.1016/j.elecom.2020.106914>
- Biglarbeigi, P, Ng, KY, Finlay, D, Bond, RR, Jing, M & McLaughlin, J 2021, 'Sensitivity analysis of the infection transmissibility in the UK during the COVID-19 pandemic', PeerJ. <https://doi.org/10.7717/peerj.10992>
- Biglarbeigi, P, Strong, A, Finlay, D, McDermott, R & Griffiths, P 2020, 'A Hybrid Model-Based Adaptive Framework for the Analysis of Climate Change Impact on Reservoir Performance', Water Resources Management, vol. 34, pp. 4053-4066. <https://doi.org/10.1007/s11269-020-02654-w>
- Bikkarolla, SK, McNamee, SE, Mcgregor, S, Vance, P, Mcghee, H, Marlow, EL & McLaughlin, J 2020, 'A lateral flow immunoassay with self-sufficient microfluidic system for enhanced detection of thyroid-stimulating hormone', AIP Advances, vol. 10, no. 12, 125316, pp. 1-8. <https://doi.org/10.1063/5.0026047>
- Bo, Z, Li, H, Yang, H, Li, C, Wu, S, Xu, C, Xiong, G, Mariotti, D, Yan, J, Cen, K & Ostrikov, KK 2021, 'Combinatorial atomistic-to-AI prediction and experimental validation of heating effects in 350 F supercapacitor modules', International Journal of Heat and Mass Transfer, vol. 171, 121075, pp. 121075 <https://doi.org/10.1016/>
- Bond, RR, Finlay, D, Al-Zaiti, SS & Macfarlane, P 2021, 'Machine learning with electrocardiograms: A call for guidelines and best practices for 'stress testing' algorithms', Journal of Electrocardiology. <https://doi.org/10.1016/j.jelectrocard.2021.07.003>
- Boyd, A, Meenan, BJ, Sharma, P, McIlhagger, AT, Mokhtarimotamenishirvan, M, Rodzen, K, Dave, F, Tormey, D & Sherlock, R 2021, 'The Direct 3D Printing of Functional PEEK/Hydroxyapatite Composites via a Fused Filament Fabrication Approach', Polymers, vol. 13, no. 4, 545, pp. 1 - 18. <https://doi.org/10.3390/polym13040545>
- Brennan, P, Jing, M, McNeil, A, Awuah, A, Jonathan, M, Kelly, B, Finlay, D, Blighe, K, McLaughlin, J, Nesbit, MA, Trucco, E, Lockhart, C, Moore, TCB & Spence, M 2021, 'Assessment of the conjunctival microcirculation in adult patients with cyanotic congenital heart disease compared to healthy controls', Microvascular Research, vol. 136, 104167. <https://doi.org/10.1016/j.mvr.2021.104167>
- Brennan, P, McNeil, A, Jing, M, Awuah, A, Moore, S, Jonathan, M, Finlay, D, Blighe, K, McLaughlin, J, Nesbit, MA, Trucco, E, Moore, TCB & Spence, M 2021, 'Assessment of the conjunctival microcirculation for patients presenting with acute myocardial infarction compared to healthy controls', Scientific Reports, vol. 11, no. 1, 7660.

<https://doi.org/10.1038/s41598-021-87315-7>

Brisk, R, Bond, RR, Finlay, D, McLaughlin, J, Jasinska-Piadlo, A, Leslie, SJ, Gossman, DE, Menown, I, McEneaney, DJ & Warren, S 2021, 'The effect of confounding data features on a deep learning algorithm to predict complete coronary occlusion in a retrospective observational setting', *European Heart Journal Digital Health*, pp. 1-8.

<https://doi.org/10.1093/ehjdh/ztab002>

Brunet, P, McGlynn, RJ, Alessi, B, Smail, F, Boies, A, Maguire, P & Mariotti, D 2021, 'Surfactant-free synthesis of copper nanoparticles and gas phase integration in CNT-composite materials', *Nanoscale Adv.*, vol. 3, no. 3, pp. 781-788.

<https://doi.org/10.1039/D0NA00922A>

Casey, M, Stokes, P, Cocks, DG, Bošnjaković, D, Simonović, I, Brunger, M, Dujko, S, Petrović, Z, Robson, R & White, R 2021, 'Foundations and interpretations of the pulsed-Townsend experiment', *Plasma Sources Science and Technology*, vol. 30, no. 3, 035017, pp. 1-11.

<https://doi.org/10.1088/1361-6595/abe729>

Choudhury, S, Roy, S, Bhattacharya, G, Fishlock, S, Deshmukh, S, Bhowmick, S, McLaughlin, J & Roy, SS 2021, 'Potentiometric Ion-Selective Sensors based on UV-Ozone Irradiated Laser-Induced Graphene Electrode', *Electrochimica Acta*.

<https://doi.org/10.1016/j.electacta.2021.138341>

Corduas, F, Lamprou, D & Mancuso, E 2021, 'Next generation surgical meshes for drug delivery and tissue engineering applications: materials, design and emerging manufacturing technologies', *Bio-Design and Manufacturing*, vol. 4, no. 2, pp. 278-310. <https://doi.org/10.1007/s42242-020-00108-1>

Corduas, F, Mancuso, E & Lamprou, D 2020, 'Long-acting implantable devices for the prevention and personalised treatment of infectious, inflammatory and chronic diseases', *Journal of Drug Delivery Science and Technology*, vol. 60, no. 101952, 101952, pp. 1-16.

<https://doi.org/10.1016/j.jddst.2020.101952>

Deshmukh, S, Banerjee, D, Marin Quintero, JS, Fishlock, SJ, McLaughlin, J, Waghmare, PR & Roy, SS 2021, 'Polarity Dependent Electrowetting for

Directional Transport of Water through Patterned Superhydrophobic Laser Induced Graphene Fibers', *Carbon*.

<https://doi.org/10.1016/j.carbon.2021.06.033>

Do, TD, Gui, MM & Ng, KY 2021, 'Assessing the effects of time-dependent restrictions and control actions to flatten the curve of COVID-19 in Kazakhstan', *PeerJ*, vol. 9, 10806, pp. e10806.

<https://doi.org/10.7717/peerj.10806>

Dsouza, SD, Buerkle, M, Brunet, P, Maddi, C, Padmanaban, DB, Morelli, A, Payam, AF, Maguire, P, Mariotti, D & Svrcek, V 2021, 'The importance of surface states in N-doped Carbon Quantum Dots', *Carbon*.

<https://doi.org/10.1016/j.carbon.2021.06.088>

Eksin, E, Torul, H, Yarali, E, Tamer, U, Papakonstantinou, P & Erdem, A 2021, 'Paper-based electrode assemble for impedimetric detection of miRNA', *Talanta*, vol. 225, 122043, pp. 122043.

<https://doi.org/10.1016/j.talanta.2020.122043>

Fan, X, Geng, J, Soin, N, Chakrabarti, S, Mitra, S, Roqan, I, Li, H, Babatunde, M & Baldwin, A 2021, 'A solid-liquid two-phase precipitation method for the growth of fullerene (C60) nanowires', *CrystEngComm*, vol. 36, pp. 6340-6348.

<https://doi.org/10.1039/D1CE00413A>

Farokh Payam, A, Biglarbeigi, P, Morelli, A, Lemoine, P, McLaughlin, J & Finlay, D 2021, 'Data acquisition and imaging using wavelet transform: a new path for high speed transient force microscopy', *Nanoscale Advances*, vol. 3, no. 2, pp. 383-398.

<https://doi.org/10.1039/D0NA00531B>

Farokh Payam, A, Morelli, A & Lemoine, P 2021, 'Multiparametric analytical quantification of materials at nanoscale in tapping force microscopy', *Applied Surface Science*, vol. 536, 147698.

<https://doi.org/10.1016/j.apsusc.2020.147698>

Ferreira, C, Bikkarolla, SK, Frykholm, K, Pohjanen, S, Brit, M, Lameiras, C, Nunes, OC, Westerlund, F & Manaia, CM 2021, 'Polyphasic characterization of carbapenem-resistant *Klebsiella pneumoniae* clinical isolates suggests vertical transmission of the blaKPC-3 gene',

PLoS ONE, vol. 16, no. 2, e0247058, pp. 1 to 18.
<https://doi.org/10.1371/journal.pone.0247058>

Harkin, R, Wu, H, Nikam, S, Quinn, J & McFadden, S 2021, 'Analysis of spatter removal by sieving during a powder-bed fusion manufacturing campaign in grade 23 titanium alloy', *Metals*, vol. 11, no. 3, 399, pp. 1-13.
<https://doi.org/10.3390/met11030399>

Harkin, R, Wu, H, Nikam, S, Quinn, JP & McFadden, S 2020, 'Reuse of Grade 23 Ti6Al4V Powder during the Laser-Based Powder Bed Fusion Process', *Metals*, vol. 10, no. 12, 1700, pp. 1-14.
<https://doi.org/10.3390/met10121700>

Hendawy, N, McQuaid, H, Mariotti, D & Maguire, P 2020, 'Continuous gas temperature measurement of cold plasma jets containing microdroplets, using a focussed spot IR sensor', *Plasma Sources Science and Technology*, vol. 29, no. 8, 085010.
<https://doi.org/10.1088/1361-6595/aba2aa>

Hughes, T, McFadden, S & Robinson, AJ 2021, 'A front-tracking measurement technique for in-situ columnar and equiaxed structure growth with controlled solidification', *Measurement Science and Technology*, vol. 32, no. 4, 045903, pp. 1-11.
<https://doi.org/10.1088/1361-6501/abcb24>

Hunter, E, Percival, B, Ahmad, Z, Chang, M-W, Hunt, JA, Tasker, S, De Risio, L & Wilson, PB 2021, 'NMR-based metabolomics associated with chronic kidney disease in humans and animals: a one health perspective', *Molecular and Cellular Biochemistry*, pp. 1-5.
<https://doi.org/10.1007/s11010-021-04222-1>

Hussain, S, Amade, R, Boyd, A, Musheghyan-Avetisyan, A, Alshaiikh, I, Martí-Gonzalez, J, Pascual, E, Meenan, BJ & Bertran-Serra, E 2021, 'Three-dimensional Si / vertically oriented graphene nanowalls composite for supercapacitor applications', *Ceramics International*.
<https://doi.org/10.1016/j.ceramint.2021.04.190>

Hussain, S, Robinson, L, Acheson, J, Meenan, BJ & Boyd, A 2020, 'The Surface Characterisation of Polyetheretherketone (PEEK) Modified via the Direct Sputter Deposition of Calcium Phosphate Thin Films', *Coatings*, vol. 10, no. 11, 1088, pp. 1-26.
<https://doi.org/10.3390/coatings10111088>

Iskander, L, DiSilvo, L, Acheson, J & Deb, S 2021, 'Dual Network Composites of Poly(vinyl alcohol)-Calcium Metaphosphate/Alginate with Osteogenic Ions for Bone Tissue Engineering in Oral and Maxillofacial Surgery', *Bioengineering*.
<https://doi.org/10.3390/bioengineering8080107>

Islam, AKMK, Dunlop, PSM, Hewitt, N, Lenihan, R & Brandoni, C 2021, 'Bio-Hydrogen Production from Wastewater: A Comparative Study of Low Energy Intensive Production Processes', *Clean Technologies*, vol. 3, no. 1, 3, pp. 156-182.
<https://doi.org/10.3390/cleantechnol3010010>

Jindal, S, Manzoor, F, Haslam, N & Mancuso, E 2021, '3D printed composite materials for craniofacial implants: current concepts, challenges and future directions', *The International Journal of Advanced Manufacturing Technology*, vol. 112, pp. 635-653.
<https://doi.org/10.1007/s00170-020-06397-1>

Jing, M, Bond, R, Robertson, L, Moore, J, Kowalczyk, A, Price, RK, Burns, W, Nesbit, MA, McLaughlin, J & Moore, TCB 2021, 'User experience analysis of AbC-19 Rapid Test via lateral flow immunoassays for self-administrated SARS-CoV-2 antibody testing', *Scientific Reports*, vol. 11, 14026, pp. 1-13.
<https://doi.org/10.1038/s41598-021-93262-0>

Joseph-Richard, P, Jaffrey, A & Uhomoibhi, J 2021, 'Predictive Learning Analytics and the Creation of Emotionally Adaptive Learning Environments in Higher Education Institutions: A Study of Students' Affect Responses', *International Journal of Information and Learning Technology*, vol. 38, no. 2, pp. 243-257.
<https://doi.org/10.1108/IJILT-05-2020-0077>

Lamon, AW, Faria Maciel, PM, Campos, JR, Corbi, JJ, Dunlop, PSM, Fernandez-Ibañez, P, Anthony Byrne, J & Sabogal-Paz, LP 2021, 'Household slow sand filter efficiency with schmutzdecke evaluation by microsensors', *Environmental Technology (United Kingdom)*, pp. 1-12.
<https://doi.org/10.1080/09593330.2021.1939795>

Maciel, PMF, Fava, NDMN, Lamon, AW, Fernandez-Ibañez, P, Byrne, JA & Sabogal-Paz,

LP 2021, 'Household water purification system comprising cartridge filtration, UVC disinfection and chlorination to treat turbid raw water', *Journal of Water Process Engineering*, vol. 43, 102203.

<https://doi.org/10.1016/j.jwpe.2021.102203>

Mancuso, E, Shah, L, Jindal, S, Serenelli, C, Tsikriteas, Z, Khanbareh, H & Tirella, A 2021, 'Additively manufactured BaTiO₃ composite scaffolds: a novel strategy for load bearing bone tissue engineering applications', *Materials Science and Engineering: C*, vol. 126, 112192.

<https://doi.org/10.1016/j.msec.2021.112192>

Manzoor, F, Golbang, A, Jindal, S, Dixon, D, McIlhagger, AT, Harkin-Jones, E, Crawford, D & Mancuso, E 2021, '3D printed PEEK/HA composites for bone tissue engineering applications: effect of material formulation on mechanical performance and bioactive potential', *Journal of the Mechanical Behavior of Biomedical Materials*, vol. 121, 104601.

<https://doi.org/10.1016/j.jmbbm.2021.104601>

Marjanović, J, Marić, D, Malović, G & Petrović, Z 2021, 'Effective ionization coefficients for low current dc discharges in alcohol vapours at low pressure', *European Physical Journal D: Atomic, Molecular, Optical and Plasma Physics*, vol. 75, 191, pp. 1-7.

<https://doi.org/10.1140/epjd/s10053-021-00138-z>

Marjanović, J, Marić, D, Malović, G & Petrović, Z 2021, 'Voltage–current characteristics of low pressure discharges in vapors of several alcohols', *Journal of Applied Physics*, vol. 129, no. 14, 143303, pp. 1-30.

<https://doi.org/10.1063/5.0044419>

McDonald, C, Ni, C, Švrček, V, Macias-Montero, M, Velusamy, T, Connor, PA, Maguire, P, Irvine, JTS & Mariotti, D 2021, 'Carrier extraction from metallic perovskite oxide nanoparticles', *Nanoscale*, vol. 13, no. 28, pp. 12271-12278.

<https://doi.org/10.1039/d1nr02890a>

McMichael, S, Fernández-Ibáñez, P & Byrne, JA 2021, 'A review of photoelectrocatalytic reactors for water and wastewater treatment', *Water (Switzerland)*, vol. 13, no. 9, e1198.

<https://doi.org/10.3390/w13091198>

McMichael, S, Waso, M, Reyneke, B, Khan, W, Byrne, J & Fernandez-Ibanez, P 2021, 'Electrochemically assisted photocatalysis for the disinfection of rainwater under solar irradiation', *Applied Catalysis B: Environmental*, vol. 281, 119485.

<https://doi.org/10.1016/j.apcatb.2020.119485>

Mehta, P, Rasekh, M, Patel, M, Onaiwu, E, Nazari, K, Kucuk, I, Wilson, PB, Sohail Arshad, M, Ahmad, Z & Chang, M-W 2021, 'Recent Applications of Electrical, Centrifugal, and Pressurised Emerging Technologies for Fibrous Structure Engineering in Drug Delivery, Regenerative Medicine and Theranostics', *Advanced drug delivery reviews*, vol. 175, 113823.

<https://doi.org/10.1016/j.addr.2021.05.033>

Meijide, J, Dunlop, PSM, Pazos, M & Angeles Sanromán, M 2021, 'Heterogeneous Electro-Fenton as “Green” Technology for Pharmaceutical Removal: A Review', *Catalysts*, vol. 11, no. 1, 85, pp. 1-22.

<https://doi.org/10.3390/catal11010085>

Moghaddam, RK, Bhalla, N, Shen, AQ & Natale, G 2021, 'Deterministic particle assembly on nanophotonic chips', *Journal of Colloid and Interface Science*, vol. 603, pp. 259-269.

<https://doi.org/10.1016/j.jcis.2021.06.120>

Mokhtari, M, Archer, E, Bloomfield, N, Harkin-Jones, E & McIlhagger, AT 2021, 'A review of electrically conductive Poly(ether ether ketone) materials', *Polymer International*, vol. 70, no. 8, pp. 1016-1025. <https://doi.org/10.1002/pi.6176>

Mokhtarimotamenishirvan, M, Archer, E, Bloomfield, N, Harkin-Jones, E & McIlhagger, AT 2021, 'High-performance and cost-effective melt blended poly(ether ether ketone)/expanded graphite composites for mass production of antistatic materials', *Polymer International*.

<https://doi.org/10.1002/pi.6226>

Molkov, V & Dery, W 2020, 'The blast wave decay correlation for hydrogen tank rupture in a tunnel fire', *International Journal of Hydrogen Energy*, vol. 45, no. 55, pp. 31289-31302.

<https://doi.org/10.1016/j.ijhydene.2020.08.062>

Molkov, V, Cirrone, D, Shentsov, V, Dery, W,

- Kim, W & Makarov, D 2021, 'Dynamics of blast wave and fireball after hydrogen tank rupture in a fire in the open atmosphere', *International Journal of Hydrogen Energy*, vol. 46, no. 5, pp. 4644-4665.
<https://doi.org/10.1016/j.ijhydene.2020.10.211>
- Mothkuri, S, Gupta, H, Jain, PK, Rao, TN, Padmanabham, G & Chakrabarti, S 2021, 'Functionalized Carbon Nanotube and MnO₂ Nanoflower Hybrid as an Electrode Material for Supercapacitor Application', *Micromachines*, vol. 12, no. 2. <https://doi.org/10.3390/mi12020213>
- Neale, G, Gaihre, S, O'Gorman, P, Price, RK, Galdos Balzategui, A, Herrera, C, Rawal, S, Morgan, M & McNulty, H 2021, 'Review of Recent Innovations in Portable Child Growth Measurement Devices for Use in Low- and Middle-Income Countries', *Journal of Medical Engineering & Technology*, pp. 1-14.
<https://doi.org/10.1080/03091902.2021.1946181>
- Nguyen, C & Cheema, AA 2021, 'A Deep Neural Network-Based Multi-Frequency Path Loss Prediction Model from 0.8 GHz to 70 GHz', *Sensors*, vol. 21, no. 15, 5100.
<https://doi.org/10.3390/s21155100>
- Nies, C-L & Nolan, M 2021, 'Prediction of Co and Ru nanocluster morphology on 2D MoS₂', *Beilstein Journal of Nanotechnology*, vol. 12, pp. 704-724.
<https://doi.org/10.3762/bjnano.12.56>
- Nikam, S, Quinn, JP & McFadden, S 2021, 'A Simplified Thermal Approximation Method to include the effects of Marangoni Convection in the melt pools of processes that involve moving point heat sources', *Numerical Heat Transfer, Part A: Applications: An International Journal of Computation and Methodology*, vol. 79, no. 7, pp. 537-552.
<https://doi.org/10.1080/10407782.2021.1872257>
- Odoemelam, CS, Percival, B, Wallis, H, Chang, M-W, Ahmad, Z, Scholey, D, Burton, E, Williams, IH, Kamerlin, CL & Wilson, PB 2020, 'G-Protein coupled receptors: structure and function in drug discovery', *RSC Advances*, vol. 10, no. 60, pp. 36337-36348.
<https://doi.org/10.1039/d0ra08003a>
- Ozhukil Valappil, M, Ganguly, A, Benson, J, K. Pillai, V, Alwarappan, S & Papakonstantinou, P 2020, 'Bismuthene nanosheets produced by ionic liquid assisted grinding exfoliation and their use for oxygen reduction reaction', *RSC Advances*, vol. 10, no. 71, 10.1039/d0ra09763b, pp. 43585-43591.
<https://doi.org/10.1039/d0ra09763b>
- Padmanaban, DB, McGlynn, R, Byrne, EL, Velusamy, T, Swadzba-Kwasny, M, Maguire, P & Mariotti, D 2021, 'Understanding plasma-ethanol non-equilibrium electrochemistry during the synthesis of metal oxide quantum dots', *Green Chemistry*, pp. -.
<https://doi.org/10.1039/D0GC03291C>
- Payam, AF & Duy Vy, N 2020, 'Dynamic analysis of flexural vibration mode of an atomic force microscope cantilever with a sidewall probe in liquid', *Microscopy research and technique*.
<https://doi.org/10.1002/jemt.23636>
- Pichel, N, Vivar, M & Fuentes, M 2021, 'Comparative analysis of the SolWat photovoltaic performance regarding different PV technologies and hydraulic retention times', *Applied Energy*, vol. 292, 116902.
<https://doi.org/10.1016/j.apenergy.2021.116902>
- Porta, M, Tonda-Turo, C, Pierantozzi, D, Ciardelli, G & Mancuso, E 2020, 'Towards 3D Multi-Layer Scaffolds for Periodontal Tissue Engineering Applications: Addressing Manufacturing and Architectural Challenges', *Polymers*, vol. 12, no. 10, 2233, pp. 1-20.
<https://doi.org/10.3390/polym12102233>
- Puttaswamy, S, Bhalla, N, Kelsey, CP, Lubarsky, G, Lee, C & McLaughlin, J 2020, 'Independent and grouped 3D cell rotation in a microfluidic device for bioimaging applications', *Biosensors and Bioelectronics*, vol. 170, 112661, pp. 1-7.
<https://doi.org/10.1016/j.bios.2020.112661>
- Puttaswamy, S, Lubarsky, G, Kelsey, CP, Zhang, X, Finlay, D, McLaughlin, J & Bhalla, N 2020, 'Nanophotonic-Carbohydrate Lab-on-a-Microneedle for Rapid Detection of Human Cystatin C in Finger-Prick Blood', *ACS Nano*, vol. 14, no. 9, acsnano.0c05074, pp. 11939-11949.
<https://doi.org/10.1021/acsnano.0c05074>

Rababah, AS, Bear, LR, Dogrusoz, YS, Good, W, Bergquist, J, Stoks, J, MacLeod, R, Rjoob, K, Jennings, M, McLaughlin, J & Finlay, DD 2021, 'The effect of interpolating low amplitude leads on the inverse reconstruction of cardiac electrical activity', *Computers in biology and medicine*, vol. 136, 104666.

<https://doi.org/10.1016/j.combiomed.2021.104666>

Ralph, C, Dahale, M, Neale, G, Ramaswamy, K, McCarthy, M, Yoo, S, Toso, N, Kelly, J, McGarrigle, C, Archer, E, Harkin-Jones, E & McIlhagger, AT 2021, 'Influence of Binder Float Length on the Out-of-Plane and Axial Impact Performance of 3D Woven Composites', *Composites Part A: Applied Science and Manufacturing*, vol. 147, 106459.

<https://doi.org/10.1016/j.compositesa.2021.106459>

Rhatigan, S, Michel, M-C & Nolan, M 2020, 'Hydrogen evolution on non-metal oxide catalysts', *Journal of Physics: Energy*, vol. 2, no. 4, 042002. <https://doi.org/10.1088/2515-7655/aba3bc>

Rhatigan, S, Niemitz, L & Nolan, M 2021, 'Modification of TiO₂ with metal chalcogenide nanoclusters for hydrogen evolution', *Journal of Physics: Energy*, vol. 3, no. 2, 025001, pp. 1-14. <https://doi.org/10.1088/2515-7655/abe424>

Rioja Cabanillas, A, Valdesueiro, D, Fernandez-Ibanez, P & Byrne, J 2021, 'Hydrogen from wastewater by photocatalytic and photoelectrochemical treatment', *Journal of Physics: Energy*, vol. 3, no. 1, 012006, pp. 1-21. <https://doi.org/10.1088/2515-7655/abceab>

Rjoob, K, Bond, RR, Finlay, D, McGilligan, VE, Leslie, SJ, Rababah, A, Guldenring, D, Iftikhar, A, Knoery, C, McShane, A & Peace, A 2020, 'Machine learning techniques for detecting electrode misplacement and interchanges when recording ECGs: A systematic review and meta-analysis', *Journal of Electrocardiology*, vol. 62, pp. 116-123. <https://doi.org/10.1016/j.jelectrocard.2020.08.013>

Rjoob, K, Bond, RR, Finlay, D, McGilligan, VE, Leslie, SJ, Rababah, A, Iftikhar, A, Guldenring, D, Knoery, C, McShane, A & Peace, A 2021,

'Reliable Deep Learning–Based Detection of Misplaced Chest Electrodes During Electrocardiogram Recording: Algorithm Development and Validation', *JMIR Medical Informatics*, vol. 9, no. 4, e25347, pp. 1-10. <https://doi.org/10.2196/25347>

Robertson, L, Moore, J, Blighe, K, Ng, KY, Quinn, N, Jennings, F, Warnock, G, Sharpe, P, Clarke, M, Maguire, K, Rainey, S, Price, RK, Burns, W, Kowalczyk, A, Awuah, A, McNamee, S, Wallace, G, Hunter, D, Sager, S, Chao-Shern, C, Nesbit, MA, McLaughlin, J & Moore, TCB 2021, 'Evaluation of the IgG antibody response to SARS CoV-2 infection and performance of a lateral flow immunoassay: cross-sectional and longitudinal analysis over 11 months', *BMJ Open*, vol. 11, no. 6.

<https://doi.org/10.1136/bmjopen-2020-048142>

Rudy, W, Pekalski, A, Makarov, D, Teodorczyk, A & Molkov, V 2021, 'Prediction of Deflagrative Explosions in Variety of Closed Vessels', *Energies*, vol. 14, no. 8, e2138.

<https://doi.org/10.3390/en14082138>

Saeed, K, McIlhagger, AT, Harkin-Jones, E, Kelly, J & Archer, E 2021, 'Prediction of the in-plane mechanical properties of continuous carbon fibre reinforced 3D printed polymer composites using classical laminated-plate theory', *Composite Structures*, vol. 259, 113226.

<https://doi.org/10.1016/j.compstruct.2020.113226>

Sarjoghian, S, Rahimian, A, Alfadhl, Y, Saunders, TG, Liu, J & Parini, CG 2020, 'Hybrid Development of a Compact Antenna Based on a Novel Skin-Matched Ceramic Composite for Body Fat Measurement', *Electronics*, vol. 9, no. 12, 2139, pp. 1-13.

<https://doi.org/10.3390/electronics9122139>

Shanmughasundaram, D, Ganguly, A, Sharma, P, Davis, J, Papakonstantinou, P & Benson, J 2021, 'One-Step Hydrothermal Synthesis of Phase-Engineered MoS₂/MoO₃ Electrocatalysts for Hydrogen Evolution Reaction', *ACS Applied Nano Materials*.

<https://doi.org/10.1021/acsanm.0c03274>

Sharma, P, Hamilton, J & Byrne, J 2021, 'Cu clusters modified aligned titania nanotubes for

photoelectrochemical water splitting', *Materials Today: Proceedings*, vol. 42, pp. 1766-1771.

<https://doi.org/10.1016/j.matpr.2021.02.372>

Sohail Arshad, M, Zafar, S, Yousef, B, Alyassin, Y, Ali, R, AlAsiri, A, Chang, M-W, Ahmad, Z, Ali Elkordy, A, Faheem, A & Pitt, K 2021, 'A review of emerging technologies enabling improved solid oral dosage form manufacturing and processing', *Advanced drug delivery reviews*, pp. 1-28.

<https://doi.org/10.1016/j.addr.2021.113840>

Soin, N, Fishlock, S, Kelsey, CP & Smith, S 2021, 'Triboelectric Effect Enabled Self-Powered, Point-of-Care Diagnostics: Opportunities for developing ASSURED and REASSURED devices', *Micromachines*, vol. 12, no. 3, pp. 1-36.

<https://doi.org/10.3390/mi12030337>

Stipniece, L, Wilson, S, Curran, JM, Chen, R, Salma-Ancane, K, Sharma, P, Meenan, BJ & Boyd, A 2021, 'Strontium substituted hydroxyapatite promotes direct primary human osteoblast maturation', *Ceramics International*, vol. 47, no. 3, pp. 3368-3379.

<https://doi.org/10.1016/j.ceramint.2020.09.182>

Su, Z, Sun, D, Zhang, L, He, M, Jiang, Y, Millar, B, Douglas, P, Mariotti, D, Maguire, P & Sun, D 2021, 'Chitosan/Silver Nanoparticle/Graphene Oxide Nanocomposites with Multi-Drug Release, Antimicrobial, and Photothermal Conversion Functions', *Materials*, vol. 14, no. 9, 2351.

<https://doi.org/10.3390/ma14092351>

Tomić, S, Petrović, A, Puač, N, Škoro, N, Bekić, M, Petrović, Z & Čolić, M 2021, 'Plasma-Activated Medium Potentiates the Immunogenicity of Tumor Cell Lysates for Dendritic Cell-Based Cancer Vaccines', *Cancers*, vol. 13, no. 7, 1626.

<https://doi.org/10.3390/cancers13071626>

Torul, H, Yarali, E, Eksin, E, Ganguly, A, Benson, J, Tamer, U, Papakonstantinou, P & Erdem, A 2021, 'Paper-Based Electrochemical Biosensors for Voltammetric Detection of miRNA Biomarkers Using Reduced Graphene Oxide or MoS₂

Nanosheets Decorated with Gold Nanoparticle Electrodes', *Biosensors*, vol. 11, no. 7, pp. e236.

<https://doi.org/10.3390/bios11070236>

Torul, H, Yarali, E, Eksin, E, Ganguly, A, Benson, J, Tamer, U, Papakonstantinou, P & Erdem, A 2021, 'Paper-Based Electrochemical Biosensors for Voltammetric

Detection of miRNA Biomarkers Using Reduced Graphene Oxide or MoS₂', *Biosensors*, vol. 11, no. 7. <https://doi.org/10.3390/bios11070236>

Wang, M, Lee, KCM, Chung, BMF, B, SCV, Ng, HC, Wong, J, Shum, HC, Tsia, KK & So, HK-H 2021, 'Low-Latency In Situ Image Analytics With FPGA-Based Quantized Convolutional Neural Network', *IEEE Transactions on Neural Networks and Learning Systems*.

<https://doi.org/10.1109/TNNLS.2020.3046452>

Wu, H, Clarke, R, Porter, M, Ward, R, Quinn, JP, Mc Garrigle, C & McFadden, S 2021, 'Thread-stripping test procedures leading to factors of safety data for friction-drilled holes in thin-section aluminium alloy', *Thin-Walled Structures*, vol. 163, 107653.

<https://doi.org/10.1016/j.tws.2021.107653>

Xiang, D, Zhang, X, Han, Z, Zhang, Z, Zhou, Z, Harkin-Jones, E, Zhang, J, Luo, X, Wang, P, Zhao, C & Li, Y 2020, '3D printed high-performance flexible strain sensors based on carbon nanotube and graphene nanoplatelet filled polymer composites', *Journal of Materials Science*, vol. 55, no. 33, pp. 15769-15786.

<https://doi.org/10.1007/s10853-020-05137-w>

Zhang, X, Xiang, D, Zhu, W, Zheng, Y, Harkin-Jones, E, Wang, P, Zhao, C, Li, H, Wang, B & Li, Y 2020, 'Flexible and high-performance piezoresistive strain sensors based on carbon nanoparticles@polyurethane sponges', *Composites Science and Technology*, vol. 200, 108437.

<https://doi.org/10.1016/j.compscitech.2020.108437>

3.2 Books/Chapters in Books

Cummins, D, Joseph-Richard, P & Morgan, M 2021, Integrated, not inserted: A pedagogic framework for embedding entrepreneurship education across disciplines. in H Neck & Y Liu (eds), *Innovation in Global Entrepreneurship Education: Teaching Entrepreneurship in Practice*. 1 edn, Edward Elgar Publishing, Glasgow, pp. 32-51. <https://www.elgar.com/shop/gbp/innovation-in-global-entrepreneurship-education-9781839104213.html>

Joseph-Richard, P & Uhomoibhi, J 2021, Ethics in Predictive Learning Analytics: An Empirical Case

Study on Students Perceptions in a Northern Irish University. in A A, A J, U J & O E (eds), *Handbook of Research on Big Data and Learning Analytics*. 1 edn, Advancing the Power of Learning Analytics and Big Data in Education, IGI Global, Hershey, PA. <https://doi.org/10.4018/978-1-7998-7103-3.ch004>

Zafar, S, Arshad, MS, Fatima, S, Ali, A, Zaman, A, Sayed, E, Chang, M-W & Ahmad, Z 2020, 'COVID-19: Current Developments and Further Opportunities in Drug Delivery and Therapeutics', *Pharmaceutics*, vol. 12, no. 10, 945. <https://doi.org/10.3390/pharmaceutics12100945>

3.3 Research Reports

Gormley-Heenan, C (ed.), Lackermeier, E (ed.), Heenan, D, Birrell, D, Johnston, R, Horgan, G, Leavey, G, O'Neill, S, Ennis, E, McLafferty, M, Gstrein, V, Murphy, MH, McNulty, H, Gray, A, Ryan, A, McLaughlin, J, Bjourson, AJ, Dubras, L & Gormley-Heenan, C (ed.) 2020, *Health, Equality and the Economy*.

3.4 Published Conference Papers

Alavi, SA, Rahimian, A & Mehran, K 2021, Statistical Estimation Framework for State Awareness in Microgrids Based on IoT Data Streams. in The 10th International Conference on Power Electronics, Machines and Drives (PEMD 2020) - Proceedings. PEMD, pp. 855-860, The 10th International Conference on Power Electronics, Machines and Drives (PEMD 2020), 15/12/20. <https://doi.org/10.1049/icp.2021.1090>

Antony Samy, A, Golbang, A, Archer, E & McIlhagger, AT 2021, A comparative study on the 3D printing process of semi-crystalline and amorphous polymers using simulation. in UK Association for Computational Mechanics (UKACM) Conference 2021 proceedings. Loughborough University, UKACM 2021 Conference, Loughborough, UK, 14/04/21.

De Marco, F, Finlay, D & Bond, RR 2021, Classification of Premature Ventricular Contraction Using Deep Learning. in 2020 Computing in Cardiology, CinC 2020., 9344238, Computing in Cardiology, vol. 2020-September, IEEE Xplore, Rimini, Italy, Computing in Cardiology 2020, Rimini, Italy, 13/09/20. <https://doi.org/10.22489/CinC.2020.311>

Ekerete, I, Garcia-Constantino, M, Diaz, Y, Giggins, O, Mustafa, M, Konios, A, Pouliet, P & McLaughlin, J 2020, Data Mining and Fusion of Unobtrusive Sensing Solutions for Indoor Activity Recognition. in 2020 42nd Annual International Conference of the IEEE Engineering in Medicine

& Biology Society (EMBC)., 9175896, Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBS, vol. 2020-July, IEEE Xplore, pp. 5357-5361, 2020 42nd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC), Montreal, Canada, 20/07/20.

<https://doi.org/10.1109/EMBC44109.2020.9175896>

Escalona, OJ, Villegas, A, Mukhtar, S, Perpiñan, G & McEneaney, D 2020, Wireless Arm Wearable Sensor Band For Long-Term Heart Rhythms Surveillance Using A Bipolar Arm-ECG Lead. in 2020 Computing in Cardiology Proceedings. vol. 47, Computing in Cardiology, Computing in Cardiology 2020, Rimini, Italy, 13/09/20.

<https://doi.org/10.22489/CinC.2020.470>

Güldenring, D, Rababah, A, Finlay, D, Bond, RR, Kennedy, A, Jennings, M, Rjoob, K & McLaughlin, J 2021, Regression or Pseudo-Inverse - Which Method Should be Preferred When Developing Inverse Linear ECG-Lead Transformations? in 2020 Computing in Cardiology. Computing in Cardiology, vol. 2020-September, IEEE Xplore, Rimini, Italy, Computing in Cardiology 2020, Rimini, Italy, 13/09/20.

<https://doi.org/10.22489/CinC.2020.330>

Jennings, M, Rababah, A, Biglarbeigi, P, Brisk, R, Güldenring, D, Bond, RR, McLaughlin, J & Finlay, D 2020, 'Coefficients for the Derivation of Posterior and Right Sided Chest Leads from the 12-lead Electrocardiogram', Paper presented at Computing in Cardiology 2020, Rimini, Italy, 13/09/20 - 16/09/20.

<https://doi.org/10.22489/CinC.2020.208>

Marques, SP, Kob, L, Robinson, TT, Yao, W & Sun, L 2021, Non-intrusive aerodynamic shape optimisation with a discrete empirical interpolation method. in AIAA Scitech 2021 Forum. AIAA Scitech 2021 Forum, American Institute of Aeronautics and Astronautics, AIAA Scitech 2021 Forum, 11/01/21.

<https://doi.org/10.2514/6.2021-0172>

Owen, K, Menown, I & McLaughlin, J 2020, 'Use of Carotid Intima-Media Thickness and Plaque Volume to Predict Single or Multi-vessel Coronary Artery Disease.', Paper presented at ECME 2020, United Kingdom, 15/12/20.

https://www.ecme-research.com/wp-content/uploads/ECME_Abstract_K-Owen.pdf

Quinn, S, Bond, RR, Donnelly, MP, Davey, S, McLaughlin, J & Finlay, D 2021, A Review of Covid-19 Symptom Checker Mobile Applications. in C Stephanidis, M Antona & S Ntoa (eds), HCI International 2021 - Posters - 23rd HCI International Conference, HCII 2021, Proceedings. Communications in Computer and Information Science, vol. 1421, Springer Science and Business Media Deutschland GmbH, pp. 591-598, 23rd International Conference on Human-Computer Interaction, HCII 2021, Virtual, Online, 24/07/21. https://doi.org/10.1007/978-3-030-78645-8_75

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

<p>Prof JAD McLaughlin Prof PD Maguire Prof B Meenan Prof D Finlay Dr D Guldenring Dr D McEaney, 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</p>	Biodevices Proto-Typing Lab	INVEST NI	£7.3M	2015-2020
<p>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 DrMS Gallagher</p>	SAFEWATER – Low cost technologies for safe drinking water in developing regions	EPSRC	£4,889,812	2017-2021
<p>Prof JAD McLaughlin Prof JSG Dooley Dr M Brennan Dr P Fernandez-Ibanez Prof JA Byrne Araya G Yesus, Uni of Mekelle Catalina Herrera, 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</p>	SAFEWATER Devices: Translation and Implementation (SAFEWATER Translate)	EPSRC GCRF-Hub 2017	£836,675.00	2019 -2022

<p>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 Sau Paulo Margarita H Perez, Uni of Medellin Nabaraj Adhikari, Med Micro</p>				
<p>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</p>	REWATERGY	CEC-H2020-MSCA-ITN	£247,536.00	2019-2023
<p>Dr P Fernandez-Ibanez Prof JA Byrne</p>	PANI Water	CEC-H2020-Pillar-Societal Challenges	£329,660.00	2019-2023
<p>Prof D Finlay Dr S Davey Prof JAD McLaughlin Dr MP Donnelly Dr R Bond</p>	SHAPES - Smart and Healthy Ageing Promoting Empowering Systems	CEC-H2020-DT TDS-01-2019	£352,706.00	2018-2023

Portfolio of Research Grants awarded during period 1 August 2020 - 31 July 2021

Unit of Assessment Member	Title of Award	Funding Body	Value
Dr G Burke Liam McLarnon (PhD student)	RegenaGraft	Innovate UK via ICURe Programme	£13,800
Dr E Archer	Synergy Promotion Fund: Investigate the use of powder epoxy to co-cure preforms	EPSRC Future Composites Manufacturing Hub	£6,044
Prof H Wang Prof JAD McLaughlin Prof CD Nugent Prof PD Maguire Dr C McCaughey, BHSC Prof U Powe, QUB Prof H Byrne, Technological University Dublin	VIPIRS - Virus Identification via Portable InfraRed Spectroscopy	UKRI EPSRC - Covid 19 call	£410,730
Prof HM McNulty Dr M Morgan Dr S Gaihre Mr PD O'Gorman Dr R Price Ms A Galdos Balzategi Cantaro, Azul Ms Ca Herrera, Barrientos CTA Ms S Rawal, SAIFRN	Improving Assessment of Child Growth and Nutrition Status in LMIC: Evaluation of a Novel Technology using Transdisciplinary Approaches (ImpACTT)	Department for the Economy-GCRF	£37,500
Prof JA Byrne	Novel dielectrics - bridging (Oct-Dec 2020)	AVX Coleraine Ltd	£22,392
Dr N Bhalla Prof JAD McLaughlin Dr N Soin Mr S Katoch, Cosmo Ferrite Ltd Dr A Thakur, Amity University	Preventing food crisis in Indian subcontinent by combating locust attacks using nanotechnology	Department for the Economy-GCRF	£37,200
Dr N Soin Dr S Fishlock Prof JAD McLaughlin Dr S Smith University of Pretoria Dr S Sinha Roy, Shiv Nadar University Prof J Luo Zhejiang University PR China	Self-powered, Point-of-Care (PoC) Diagnostics for Management of Non-Communicable Diseases	Department for the Economy-GCRF	£37,500

Dr J Liu Dr G Hawe Dr P Joseph-Richard Dr J Uhomobhi	KTP Programme between University of Ulster and Semple & McKillop Limited	Innovate UK/INI and Semple & McKillop Li	£186,773
Prof JAD McLaughlin Prof JA Byrne Dr P Fernandez-Ibanez Dr M Brennan Prof JSG Dooley	UKRI COVID CoA Funding - for project 70256R	UKRI Covid 19	£91,344
Prof B Meenan Dr MM Webba da Silva Dr A Farakh Payam Dr AR Boyd Dr NG Ternan Dr G Burke Prof D Mariotti Prof JAD McLaughlin Dr PSM Dunlop Dr N Soin Prof PD Maguire Dr PN Lemoine Prof D Finlay	Multi-User Atomic Force Microscope (AFM) Core Equipment	EPSRC - Core Equipment 2020	£250,000
Prof B Meenan Prof D Finlay Dr PSM Dunlop Dr AR Boyd Prof JAD McLaughlin	Optical Microscopes Core Equipment - related to 70285R (App 17418)	EPSRC - Core Equipment 2020	£165,000
Prof D Mariotti Prof PD Maguire Prof JAD McLaughlin	UKRI COVID CoA 70196R/70131R - UKRI Covid 19 Grant Extension Allocation	UKRI CoA Funds	£222,744
Dr G Burke	RegenaGraft - Phase 2	Innovate UK via ICURe Programme	£3,819
Prof A McIlhagger Dr A Golbang Prof JAD McLaughlin Dr G Hawe Prof E Harkin-Jones Dr C Ralph Dr E Archer Prof D Finlay	Decarbonisation of Maritime Transportation: A Return to Commercial Sailing	UKRI - Strength in Places	£2,123,721

Dr P Fernandez-Ibanez Prof JA Byrne Lyda Patricia Sabogal, Uni of Sao Paulo	Low cost technologies for drinking water in Brazilian rural communities - household slow sand filters combined with ultraviolet LED disinfection	The Royal Society	£225,000
Dr C Ralph Dr E Archer Prof A McIlhagger	Future Lightweight Composite Canisters	Invest NI DTEP	£24,800
Dr JV Condell Prof JAD McLaughlin Prof D Finlay Lee Heaney, NHS Highland Health Board Tomas Gustafsson, Region Vasterbotten Jack Anderson, Capita IT Services, Glasgow Stephen Milne, GENSIS Uni, Glasgow Joannes Noroberg Poulson, Techcare	TESTED - IoT TestBed	Interreg Northern Periphery & Arctic Pro	£25,277
Prof CBT Moore Prof JAD McLaughlin Dr A Nesbit Dr R Price	Experience Postal Study	Abingdon Health	£146,365
Dr MW Chang Prof YC Su, National Tsing Hua University	Design, engineering and characterisation of hybrid 3D printed self-response structures for the long term culture of mesenchymal stem cells	The Royal Society - Int Exchange Scheme	£12,000
Dr E Mancuso	Custom 3D printed implantable biomedical devices for guided mandible bone regeneration	Academy of Medical Sciences-Springboard	£98,825
Dr PSM Dunlop Dr NG Ternan Dr B Snelling	COVID Air Sterilisation	ILIMEX	£21,939
Prof CBT Moore Prof JAD McLaughlin Dr A Nesbit Dr R Price	Experience Postal Study	Abingdon Health	£28,745

Prof JA Byrne	Novel dielectrics - bridging (Jan-Sep 2021)	AVX Coleraine Ltd	£67,626
Dr S Fishlock Prof CBT Moore Prof JAD McLaughlin	KTP Programme between University of Ulster and BioPanda Reagents Limited	Innovate UK/INI and BioPanda Reagents Ltd	£186,206
Prof JAD McLaughlin	Collaborative Research Support Fund - Theme Leader Digital Health (NICP)	Department for the Economy	£63,838
Mr T Cadden Prof RT Mclvor Mr W McKnight	KTP Programme between University of Ulster and Heron Bros Ltd	BEIS and Heron Brothers Ltd	£184,579

