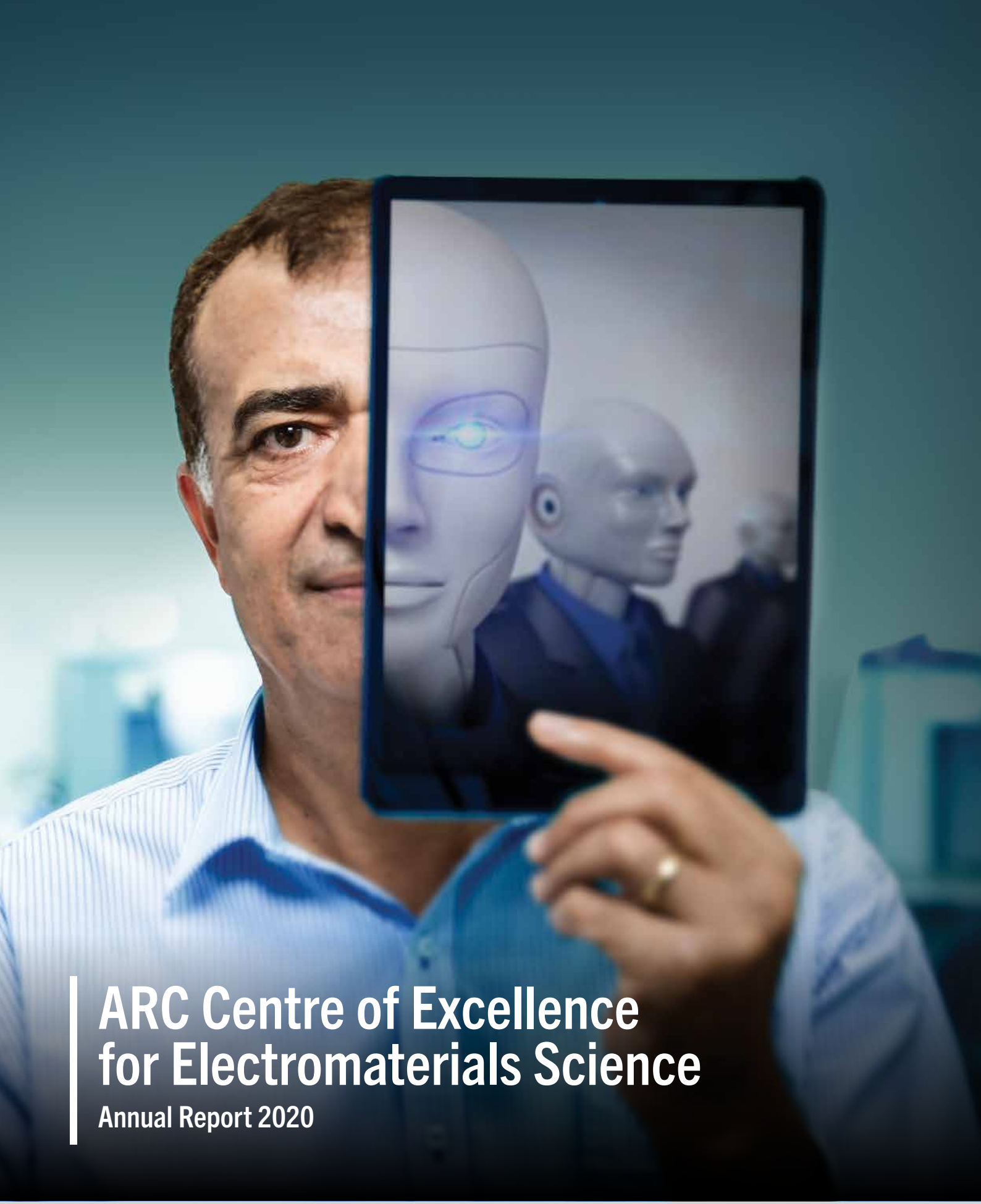


ARC Centre of Excellence for Electromaterials Science

Annual Report 2020

ARC Centre of Excellence for Electromaterials Science

Contents

Welcome

Our Vision is to be the pre-eminent world centre for research in the field of electromaterials science and integrated device assembly.

To achieve this we strive:

- To use our research into advanced materials to deliver innovative device solutions for clean energy and medical bionics.
- To deliver research programs that produce world class graduates with not only exceptional technical skills, but skills in science communication, research management, commercialisation, and an awareness of the ethical, social and environmental impact of their research.
- To realise commercial opportunities for our research through delivery of step-change technologies that positively impact on quality-of-life issues for the global community.
- To educate, inspire and engage stakeholders and the broader community, by effectively communicating our research messages.

The ACES Partners

We have established a global network of partners integral to our success in research, training, commercialisation and engagement. ACES, led by the University of Wollongong, incorporates eight Australian collaborating organisations and five international partner institutions known for their expertise in materials and device fabrication.

The collaborating organisations currently are Deakin University, Monash University, University of Tasmania, The Australian National University, The University of Melbourne, Swinburne University of Technology and La Trobe University.

The international partner institutions are Dublin City University, Ireland; University of Warwick, UK; Friedrich Alexander University of Erlangen, Germany; Hanyang University, Korea and Yokohama National University, Japan.

Each node comprises of individuals with key research strengths that when combined, place ACES in a powerful position to design, discover and develop new electromaterials.

Our Funding

The Australian Research Council invested $25 million in ACES over 2014-2021 to translate our materials science knowledge into practical, game-changing devices that will have a significant impact in the areas of diagnostics, energy, health and soft robotics.

The NSW Government invested $500,000 through its Research Attraction and Acceleration Program (RAAP) to help us facilitate the commercialisation of our research. In addition, this funding is designed to assist in developing innovative approaches that encourage entrepreneurship and commercialisation.

Our core funded activities provide a fundamental research program, facilities and expenditure that have enabled us to pursue new opportunities through MedTech and Pharma Growth Centre connect (MTPConnect) funded projects, Australian Renewable Energy Agency (ARENA), CRC funded projects, ARC linkage (project and training hubs), NHMRC and ARC discovery projects.

As we work towards our goals, we embrace the challenge of training the next generation of multidisciplinary research leaders, and providing new manufacturing and industrial opportunities for Australia.

2020 was a unique year with the impact of COVID-19 changing the world. We at ACES have managed to adapt to the “new normal” and have produced some innovative ways to remain in contact and productive despite the isolations and lockdowns.

A Word from the Director

2020. A year like no other.

COVID-19 certainly had us scrambling. We very quickly needed to shift towards a world of replacing face-to-face catch ups with online meetings, developing new ideas with limited human interaction, and accelerating research with limited lab access or no lab access at all.

In parallel, we found new ways to provide innovative training programs for our team to ensure our skills go beyond just technical knowledge to maximise the opportunity for success.

2020 taught us all something new. At ACES, we realised we needed to change how we plan, implement and provide impact from research.

As researchers, we traditionally disseminate our knowledge via academic journal articles, often not accessible (both physically and in terms of language) to the person on the street. 2020 confirmed for us that we need to turn this knowledge into tangible products – things that matter to the people we work for. It is no longer good enough to say the knowledge we generated is out there, is somewhat accessible and should be used by others. We need to be responsible for the delivery of that knowledge, not just the creation of it. That delivery needs to be in a form that enables the realisation of workable solutions to big challenges.

2020 also helped our collaborators, end-users and industry partners realise the importance and benefit of working together to deliver well-rounded and successful products. For example, our University of Wollongong node assisted in meeting the emergency need for protective face shields for local health workers at the height of the COVID-19 pandemic in Australia.

The Illawarra Shoalhaven Local Health District (ISLHD) identified that PPE face shields were critically needed to protect the region's healthcare workers in the COVID-19 crisis. The ACES and ANFF team worked with Dr Bruce Ashford (who led Wollongong Hospital's response to COVID-19) to test and refine designs. We enlisted the help of local industry partners with 3D printing capabilities CammPro and Me3D, and established the network to ensure we could supply the number of face shields needed.

This initiative evolved extremely quickly, and demonstrated that our legal, insurance and commercial processes needed to adapt to support this urgent need. I must pay tribute to my colleagues at UOW in these areas and the executive levels of UOW and ISLHD who worked swiftly to help us forge a path forward so we could supply the face shields.

In parallel, the UOW legal team assisted us in getting TGA certification for our face shield design. This includes having processes in place for design testing and verification, quality management systems for fabrication and packaging, and customer feedback lines of communication.

With the support of UOW, we are also well down the track in the implementation of a Quality Management System as we move towards ISO9001 and ISO13485 accreditation during 2021. This will further bolster the confidence of end-users in engaging with UOW for product supply.

The ability for universities to deliver a tangible product in an effective and efficient way has shown us the unintended beneficial consequence – of bridging the ideas to industries chasm. This outcome instils a level of confidence in investors, industry, government, institutions, and researchers themselves that university researchers CAN deliver.

The ability to undertake low-volume manufacturing brings researchers, investors and existing industry closer together. By enabling product refinement through customer engagement, building confidence that the product can be manufactured, and building the initial customer base, the knowledge accrual network becomes a technology deployment network.

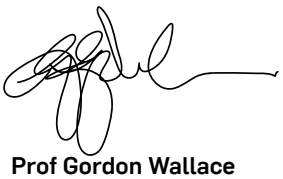
This new approach is quite revolutionary (believe it or not) and has the ability to make our manufacturing sector more agile and able to respond to emergencies by using the technologies we are developing at universities to take products to market with great speed.

We now need to utilise the momentum created in 2020 to catapult us over traditional hurdles as we up the ante on our ideas to industry and end-user journey.

I must thank the Australian Research Council (ARC) for its continual support, and especially in 2020, as we looked for socially distanced ways to work together, to collaborate and to achieve in these interesting times.

A special thank you to our International Advisory Committee chaired by Dame Bridget Ogilvie for your advice, support and mentorship during the year as you faced your own difficulties due to COVID-19.

I am excited by the prospects in front of us as we charge into 2021. This will be a blast!



Prof Gordon Wallace
Executive Director of ACES

International Advisory Committee Report

This year will be remembered as the year of COVID-19 and its consequences, which as well as severe illness and death, include huge social and workplace disruption.

The impact of COVID-19 is global and it has had a significant impact on the university sector where ACES members are based. Nonetheless, ACES has achieved an impressive amount of progress this year despite restrictions and adapted quickly to the new world of virtual working as well as communication.

ACES showcases are a great introduction. They are indicative of its increasing capacity to translate its fundamental research into industry and the ability, of the years of such research, to deliver real world impacts now and into the future.

Governments everywhere rightly want to see community benefits from the fundamental research paid for by the taxpayer. ACES has increasingly demonstrated the importance of the fundamental work which initially dominated its research output to its current position where its staff are much involved in translating the fruits of their fundamental science into industry, start-ups and spin-offs.

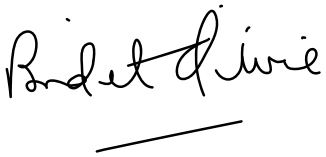
The IAC welcomed two new members at the start of 2020; Dr Pia Winberg and Dr Amanda Caples. The passionate founder, director and chief scientist of Venus Shell Systems, Pia has been working across both the marine industry and academia for the past 15 years and has a background in marine systems and ecology. Amanda was appointed to the role of Victoria's Lead Scientist in 2016, and brings a wealth of experience, particularly in commercialisation, policy and governance of public and private entities.

ACES has had core funding from the ARC for 15 years and in addition over the years its members have been highly successful in winning other funds, personal awards and grants from the ARC and elsewhere. Although ACES has been very successful and has delivered impacts not only to Australia but around the world, success does not equal continued core funding and consequently the focus now is on what science its members will engage in beyond 2021 and how it may be funded.

When I first became involved with ACES early in its existence, I was struck by its combination of truly original science and the interdisciplinarity of its approach, qualities which have been sustained. Scientific progress depends on exceptional originality and technical expertise, and especially novel results often occur when its practitioners come from different disciplines.

I worked for a funding agency, the Wellcome Trust, for almost two decades and hence know that the funding process does not accommodate these realities well. Truly novel ideas often go unfunded and likewise applications involving more than one discipline frequently fail the funding process. The same is true for the publication of research. Novel ideas are questioned simply because of their originality or it is said there is insufficient preliminary data, and peer review just doesn't work well for applications involving more than one discipline.

Year after year, the IAC has commented on the exceptionally positive atmosphere of congeniality and collaboration that is characteristic of ACES. This is a tribute to all concerned, perhaps particularly the Chief Investigators, and has probably helped when its scientists inevitably run into the funding and publication problems arising from real originality and interdisciplinarity. I believe these qualities will help the current ACES team to build on its 15 year legacy and achieve funding to move into other areas founded on its current strengths in health, batteries and energy.



Dr (Dame) Bridget Ogilvie (AC, DBE, FAA, FRS, FMedSci)
Chair of the ACES International Advisory Committee

COVID-19 impacts

2020 was a year unlike any other in modern Australia: severe drought (the previous three years being the driest on record across the country *source: BOM*), unprecedented bushfires, followed by extensive floods and then a global pandemic.

The COVID-19 pandemic changed the world and the way everything worked. Travel became limited to almost non-existent which meant virtual meetings became the only way to keep communication channels open across the world.

Despite the challenging realities of 2020 in lockdown, it is also important we reflect on our significant achievements. Within ACES, in an extraordinary year, our team has managed to do some extraordinary things.

The ACES team amassed 217 publications with 538 citations in 2020, showcasing the latest advances in diagnostics, robotics, energy and health. From a breakthrough in the development of new technologies to treat muscle loss, to the realisation of new high energy density sodium metal batteries for more efficient, longer storage capacity; we continued to use our expertise and knowledge to create solutions for real world challenges.

During 2020, Australia was one of the luckier countries, with relatively small infection numbers compared to the rest of the world through its ability to control infection spread. ACES nodes depending on their location were impacted to a greater or lesser extent. However lockdown proved a fruitful time for electronic communications, writing, online and teaching.

Above all, ACES stayed positive in the face of the impacts and restrictions.

ACES researchers assisting with COVID-19 Response

COVID-19 required rapid strategical efforts across the world, and there was a need for appropriate expertise and application to practical and strategic assistance. ACES expertise has contributed as follows:

ACES CI Sue Dodds provided expertise both nationally and internationally. Sue was an International Advisor as a member of the World Health Organisation (WHO) COVID Think Tank on Ethics (April-June 2020), as well as part of a future-scoping project on how WHO's West Pacific Regional Office can support its member countries' health systems after the initial challenge of COVID had passed. Sue was also named peer reviewer for three of the Chief Scientist's Rapid Research Information Forum papers, advice to government:

- Bell, Genevieve *et al.*, 2020. What motivates people to download and continue to use the COVIDSafe app. RRIF Q11 Rapid Research Information Forum, Office of the Chief Scientist (Independent reviewer).
- Larkins, F *et al.*, 2020. Impact of COVID-19 pandemic on Australia's research workforce RRIF Q6 Rapid Research Information Forum, Office of the Chief Scientist (Independent reviewer).
- Ahmed, W *et al.*, 2020. Monitoring Wastewater to Detect COVID-19, RRIG Q 3, Rapid Research Information Forum, and Office of the Chief Scientist (Independent reviewer).
- Duncan Ivison, Marc Steers, Susan Dodds. 2020. An Ethical Framework for the recovery, Group of Eight, COVID-19 Roadmap to Recovery: A report for the nation, pp 23-25. (Contribution to the writing of the framework).

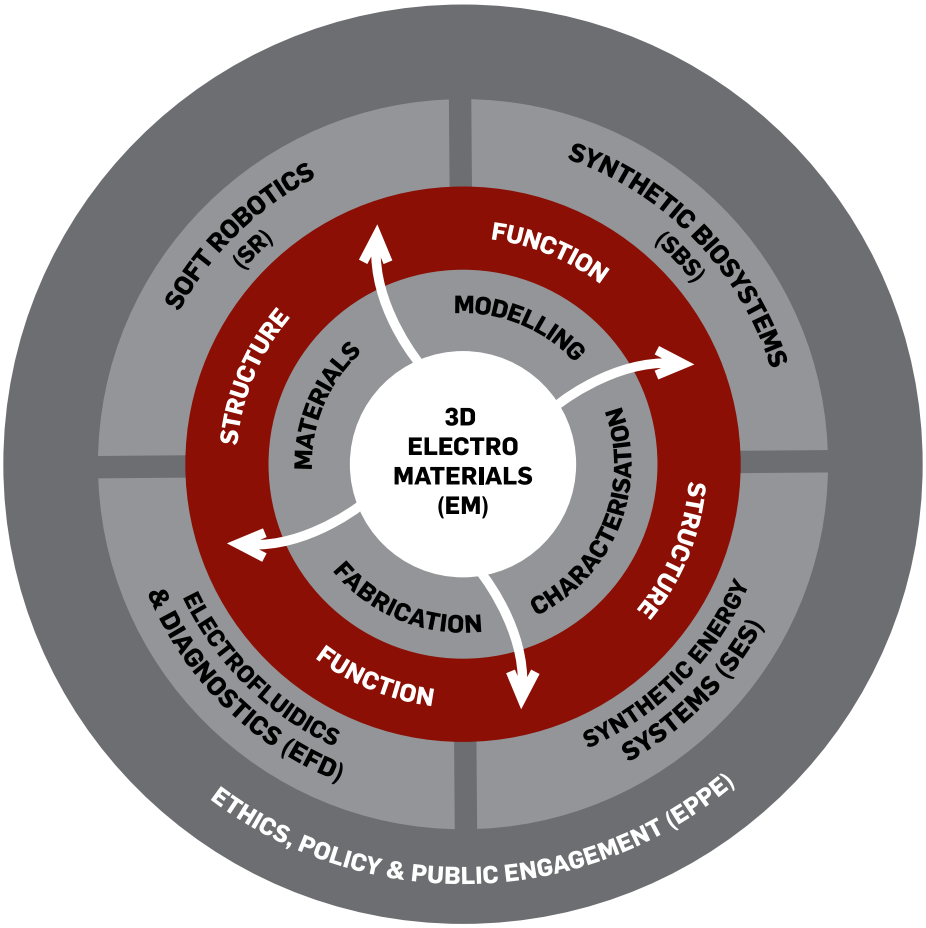
IAC member John Glynn, as a researcher to the Spanish Institute of Gerontology, looked at ways to mitigate the COVID-19 death rate amongst the elderly at home and in residencies. Prof Glynn also investigated a plan to improve infection procedures in residences.

ACES AI Mathew Cherian was appointed on the High Level Committee on COVID-19 Crisis Management Committee by Niti Aayog, Delhi, India in June 2020.

The ACES team at Wollongong demonstrated researchers can help in a time of crisis and responded to calls for the manufacture of face shields. The ACES and ANFF teams combined with other local commercial 3D printing entities to prepare face shields for Illawarra Shoalhaven Local Health District front line medical staff. UOW provided legal support to ensure delivery and eventually to realise certification of the face shield design.

"In 2020, ACES continued to set new standards of multidisciplinary excellence through the development of cutting-edge materials and using them to solve pressing societal problems in the medical, environment and energy arenas. Despite its many challenges, 2020 saw the Centre deepen its global impact through a uniquely deep international network for transnational R&D cooperation."
- Prof Robert Forster, Personal Chair of Physical Chemistry, Director National Centre for Sensor Research, Dublin City University, Ireland

ACES Research Outcomes



Schematic 1: ACES core 3D electromaterials research theme and associated application themes.

Despite an extraordinary and challenging year in which the COVID-19 pandemic caused most ACES node laboratories to shut down for extended periods and brought to a halt almost all national and international work-related travel, ACES research continued to create high impact and translational outcomes in its penultimate and seventh year. The extraordinary adaptability and resilience of ACES researchers, along with the widespread use of technology already well established across the ACES nodes ensured that collaborative outcomes across the electrofluidics and diagnostics (EFD), soft robotics (SR), synthetic energy systems (SES), synthetic biosystems (SBS) and ethics, policy and public engagement (EPPE) themes could still be achieved, building upon the fundamental knowledge in electromaterials, reactive systems, materials processing and fabrication approaches, developed in the electromaterials (EM) theme.

The benefits, in this extremely difficult year, of these interactions across themes and integrated centre research structure are evident from the success of the following ACES research outcomes relevant to our 2020 Activity plan and Year 6/7 milestones (see Table 1).

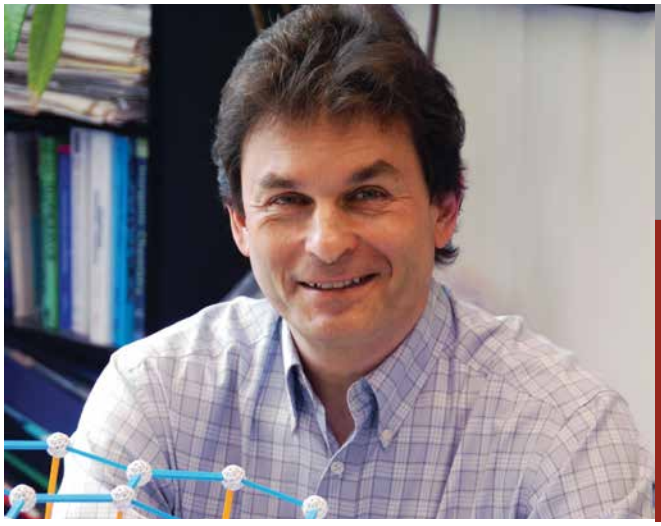
Electromaterials (EM)

Electromaterials research involves modelling, synthesis and fabrication protocols to develop high performance electromaterials for integration into devices for energy, robotics, bionics and diagnostic applications.

Materials

Graphene (Milestones EM15/20)

The graphene research focus in 2020 consisted of demonstrating, as widely as possible, the versatility and processability of the ACES-patented Edge Functionalised Graphene (PCT Appln WO2020073081A1, 2020) and determining its potential for commercialisation.



PROF RICHARD KANER DISTINGUISHED PROFESSOR

Dr Myung Ki Hong Endowed Chair in Materials Innovation, University of California Los Angeles, USA

"The Australian Research Council Centre for Electromaterials Science continues to make remarkable progress on materials that are providing exciting advances in energy storage, composites, flexible electronics and artificial limbs. "Very impressive results both in science and technology!"

Table 1: ACES 2014-2021 Research Milestones – Years 6/7

Milestone	Year	Description
Theme 1: Electromaterials (EM) - (Leader: Prof D L Officer)		
EM15	6	Provided optimised materials to the application theme projects.
EM16	6	Provided catalysts for CO_2 and N_2 reduction.
EM17	6	Developed a 3D model of the structure of electrolytes and their influence on chemical and electrochemical processes.
EM18	6	Identified optimal Diels-Alder couples for electrically driven self-healing polymer applications.
EM19	6	Evaluated and optimised photo-enol reactions for photo-ligation processes.
EM20	7	Provided optimised materials to the application theme projects.
EM21	7	Designed optimal electrolytes for Na-air battery applications and other applications as required.
EM22	7	Used an electric field to grow a sequence controlled polymer on a surface.
EM23	7	Designed improved visible light initiators for 3D printing applications.
Theme 2: Electrofluidics and Diagnostics (ED) - (Leader: Prof B Paull)		
EFD7	6	Integrated microfluidic electrophoresis system and detection into cell culture platform for target drug, nutrient and biomarker species, providing continuous monitoring of cell culture/stimulation process.
EFD8	7	Extended the application of cell culture, stimulation and analysis platform into study of other neural conditions, e.g. Parkinson's Disease.
Theme 3: Synthetic Energy Systems (SES) - (Leader: Prof D R MacFarlane)		
SES6	6	Developed optimised device prototype designs and initiated construction.
SES7	7	Demonstrated optimised devices.
The above milestones relate to a (i) solar driven CO_2 or N_2 reduction cell, (ii) sodium-air battery and (iii) thermoelectrochemical cell.		
Theme 4: Synthetic Biosystems (SB) - (Leader: Prof M Cook)		
SBS6	6	Clinically-specific function modelling platforms established/constructed.
SBS7	7	Applied integrated modelling platforms to *in vitro* functional modelling studies.
Theme 5: Soft Robotics for Prosthetic Devices (SR) - (Leader: Prof G Alici)		
SR5	6	Built a neural interface system *(in vitro)* for the multi-digit 3D robotic prosthetic hand.
SR6	7	Tested and refined neural interface.
Theme 6: Ethics, Policy and Public Engagement (EPPE) - (Leader: Prof S Dodds)		
EPE4	6	Identified the epistemic and ethical limitations of randomised clinical trials for regulation and approval of personalised medicine.
EPE5	7	Identified the policy and supply chain aspects of renewables to assess their impact on equity, access, conflict and resilience.
EPE6	7	Identified implications of new medical diagnostic systems for access to health care and international aid policy.

Edge Functionalised Graphene (EFG) and Edge Functionalised Expanded Graphene (EFxG) were provided to ten national and international research groups and three companies for use in lithium batteries, sodium batteries, solar cells, supercapacitors, photo supercapacitors, sensor materials and polymer composites. In addition, a report on the commercialisation prospects for EFG was completed by consultant and company director Dr Roger Buckeridge.

Porphyrins (Milestones EM15/20)

Fluorinated and other porphyrins were provided for SES researchers as CO_2 reduction catalysts and results from studies of carbazole and ferrocene-substituted porphyrins with collaborators in Poland and New Zealand have been reported.

Catalysts (Milestones EM15/16/20)

As well as the porphyrins mentioned above, a number of new catalysts for CO_2 reduction were developed from polyaniline, palladium on highly ordered TiO_2 nanotube arrays, metal organic frameworks and nickel decorated copper.

Electrolytes (Milestones EM15/20/21)

Organic ionic plastic crystals (OIPCs) show considerable promise as safe alternative solid-state electrolytes for lithium batteries. New hexamethylguanidinium bis(fluorosulfonyl) imide ([HMG][FSI]) OIPCs have been prepared and display excellent properties, such as high conductivity, a wide electrochemical stability window and good transport properties, opening an important new avenue for the development of solid state electrolytes. A new class of zwitterion electrolytes was also prepared, and have been shown to be effective as the basis for solid, liquid and polymer composite electrolytes for metal batteries (Aust. Prov. Patent 2020901539). Given this focus on solid state electrolytes, EM and SES researchers published a review on the opportunities and challenges for solid organic electrolytes in lithium metal batteries.

Copper-based redox couples with N-heterocyclic ligands and ligands for their preparation have continued to be produced for SES thermoelectrochemical cell research in order to study the effect of changing the structure of the ligand on the thermoelectrochemical parameters. A range of copper and cobalt redox couples with N-heterocyclic ligands were also provided to ACES researchers for the study of dye sensitised solar cells and solar redox flow batteries.

Biopolymers (Milestones EM15/20/21)

The development and supply of biopolymers for bioinks has continued from the TRICEP facility associated with ACES including gelatin, hyaluronic acid methacrylate, ulvan methacrylate and chitosan methacrylamide as well as composites with materials such as methyl cellulose, polylysine and nanocellulose.

Modelling

Structure of electrolytes (Milestones EM17/21)

Modelling research continues to provide advanced in-depth knowledge for making safer, more efficient and long storage capacity batteries. As reported in the high impact journal, Nature Materials, molecular dynamics simulation demonstrated that interfacial chemistry can be tuned by adopting high salt concentration to introduce more anions to sodium ion's solvation shell in the innermost layer of electrolyte, therefore inducing a unique uniform solid electrolyte interphase from Li-FSI reduction products, and this dramatically stabilises sodium metal anodes. Modelling also revealed how a different coordination environment of superoxide for different ionic liquid electrolyte compositions affects the homogeneous sodium superoxide growth. This will allow the design of better sodium-oxygen batteries.

Molecular dynamics was used to clarify the ether-assisted ion transport mechanism in a superconcentrated ionic liquid, which will contribute to higher performance of these electrolytes in lithium metal batteries.

Photo-enol reactions (Milestone EM19)

Optimal photo-enol reactions for CO_2 trapping, as well as improved visible light photoinitiators and photo-active reagents for nitroxide mediated polymerisation have been designed.

Electrostatic catalysis

The scaling up of electrostatic catalysis in practical systems was brought closer to fruition with a proof-of-concept study in which electric fields were used to order ionic liquids. Studies also explored tribocharged polymers, bubbles and charged functional groups as vehicles for harnessing electrostatic effects.

Fabrication

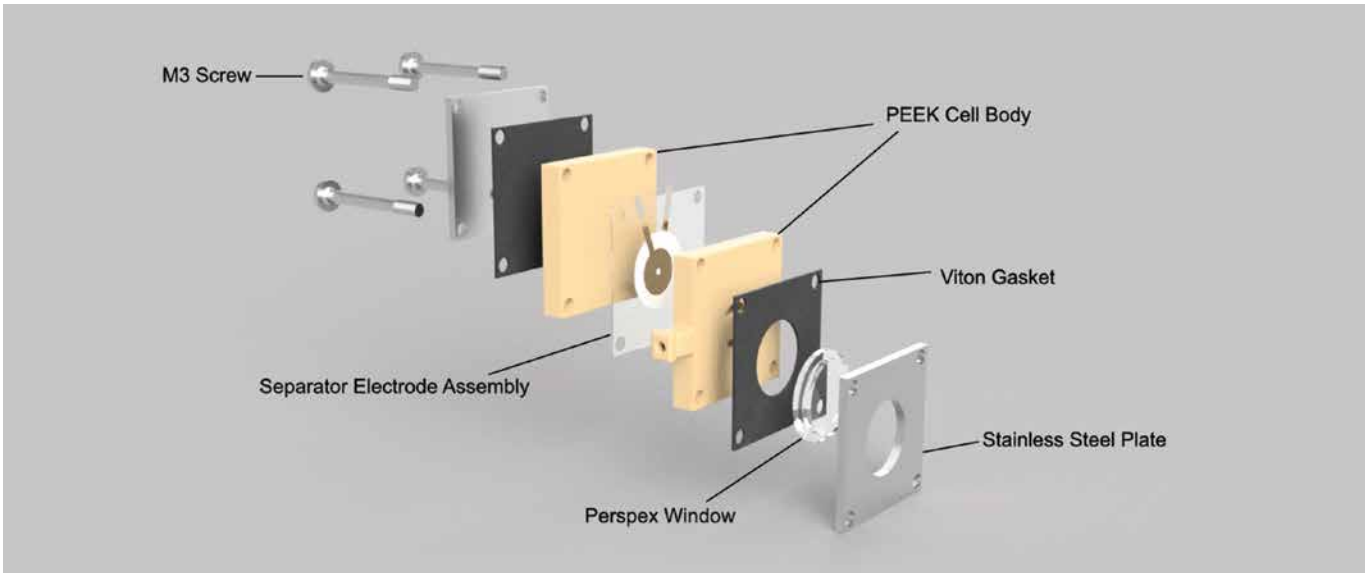
Fibres

The fabrication of functional fibres such as the Sutrode continued to be a major activity in the Centre. Commercial opportunities are being developed with ACES international partners surrounding the Sutrode platform. Here there is an emphasis on scaling up the production of these fibre-based electrodes in accordance with industry standards and working towards the ISO13485 quality control standard.

Bioprinter hardware development

Handheld bioprinting hardware including iFix Pen and Axcelda Biopen have undergone design revisions for use and evaluation in large animal trials.

3D REDI, a bioprinting platform aimed at educating the next generation of biofabricators and serving as a biomaterials research tool, has been fabricated and released for worldwide sale. The integrated bioprinting platform and control software



Prototype cell for demonstration of electrocatalytic reduction

offer printing functionality that economically surpasses the capabilities of current printer market leaders. The platform is intuitive and flexible and has been developed with the input of world leading clinicians, whilst focused on operation at the forefront of research and training. Nine hours of accompanying training content has been developed so that users are guided through the fundamental skills necessary to start printing and characterising multi-material bio-scaffold structures.

New bioprinter acquisitions

The ACES/TRICEP fabrication team continued to refresh hardware infrastructure so that our facilities are maintained at the state-of-the-art. During FY20/21 some of the aging first round ANFF investments have been or will be replaced and our capabilities significantly expanded. New hardware to be housed within TRICEP will include:

- Stratasys F370 fused deposition modelling system;
- Trumpf TruPrint 1000 selective laser melting metal additive manufacturing hardware with expanded materials capabilities;
- Lithoz CeraFab 7500 DLP based high resolution ceramics printing system.

Synthetic Energy Systems (SES)

Research directions in this theme during 2020 focused on developing new materials with outstanding performance and demonstrating these in prototype devices. Current project areas include:

- Electrocatalytic N_2, H_2O and CO_2 reduction, and H_2O oxidation;
- Metal batteries including metal-based flow batteries;
- Thermocells.

Prototype and demonstration devices fabricated

Solar fuels (Milestones SES6/7)

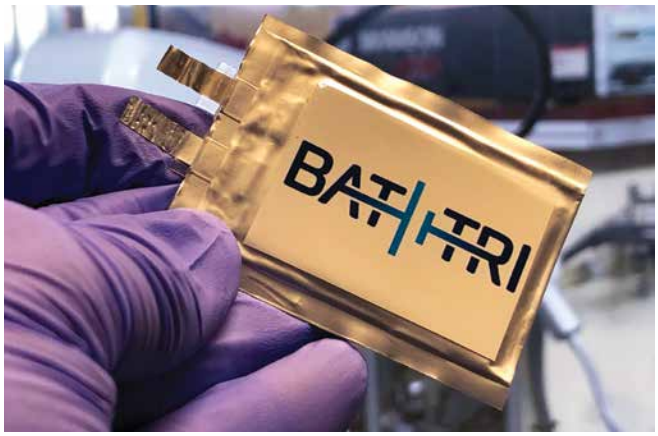
Scaled-up demonstration devices for water splitting, N_2 and CO_2 reduction have been built and tested. New prototypes of a zero-gap water splitting cell with “unflooded” electrodes has been designed and the first prototypes created. The cell can operated at up to 120 °C and sustain a current of up to 1 A.

New versions of our pressure cell for the ammonia electrosynthesis have been designed and built in PEEK. This is to avoid the use of stainless steel, which can produce high background readings. This cell allows testing of materials and process conditions up to 100°C and 15 bar under both flow and static conditions.

Batteries (Milestones SES6/7)

A high capacity Li-metal | NMC622 pouch cell in pyrrolidinium ionic liquid electrolyte was manufactured at the BatTRI-Hub, the world-class battery research translation facility established by the the Deakin Node of ACES. The cell contains the maximum number of layers (15 layers of cathodes and 16 layers of Li metal) that delivered 1.4 Ah charge and more than 4.8 Wh energy in each cycle over 50 cycles.

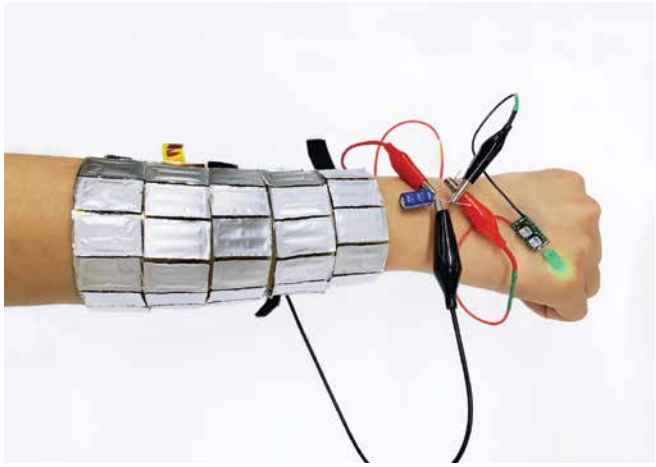
A flow battery prototype has been designed to hold porous felt electrodes with an area of 4 cm^2 and a thickness of 2-7 mm. Testing of the battery utilising low concentrations of active material at various flow rates and charge rates (C/10 to 2C) has been undertaken. Discharge potentials up to 2.3 V, coulombic efficiencies up to 97% and overall cycle efficiencies up to 83% have been achieved.



High capacity pouch cell manufactured at BatTRI-Hub

Thermoelectric cells (Milestones SES6/7)

High performance p-type and n-type flexible thermocells have been developed through systematic investigation of both electrodes and gel electrolytes containing EFG, which are of vital importance in establishing effectively paired p-n cells. The fabrication of a flexible watch-strap shaped thermo-cell that could harvest body heat, charge supercapacitors, and light a green LED, highlighted the potential of these devices.



Wearable thermoelectric cells showing the ability to light a green LED from body heat.

Electrofluidics and Diagnostics (EFD)

Within the EFD Theme a number of emergent and collaborative projects have developed, focussed upon the application of novel modified and composite materials in production of micro- and electrofluidic analytical devices, and in the form of functional fibres and threads for use within microfluidic, electrofluidic and diagnostic platforms and applications.

Fundamentals of thread-based electrofluidic systems and bipolar electrochemistry-based pre-concentration (Milestone EFD7)

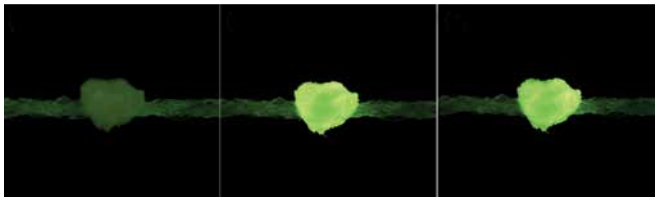
The ability to isolate and concentrate biological targets in a controlled and reproducible manner forms the basis of these projects, with clear potential for rapid diagnostic applications. Bipolar, electrochemistry-based, on-fibre, pre-concentration has been investigated with bipolar electrochemistry on a textile-based braided structure using a Pt metal wire inside the braid demonstrated using universal pH indicator.

Point-of-care thread-based analytical systems (Milestone EFD7)

This project has been developed to explore the ability to use electrofluidics for automatic and quantitative transfer of 'swab sampled' materials onto a fibre and concentrate target biomolecules for subsequent confirmatory detection. The approach allows multiplexing upon printed platforms to deliver simultaneous multi-sample handling capability for rapid diagnostics.

Pre-concentration and isolation of analytes on thread-based electrophoretic systems (Milestone EFD7)

New materials are being investigated for microfluidic substrates and 3D platforms for solute isolation and concentration. These include new silica fibres and threads, which present opportunity for on-thread UV absorbance detection of concentrated targets. Other projects are looking at combined (linked) materials for interface concentration and trapping, including graphene oxide coated nylon threads.



Electrofluidic isolation of concentrated alkaloids on knotted fibres.

Soft Robotics (SR)

The aim of the SR research is to use the mechanical actuation and sensing properties of selected electromaterials to develop new robotic systems such as a multi-digit, fluid and highly dexterous 3D robotic hand with a control system, programmable mechanical compliance, integrated sensors and a neural interface system. This would deliver new benchmarks in performance for applications in industrial, personal and prosthetic robotic systems.

Multi-digit 3D robotic prosthetic hand (Prior milestones)

A new 3D-printed soft prosthetic hand with embedded soft position and touch sensors was designed and fabricated during 2020. Two newly developed flexure hinges, capable of sensing position without the problem of drifting, integrated as revolute joints within each digit, which is in the form of one monolithic 3D-printed structure. With additional sensing capabilities, a system of grasp planning is under development. This new system can provide seamless interaction between the robotic hand and the new-generation myoelectric control system (e.g. pattern recognition) to make the hand's movements much more efficient and intuitive, compared with current myoelectric prosthetic hands on the market.

Amputee trial with pattern recognition myoelectric control (Prior milestones)

To better adapt pattern recognition myoelectric control to practical applications, SR researchers have worked on the development of a compact and cost-effective approach by reducing the number of sensors and maintaining the recognition performance for four to six of the most commonly used hand gestures. Preliminary tests have been conducted with existing myoelectric hand users, who used the existing sensors inside the existing forearm socket to successfully perform four common hand gestures: closing, opening, pinching and index pointing. Tests were also successfully conducted

Prototype of the new hand embedded with soft sensors

on healthy subjects with another sensor configuration: two on the forearm and the other two on the upper arm, to prevent interference with the forearm sockets of the existing myoelectric hand users. Minimising the requirement of additional hardware and cost can greatly encourage the prosthetic hand users to try pattern recognition control and boost the transition from conventional direct control (used for over 50 years) to new-generation myoelectric control.

Control of a 3D Printed Monolithic Soft Robotic Finger with Embedded Pneumatic Sensing Chambers (Prior milestones)

A directly 3D printed soft monolithic robotic finger with embedded soft pneumatic sensing chambers as position and touch sensors was fabricated using a low-cost and open-source fused deposition modelling (FDM) 3D printer. A single soft hinge with an embedded PSC was optimised using finite element modelling (FEM) and a hyperelastic material model used to minimise its bending stiffness and to maximise its internal volume. The real-time position and pressure/force control of the soft robotic finger were achieved using feedback signals from the soft hinges and the touch PSC embedded in the tip of the finger. This project successfully demonstrated the development of seamlessly embedding optimised sensing elements in the monolithic topology of a soft robotic system and controlling the robotic system using the feedback data provided by the sensing elements to validate their performance.

Adaptive Neural Interface to control prosthetic devices: design, fabrication and performance evaluation (Milestone SR5)

The focus of this project has been to define the concept of cuff-based and adaptive neural interface, and hardware needed to retrieve nerve signals.

By taking into account previous investigations, SR researchers have identified the requirements when designing the adaptive neural interface *(in vitro)* for the multi-digit 3D robotic prosthetic hand as follows:

- small enough (1.2mm ∅);
- good conductivity (<2kΩ);
- stretchable (≈20%);
- flexible and adaptable;
- biocompatible;
- easy fabrication (by mechanical techniques);
- wired (Ferric and non-ferric yarns/wires up to 320g tension);
- long duration (More than 10k bending Cycles).

As a result, a biocompatible EFG-PDMS composite substrate has been developed with good conductivity, interesting electro-chemical properties, flexible and adaptable with stretchability superior to 20%, easy to adapt to the measuring equipment using ferric and non-ferric wires that is ready for *in vivo* testing with the help of ACES's research partners in the USA (Prof. Mario Romero-Ortega).

Synthetic Biosystems (SBS)

Research directions in this theme during 2020 focused on further developing 3D models of muscle and nerve tissues, including further developing 3D printing techniques for tissue constructs.

Wireless piezoelectric stimulation for tissue building, functional modelling and electroceuticals (Milestone SBS6)

A novel platform for wireless 3D electric stimulation (e-stim) of cells/tissues using piezoelectric nanoparticles and ultrasound has been developed by CI Crook's team following previously reported proof-of-concept 2D studies. A provisional patent relating to the technology was finalised for filing. The technology has been developed for clinically-specific tissue modelling, including 3D neural and other tissue building, and electroceuticals for therapeutics.

Engineering of muscle tissue constructs (Milestone SBS6)

Repair of volumetric loss of skeletal muscle from accident, injury or disease requires replacement of large volumes of tissue to restore function. SBS researchers have been investigating ways to achieve this using various constructs.

A novel method to create skeletal muscle tissue constructs has been developed using 3D layered wet-spun alginate fibres

containing muscle precursor cells for bulk mass delivery of the muscles cells to areas of muscle lesions. These biosynthetic alginate fibre constructs resulted in better regeneration of muscle cells compared to previous constructs using polylactic acid fibres.

3D bioprinting technologies offer the possibility of printing orientated 3D structures. Consequently, protocols have been developed that provide for the generation of robust skeletal muscle cell precursors and methods for their inclusion into methacrylated gelatin (GelMa) constructs using 3D bioprinting.

3D printing for cell constructs ((Milestones SBS6/7)

3D bioprinting is an emerging technology for arranging cells and biomaterials in 3D, with the goal to develop functional substitutes for damaged tissue. SBS researchers have developed a number of 3D printable materials and processes.

Photo-crosslinkable hydrogels are promising materials for formulating printable bioinks. For the first time, an on-board light exposure strategy is demonstrated which enables rapid (<1s) and direct crosslinking of a bioink as it is being extruded from the nozzle, and without the use of transparent tubing to stabilise the filament. This technique has been used on a manually operated device, allowing for free-form additive sculpting of bioink structures in 3D. A co-axial free-form extrusion system has also been demonstrated, allowing for encapsulation of a very soft, or entirely liquid, core within the rapidly photo-crosslinked shell filament.

A 3D hybrid printing platform for ear cartilage reconstruction has been developed using using a composite bioink consisting of methacrylated gelatin and hyaluronic acid as the cell-laden hydrogel, polycaprolactone as structural support and Lutrol F-127 as sacrificial material. The viability and proliferation of human mesenchymal stem cells delivered within the bioink was not affected by the printing process, with the bioink components proving to be an an excellent combination to provide tailored mechanical integrity, while maintaining porosity and protection to cells during differentiation.

A methacrylated gelatin and hyaluronic acid hydrogel has also proven to be an excellent bioink medium for supporting human adipose-derived stem cells. Coaxial extrusion of this bioink has been successfully used *in situ* to give a core/shell bioscaffold with high cell viability, as well as adequate mechanical properties for articular cartilage regeneration and repair.

Regulatory T-cells (Tregs) are important modulators of the immune system through their intrinsic suppressive functions. For the first time, the encapsulation of human natural and induced Tregs for localised immunosuppression has been achieved using an alginate-gelatin methacryloyl hydrogel. This allowed a major advance in the 3D printing and subsequent survival of murine pancreatic islets, opening the way for a more effective treatment of type 1 diabetes.

Ethics, Public Policy and Engagement (EPPE)

The Ethics, Policy and Public Engagement (EPPE) theme has been involved in collaboration across themes as part of the increased focus on research translation. Examples of these collaborations includes work done between EPPE RF Goddard and AI Walker with the Soft Robotics team to survey upper limb prosthetics users on what they are seeking in prosthetic limbs and the work between ACES EPPE AI Walker with CI Wallace and AI Mukherjee on ethical and regulatory issues associated with development of 3D printed medical devices. EPPE researchers are also continuing to conduct conceptual research related to the ethics of emerging technologies, climate and energy justice, the impact of neural implants and robotics on health care ethics and society. The EPPE team has two major areas of focus, energy and health.

Policy and supply chain aspects of renewables (Milestone EPE5)

Significant progress has been made in identifying the policy and supply chain aspects of renewables to assess their impact on equity, access, conflict and resilience. Progress includes:

- conducting comparative research on policy settings for adapting renewables in Australia and Germany, assessing democratisation of control of renewables;
- work on clean energy systems, corporate social responsibility and the circular economy;
- conducting research towards a book chapter on new frontiers for peacebuilding and a paper on the role of business and the corporate sector in countering violent extremism;
- continuing the research on India: a framework for design of energy critical infrastructure to inform disaster policy making.

EPPE RF Natalie Ralph presented for the 'Energy Research and the Circular Economy' workshop, organised by Stor Energy (ARC Training Centre for Future Energy Storage Technologies), Institute for Frontier Materials (IFM), and School of Education at Deakin University, 4 May 2020. Presentations will form part of a new 'Circular Economy' website prepared by Deakin University for chemistry teachers and students. Natalie also participated in the UN/Principles for Responsible Management Education (PRME) Business for Peace working group online meeting to organise 2020-2021 activities.

ACES CI Linda Hancock was conference co-chair for 9th International Workshop on Advances in Cleaner Production - Towards Sustainable Energy-Water-Food Nexus: The Contribution of Cleaner Production held virtually on 26 May 2020.

Implications of new medical diagnostic systems (Milestone EPE6)

EPPE researchers and affiliates working on the medical applications of ACES research and medical innovation have made advances on the understanding of the impact of patenting of bioprinting for access to new technologies,

regulation and oversight of medical technologies and allocation of health resources. UTAS affiliate student Olumayowa Adesanya submitted her PhD thesis 'Patenting Bioprinting: An ethical dilemma in the provision of health technologies', which identifies ethical issues surrounding access to bio-printed technologies as a key issue in the regulation of patents in this area. CI Sparrow has collaborated on work identifying the ethical risk that use of AI in medicine may lead to poorer health outcomes and CI Dodds and collaborators have explored issues on health resource allocation principles. AI Neilson and collaborators have written on the legal implications of medical innovation. The work undertaken by the EPPE team may help researchers, regulators and policy makers to anticipate likely risks and, in some cases, to set in place mechanisms to avoid these risks being realised.

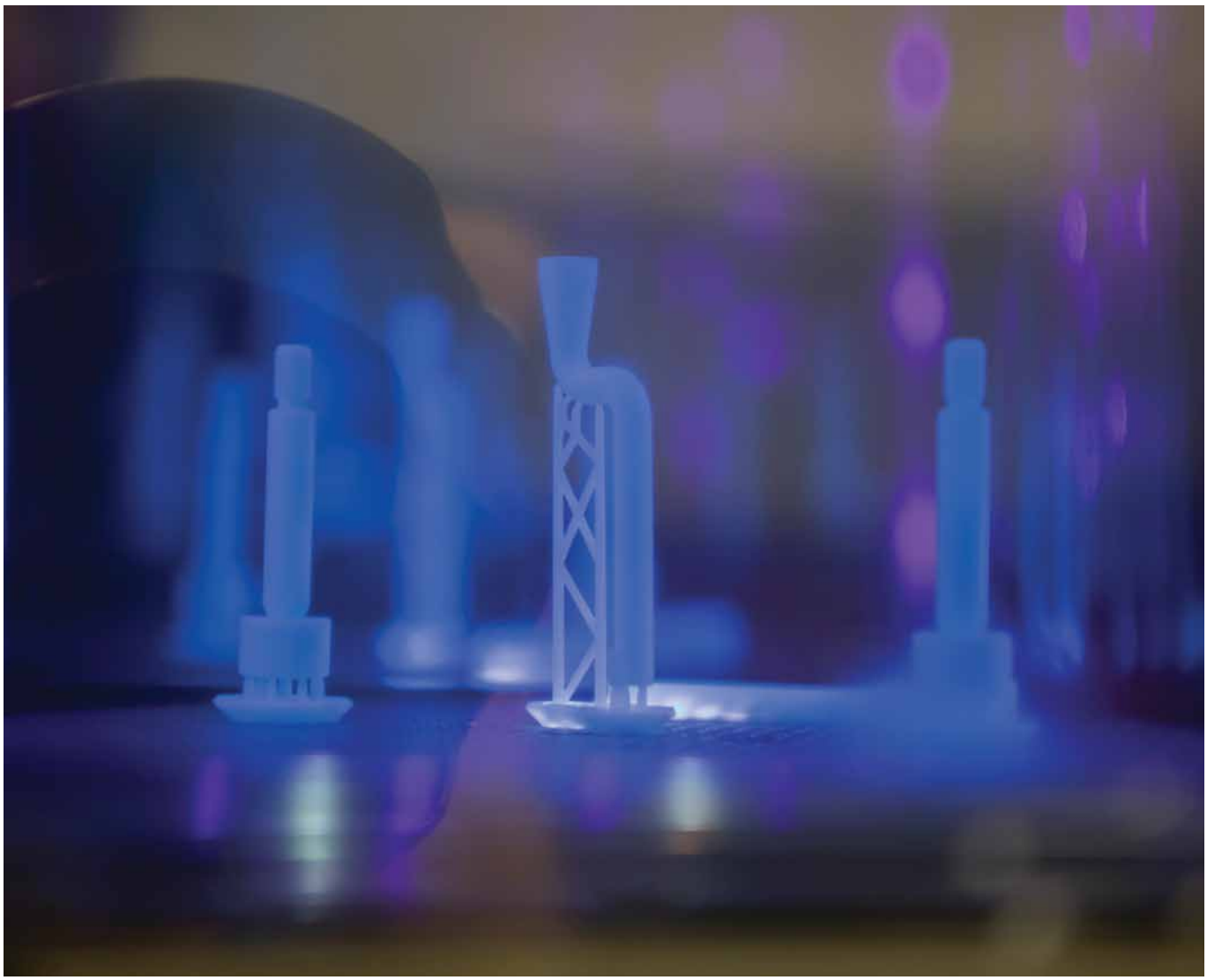
Susan Dodds and Frédéric Gilbert prepared a book chapter entitled "Is there anything wrong with using invasive and predictive brain devices to prevent convicted offenders from reoffending?" in the book Neuro-Interventions and The Law: Regulating Human Mental Capacity. Oxford University Press, ISBN 9780190651145.

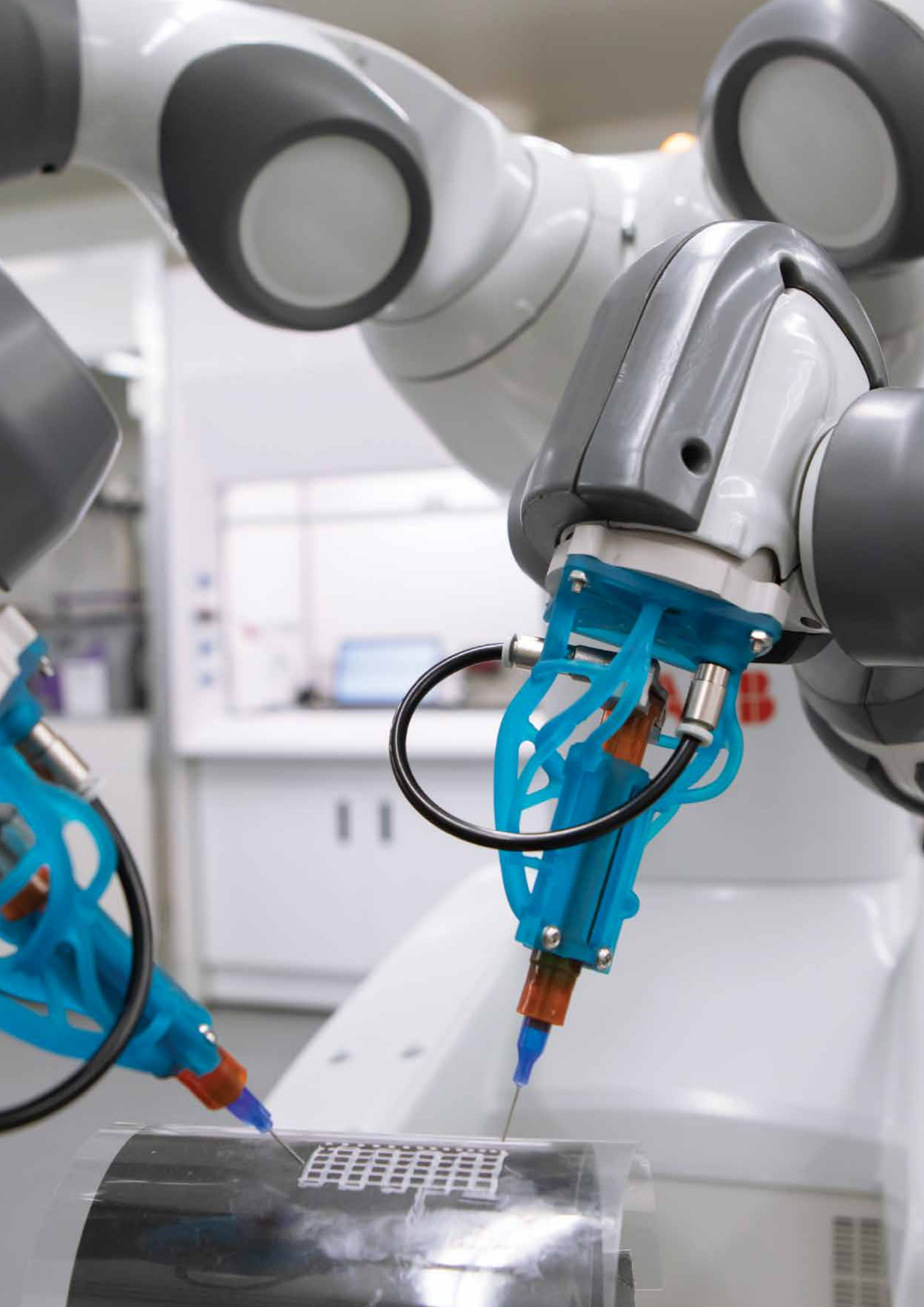
A chapter entitled 3D Bioprinting: Ethics and Policy was also prepared by EPPE researchers Eliza Goddard and Susan Dodds in the book 3D Bioprinting: Principles and Protocols, Methods in Molecular Biology Series, Springer Nature, pp 43-64, ISBN 9781071605202 edited by SBS researcher Jeremy Crook.

CI Sparrow continued to conduct research on the social constitution of race and robotics.

Other progress

COVID-19 required rapid strategical effort across the world. EPPE COVID-19 contributions included CI Dodds providing expertise both nationally and internationally, as an International Advisor: Member of the World Health Organisation (WHO) COVID Think Tank on Ethics (April-June 2020), along with being part of a future-scoping project on how WHO's West Pacific Regional Office can support its member countries' health systems after the initial challenge of COVID has passed. CI Dodds was also named peer reviewer for three of the Chief Scientist's Rapid Research Information Forum papers as advice to government.





Research Training

ACES is committed to research excellence in an environment that ensures effective training to develop the future research leaders for all potential career paths. The focus is to enable people to train for the future in a wide range of career options including academic research, industry, government, and innovation start-up companies.

ACES Research Theme and Training Workshops

The ACES workshop program targets the professional development of research staff and postgraduate students, as well as key areas of continuing technical and scientific education. The workshops in 2020 were undertaken in the form of:

- ACES Full Centre Meeting: was held virtually 20-21 August 2020;
- A monthly 'ACES All' virtual meeting (March to December 2020). At this meeting members talk all things ACES from introduction of new members, facility reports and updates, theme highlights and governance matters;
- Research theme meetings are conducted as required to progress and co-ordinate the research activities to address the milestones;
- At least two virtual meetings per theme were held in 2020;
- A number of virtual targeted ACES research theme workshops. 2020 workshops included: Sutrode workshop; Clinical Connections workshop; ACES Electromaterials Symposium; 3D Printed Prosthetic Ears Workshop; 9th International Workshop Advances in Cleaner Production (IWACP) Towards Sustainable Energy-Water-Food Nexus - The Contribution of Cleaner Production; Meet the Media Forum; Ammonia Association Conference.

Webinars

During 2020 ACES developed a range of webinars to give our team, our collaborators and the wider research community the opportunity to further their learning and maintain their networks throughout the COVID-19 pandemic. ACES undertook a program of three webinar series. The webinars were also made available through the ACES website for the wider community.

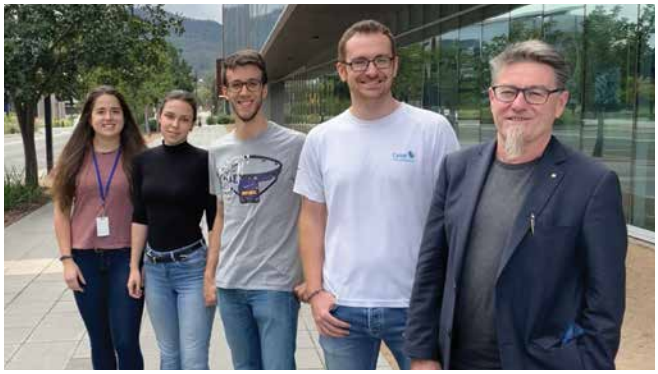
The first series primarily focussed on professional development of staff and students of both ACES and the broader research community. Highlights included: 'Making Animated Videos using PowerPoint' (given by ACES PhD students), 'Making a PhD Work for You', 'Scientific Writing for the Public', 'Writing good English', 'Meet the Media Forum' (conducted by Science in Public), 'Publishing from an Industry Project', and 'Getting Ideas to Industry'.

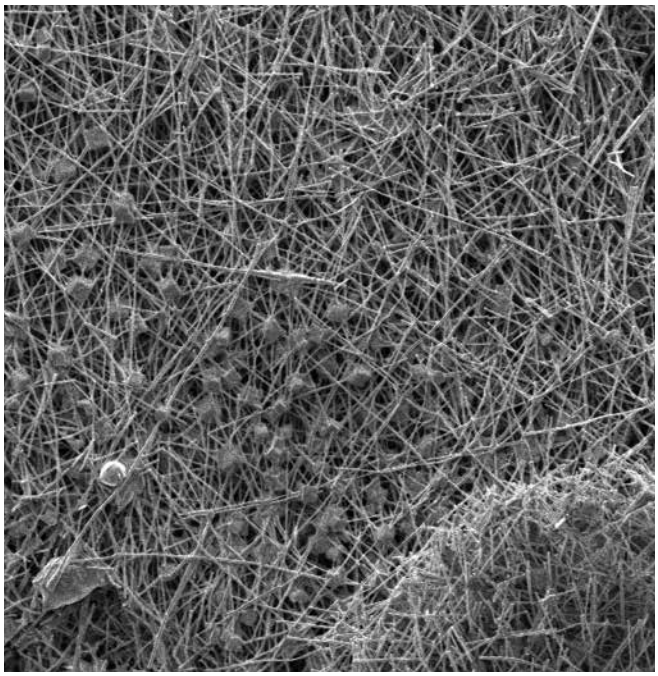
The second series featured the latest research in electromaterials science presented by eminent Australian and international researchers. A series of special interest topic webinars were also featured.

Finally, the ACES team held a series of technology showcases focussing on translation of research see appendices 3, 4 and 5 for a full listing of all virtual ACES engagements for 2020).

Summer Scholarships

ACES provided a number of summer scholarship students at its UOW and Deakin nodes. In 2019-2020, three students were supported at UOW for 10 weeks to work on 3D Printing Protocols for 3D Educational Printers. During this time, UOW also provided support for three interns. At Deakin, two students worked on projects that examined air cathode chemistries and compositions for sodium-oxygen batteries, and neodymium speciation in ionic liquid mixtures for efficient recovery processes. In 2020-2021, Deakin also supported two students working on new electrolyte materials-based research.





Scanning electron microscope image of carbon nanofibres air cathode. Image courtesy of Laura Garcia-Quintana, Deakin University.

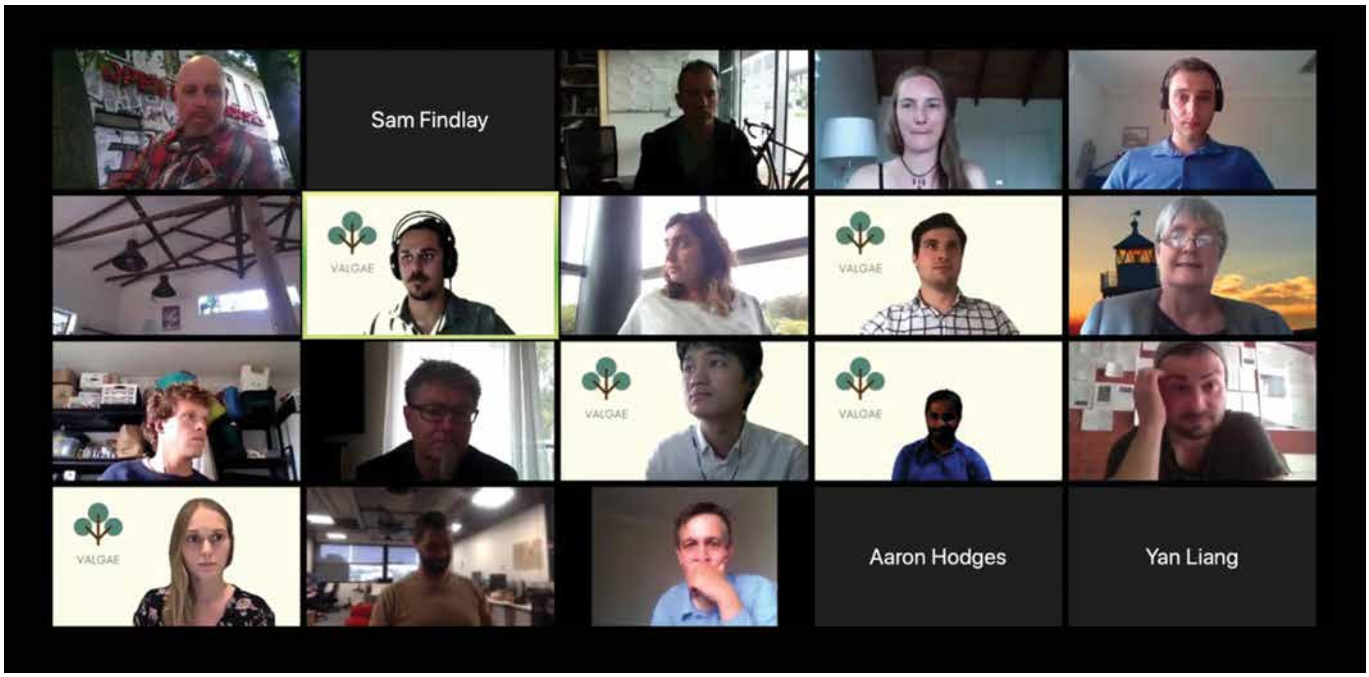
Biofabrication Courses

Graduate Certificate in Biofabrication (UOW)

This is now an online course designed for professionals currently working in the fields of science, health, engineering and technology, as well as those who want to pursue a career in biofabrication. Full online delivery enables accessibility to students based anywhere in the world. The certificate was launched in 2018 (4 students), and ran in both 2019 (6 students) and 2020 (5 students).

UOW has reformatted the course content to also be available as micro-credential courses in 2021. Each course is two credit points and runs for 1-2 weeks. This will enable the completion of topics of relevance to an emerging global industry without the need to commit to full program, credit for completion is retained and counts towards qualifications if that is the desired end goal.

The Graduate Certificate in Biobrication also provides an entry pathway into the Masters of Philosophy (Biofabrication) or a Doctor of Philosophy, both of which involve undertaking of a research project in one of the ACES laboratories.



Master of Philosophy (Biofabrication) (UOW)

The Master of Philosophy (Biofabrication) is offered as a coursework and thesis project (2 years) at UOW and has been running successfully for 4-5 years.

This degree is accessible to students anywhere in the world, the coursework component is fully available online and the students can elect to undertake the research component of the masters at a collaborative university. Eleven MOU's (Memorandum of Understanding) have been signed with various universities, to allow students to undertake the research component of the master course at an institution suitable to them.

Masters in Materials Science for Energy

ACES, through Deakin University, are involved formally in a European Masters course 'Materials for Energy Storage and Conversion' (MESC), supported by Erasmus Mundus funding, until 2024. MESC is a two year education program in materials science and electrochemistry.

Partners in the program include five universities in four European countries (France, Poland, Slovenia and Spain), universities in USA (Drexil) and Australia (Deakin), a European research institute (ALISTORE), the French Network on Energy Storage (RS2E), the Slovenian National Institute of Chemistry (NIC) and a leading research centre in Spain (CIC Energigune). These Institutions host world renowned, leading research laboratories in the field of energy related materials.

In 2019, ACES at Deakin University hosted MESC student Gabriel Comeron Castillo for his six month research thesis. Due to COVID-19 restrictions no new students were hosted for 2020. However, in 2021 a new student will be co-supervised by ACES CI Jenny Pringle and will be hosted in France (Bordeaux) due to travel restrictions. ACES is providing a scholarship to student Luis Guerrero and we hope to welcome him to Deakin for his internship in 2022.

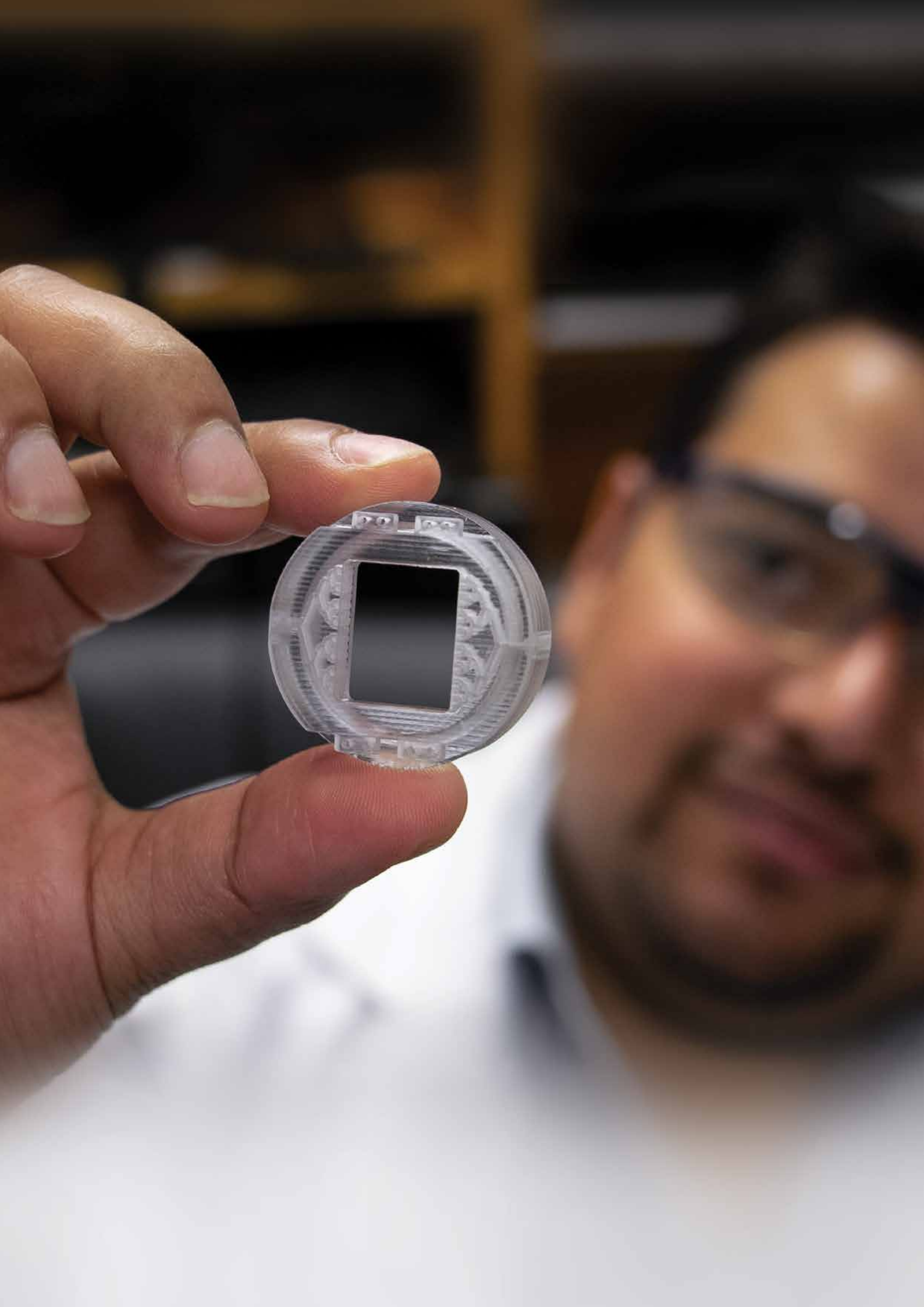
Certificate in Innovation and Entrepreneurship

The Certificate in Innovation and Entrepreneurship from the Sydney Business School ran in both 2019 and 2020. There were 17 students in the 2019 cohort and another 11 students in the 2020 cohort. The culminating event was the ACES Innovation and Entrepreneurship Pitch Session which was held virtually in October 2020.

Participants receive six credit points towards the UOW Graduate Certificate in Entrepreneurship and Innovation if they wish to continue further studies in this area. The success of this course has led to the development of plans to continue this course into the future.

3D Bioprinting Short Course

A collaboration between ACES, TRICEP, Andhra Pradesh Medtech Zone (AMTZ in India) and Kalam Institute of Health Technology (KIHT in India) has resulted in a new short course for international audience, with the inaugural intake commencing on 21 August 2020. The course is designed to enable students to learn from experts in bioprinting over 10 weeks with a "Question and Answer" segment and other interactive content. Due to the success of this pilot program and demand from potential students there are now plans to make this an ongoing course available online through UOW.



Translation

2020 has highlighted the need for research organisations to accelerate translation and the need to pivot to meet emergency demands. The situation has shown that research organisations are capable of both, but the alignment of technical and non-technical areas with usually disparate agendas is required. The ACES team is strategically committed to translation of research through initiative, achievements and enterprise. ACES has continued to move beyond its initial strategic goals and continues its strong forward momentum. The activities pursued in 2020 have helped develop our translational pipeline. This pipeline has been in construction for a number of years and traverses activities in fundamental discoveries to commercially sustainable use.

Graphene commercialisation

Given the potential of Edge Functionalised Graphene (EFG), Mr Roger Buckeridge, a venture capital company manager and advisor to Imagine Intelligent Materials, was appointed to assess the commercial potential of EFG and business case development.

Fibres and textiles

The fabrication of functional fibres such as the Sutrode continues to be a major activity in the Centre. Commercial opportunities are being developed with our international partners (RBI Medical) surrounding the Sutrode platform. Here there is an emphasis on scaling up the production of these fibre based electrodes in accordance with industry standards and working towards ISO13485 accreditation.

Preclinical trials for ifix and Axelda

External commercial relationships with a focus on biomedical therapeutics continue to grow with iFix Medical and Axcelda. Preclinical trials on both these projects are almost complete.

The Prosthetic Hand

We maintain our interaction with hospitals, clinics and prosthetic hand manufacturers to explore any collaborative research opportunity, including amputee recruitment for testing our systems, commercial translation in prosthetics, orthotics and rehabilitation industries. We keep our interaction with prosthetic hand end-users, especially local ones who reside in Illawarra area, to get them actively involved in our prosthetic hand project.

3D MADe

3D MADe continues to provide opportunities for the researchers to design and develop unique three-dimensionally complex microfluidic components that are specifically tailored to meet their project ideas. ACES UTAS CI Brett Paul and RF Vipul Gupta teamed up in 2019 to found a start-up company building upon the expertise of ACES. 3D MADe is a 3D printing initiative to bridge the gap between research project requirements and the commercially available analytical devices. Researchers all over the world are restricted to the use of limited off-the-shelf analytical components. 3D MADe offers an ever growing library of components as well as bespoke fixes to the international research community.

3D REDI Online Launch

Designed and manufactured by the ACES team at UOW, the exciting new 3D bioprinting system, 3DREDI, was launched on Thursday 26 November 2020. 3D REDI is a 3D bioprinting system designed for use in research and training. The intuitive 3DREDI platform, combined with practical training modules, equips users with the essential hardware and skills to embark on projects in the rapidly emerging bioprinting industry. The system is designed to assist the translation of research through the education of the next generation of biofabricators, by equipping them with the skills and tools to tackle big medical challenges, as well as serving as a biomaterials research tool. The online launch attracted interest from countries including India, USA, Indonesia, Finland and Dubai.

Engagement Strategies

The translation of research into commercial opportunity relies on relationships which can be hampered by issues like opportunism, trust and communication. By better understanding these issues, strategies can be put in place to make the path to collaboration easier to navigate. ACES CI Gordon Wallace and collaborators undertook a study on the factors that support knowledge creation in the university-industry complex inter-organisational arrangement whilst building upon social capital and relationship marketing theories. The study highlighted the future implications for managers and policymakers including understanding if the current controls that are designed to reduce the risks associated with opportunism are inadvertently restricting the effectiveness of the innovation relationship (Journal of Knowledge Management doi.org/10.1108/JKM-06-2020-0461).

Dr Tillmann Boehme continued his role with ACES/TRICEP as Engagement Manager in 2020. He was tasked to develop and implement strategies to promote and facilitate end-user engagement in TRICEP with a particular focus on local SME engagement. To this end he has been working on an Illawarra-based additive manufacturing cluster that encourages open learning on 3D printing technologies and the development of new industrial value streams.

DR ANITA J HILL

HONORARY FELLOW, CSIRO
FELLOW OF THE AUSTRALIAN ACADEMY OF SCIENCE, FELLOW OF THE AUSTRALIAN ACADEMY OF TECHNOLOGICAL SCIENCES AND ENGINEERING

"The ability of ACES to move their fundamental research in electromaterials to the next level of manufacturing capability that is essential for Australia is evident in their three industry de-risking and prototyping facilities: TRICEP (UOW), BatTRI-Hub (Deakin), and ACMD (St Vincent's). The success of ACES underlines the ARC's ability to fund basic research through Centres of Excellence that translates to Australian industry capability."

Facilities

Translational Research Initiative for Cellular Engineering and Printing (TRICEP)

TRICEP, based at UOW, hosted a collaborative engagement workshop at the end of February, which brought together local industry with international additive manufacturing expertise. The workshop showcased the latest TRICEP technology and future developments. Work on meeting current and future clinical needs has enabled TRICEP to bring about real advances to tackle significant medical challenges. TRICEP initiatives include; seaweed bioinks, 3D Alek, 3D REDI, the Biopen (Axcelda), iFix Pen, and 3D PICT.

A Quality Management System at TRICEP is being implemented to be aligned with ISO9001 and ISO13485, the international standard for medical device manufacturers.

The Battery Technology Research and Innovation Hub (BatTRI-Hub):

The BatTRI-Hub facilities at Deakin University enable academic and industrial researchers to address the increasing consumer demands for safer, lighter, longer lasting batteries. The team have been engaging more extensively with industry and CSIRO. Recently they were successful in having a $1.66M project approved by the Future Batteries Industries Cooperative Research Centre (FBICRC), which involves 10 companies across the resources and materials sectors. There is a current submission to expand the operations of BatTRI-Hub to be able to make larger format cells and batteries and further enhance the interaction with industry and a potential start-up company is being explored.

BioFab3D@ACMD

BioFab3D is Australia's first robotics and biomedical engineering centre embedded within a hospital, St Vincent's Hospital in Melbourne. It is a collaborative endeavour between St Vincent's, UOM, UOW, RMIT and Swinburne universities. The initiative brings together researchers, clinicians, engineers and industry partners to work alongside each other and accelerate the rates of clinical breakthroughs.

International Engagement Highlights

AMTZ, India

The ACES-AMTZ partnership continues to develop business opportunities involving 3D printing capabilities.

AMTZ is an enterprise under the Government of Andhra Pradesh, a 270 Acre zone, dedicated for Medical Device Manufacturing. The objective behind this 'One-Stop- Solution' is not only to reduce the cost of manufacturing up to 40% and to simplify the end-to-end operations but also to reduce the import dependency, which is presently around 75%. AMTZ envisions to put India on the global map of high end medical equipment production and make health care products affordable and accessible not only for India but for world at large.

University Texas Houston, US

Our partnership with Professor Mario Romero-Ortega's group in the area of new electromaterials for electroceuticals continues to flourish. The patented Sutrode technology has been licensed to a spin-out company, RBI Medical.

Asan Medical, Korea

ACES has been engaged with the Asan Medical Center (AMC), Korea's leading hospital for surgery. ACES and AMC are working together on clinical testing of the 3D printing of islet cells developed previously. This collaboration is enabling the development of robust translation protocols for *in vivo* studies. The 3D PICT was delivered to Asan Medical Center in August 2020.

Engagement Events

Along with our traditional workshop events with end-users, ACES commenced a new engagement strategy in 2020: industry focussed technology showcases delivered via webinar.

Table 2: ACES Engagement Events 2020

Event	Date	Venue
Clinical Connections Workshop	3 February	Wollongong
Sutrode Workshop	9 February	St Vincent's Hospital, Melbourne with Mario Romero-Ortega USA
3D Printed Prosthetic Ears Workshops	14 February	Wollongong
Australia-India MedTech 3D Printed Ears Workshop	26 June	Virtual
ACES Technology Showcase – Soft Robotic Hand (Gursel Alici)	26 October	Virtual
ACES Technology Showcase – Quantitative Ultrasound Imaging (Andres Ruland)	2 November	Virtual
Webinar – Latest Advances in Bioinks, Presented by ACES/ ANFF (Gordon Wallace & Sanjeev Gambhir)	9 November	Virtual
ACES Technology Showcase – CO_2 Reduction (Doug MacFarlane/Caiyun Wang)	16 November	Virtual
ACES Technology Showcase – Edge Functionalised Graphene (David Officer)	30 November	Virtual
ACES Technology Showcase –Building Electric Tissue using Ultrasound (Jeremy Crook)	14 December	Virtual

PROF MARK COOK

UNIVERSITY OF MELBOURNE DIRECTOR OF THE GRAEME CLARK INSTITUTE, THE SIR JOHN ECCLES CHAIR OF MEDICINE AND DIRECTOR OF CLINICAL NEUROSCIENCES AT ST. VINCENT'S HOSPITAL.

"The experience and insights gained through long term collaborations between St. Vincent's, University of Melbourne and ACES, around clinical applications of new materials technologies, has ultimately led to the hospital establishing a much larger project. Based on the ACES methodology of cross disciplinary integration of engineering, materials sciences and clinical medicine has resulted in the establishment of the Aikenhead Centre for Medical Discovery (ACMD), the first such institute based on a clinical site dedicated to the development of novel approaches to clinical problems through application of new engineering and materials science. The centre is now funded through a consortium of partners, and Federal and State governments to a total of $300M, and is under construction with a completion date of 2024. Further investment in Biomedical Engineering at the University of Melbourne through the Faculty of Engineering, and endeavours including the Graeme Clark Institute, the Clifford Chair in Neural Engineering, and the recently established Shanahan Chair in Frontier Medical Solutions, have all built on this opportunity, and the experience gained though the ACES interaction. This project delivers the final link – the ability to construct bespoke prototype devices that will allow new technologies to be developed and to be rapidly constructed, deployed, and tested, without the need to pass through an expensive commercial build cycle, whilst retaining the skills and IP that have been developed through the partners academic and scientific ventures."

Intellectual Property

ACES is finding innovative material breakthroughs that provide energy solutions, improve health and lifestyle along with productivity improvements for existing industries and helping to create new ones.

Worldwide, materials are seen as a priority for innovation, but also as a source of competition and advantage. Advanced materials and additive manufacturing are two connected technologies within the current Fourth Industrial Revolution. Industry 4.0 is the new wave of innovation which brings with it incredible new opportunities.

Five patents were lodged in 2020 (see Table 2) and the executive received a further five IP disclosures. TRICEP conversely has generated trade knowledge in material extraction, purification, packaging and sterilisation for bioinks, as well as know-how in bioprinter fabrication and custom control software development to access functionality enabled by hardware developments.

End User Engagement

ACES disseminates knowledge to existing industry partners through information sessions, workshops and web-portal sessions. The aim is to (a) showcase ACES research skills, technologies and facilities as well as to (b) understand how ACES can better facilitate pathways and connections to maximise their research impact.

Through avenues such as those listed below ACES has taken the opportunity to share our extensive knowledge and engage in networking that is vital to further translation activities.

22 business briefings took place via visits or teleconferences to ACES (listed in appendix 7); 10 interactions with government or non-government organisations (listed in appendix 8) and a further 45 briefings by ACES members visiting personnel within the government, industry or part of the business community (listed in appendix 9).

ACES also hosted or showcased 11 events (listed and summarised in appendix 10) in the 'bio-space'; 'energy space' and 'materials and facilities space', to raise awareness of the facilities and research activities amongst end-users. ACES has also been given a voice on panels and at symposiums discussing new technologies on the horizon and how they may impact future directions.

ACES researchers at UOW will lend their internationally-renowned expertise in bioinks to a new project to develop a 3D bioprinting system to treat burns during surgery. The project was successful in gaining support from the latest round of the Federal Government's BioMedTech Horizons program. The project is in conjunction with Inventia Life Science (COO is former ACES PhD student Dr Cameron Ferris) and world-renowned burns expert Prof Fiona Wood. The team is also part of a project that received funding this year from the Government's Medical Research Future Fund for a second project in the same area.

ACES Research Fellow Dr Alex Harris, in partnership with researchers at Monash University, received MRFF funding to conduct research into new and innovative treatments for epilepsy using personalised medicine.

From our various research activities, ACES members have become involved in other research initiatives. A list of funding awarded in 2020 to researchers is in Table 3.

Table 3: ACES Patent Filings 2014-2020

	Patent Description		Lead for Submission	Year filed
1.	Thermo-Electrochemical Cell and Method of Use	PCT/AU2015/901513	Deakin and Monash Universities	2015
2.	Functionalised Photo-Electrocatalyst and Method for Chemical Conversion	PCT/AU2015/000248	Monash University	2015
3.	Electrochemical Cell	PCT/AU2016/050389 WO/2016/183638	Deakin University	2015
4.	Chemical Gradients	PCT/US/14/768,820	University of Texas Dallas	2015
5.	Nanostructured electrode for CO_2 reduction	2016/903555	Monash University	2016
6.	High-efficiency electrochemical conversion of nitrogen into ammonia	2016/900354	Monash University	2016
7.	High-efficiency electrochemical conversion of nitrogen into ammonia	2016/900613	Monash University	2016
8.	Sodium-ion Electrolyte Composition	PCT/AU2016/051172 WO/2017/091854	Deakin and Monash Universities	2016
9.	Appartus and method for handheld free-form Biofabrication	PCT/AU2016/050886	St Vincent's Hospital Melbourne	2016
10.	Method and Cell for Conversion of Dinitrogen into Ammonia	PCT/AU2017/000036, WO/2017/132721	Monash University	2017
11.	Method and Cell for Conversion of Dinitrogen into Ammonia	AU 2018900370	Monash University	2018
12.	Method and Cell for Conversion of Dinitrogen into Ammonia	AU 2017902960	Monash University	2018
13.	Method and Cell for Conversion of Dinitrogen into Ammonia	PCT/AU2018/000122	Monash University	2018
14.	An Implantable Device and a Method for Implanting said Device in a Subject	PCT/AU2019/051017, WO/2020/056467	University of Wollongong	2018
15.	Edge Functionalised Graphene	AU 2018903793	University of Wollongong	2018
16.	A device and a method for using a device to receive and/or deliver a substance *in vivo*	PCT/AU2018/051033, WO/2019/068136	University of Wollongong	2019
17.	A device for immobilising a robotic capsule within a body lumen	PCT/AU2018/051034, WO/2019/068137	University of Wollongong	2019
18.	Dispersible edge functionalised graphene platelets	PCT/AU2019/051076 WO2020073081	University of Wollongong	2019
19.	Cell harvest method	AU 2020901733	St Vincent's Hospital Melbourne	2020
20.	Electrolytes for target ion transport	AU 2020901539	Deakin and Monash Universities	2020
21.	Tissue Scaffolds and Constructs	AU 2020903779	University of Wollongong	2020
22.	Self-Regulating Electro-Synthetic or Electro-Energy Cell	AU 2020903369	University of Wollongong	2020
23.	An Implantable Device	AU 2020901409	University of Wollongong	2020


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Table 4: Funding awarded in 2020 leveraged from ACES research activities

Funding leveraged from ACES research activities	Team and project Description	Years
Ethics in AI Research Initiative for the Asia Pacific: $42,400	ACES CI Prof Robert Sparrow; Dr Mark Howard; Joshua Hatherley "The Uses and Abuses of Black Box AI in Emergency Medicine"	2020
Australian Government Department of Health grant: $499,417	ACES CI Prof Robert Sparrow and Prof Catherine Mills; Dr Karinne Ludlow; Dr Narelle Warren. "Preventing Mitochondrial Disease Using Genomics - Ethical, Social and Legal Aspects"	2020-2023
MRFF - 2020 Stem Cell Therapies Mission Grant: $737,689	ACES CI Gordon Wallace, AI Zhilian Yue and collaborators "Optimizing a preclinical model for bioprinting skin aimed at repairing skin loss in patients"	2020-2022
MTP Connect BioMedTech Horizons Program 3.0	ACES CI Gordon Wallace and collaborators "Developing a 3D bioprinting system for intraoperative skin regeneration"	2020-2022
Australian Renewable Energy Agency (ARENA) Project:	ACES CI Douglas MacFarlane, Alexandr Simonov, CI Gordon Wallace, and Gerry Sweigers, "Ammonia Production from Renewables at Ambient Temperature and Pressure. Developing a process for reduction of nitrogen to ammonia"	2021-2024
Australian Research Council (ARC) Discovery Project:$300,000	Michael Breadmore and ACES RF Vipul Gupta for "3D printed microchemical devices and systems"	2021-2024
Australian Research Council (ARC) Discovery Project: $334,055	ACES CI Gursel Alici for "Non-invasive and safe human-machine interface (HMI) systems"	2021-2024
Australian Research Council (ARC) Discovery Project: $470,000	ACES CIs Jennifer Pringle, Professor Douglas MacFarlane and Dr Mega Kar for "Designing disorder into ionic materials for clean energy applications"	2021-2024
Australian Research Council (ARC) Discovery Project: $480,000	ACES Jie Zhang, Alan Bond and collaborators for "Parameterisation of voltammetry in a machine learning environment"	2021-2024
Australian Research Council (ARC) Discovery Project: $651,162	ACES CIs Maria Forsyth, Patrick Howlett and collaborators for "Sustainable high energy sodium batteries with enhanced safety & cycle life"	2021-2024
Australian Research Council (ARC) Discovery Project: $560,000	ACES CI Michelle Coote and collaborators for "Switchable and stereocontrolled photoredox catalysis"	2021-2024
MedTech Actuator Menzies Fellowship: $70,000	ACES CI Jeremy Crook for translation of his research "Next generation tissue building & regenerative medicine for neural repair"	2021
International Research Staff Exchange	ACES CI David Officer, CI Gordon Wallace and collaborators, "DeMANS - Design and Manufacture of Sustainable Materials for Additive Manufacturing"	2021
FSHD Global Foundation translational grant	ACES CI Robert Kapsa and AI Anita Quigley "Autologous cell therapy for Fascio Scapulo Humeral Muscular Dystrophy"	2021
NSW Government Cancer Institute NSW translational program grant: $3,750,000	ACES CI Gordon Wallace is co-investigator with team based at Chris O'Brien Lifehouse Centre "Reducing the Morbidity of Head and Neck Cancer Treatment"	2021-2025
Australian Research Council (ARC) Future Fellow: $784,234	ACES RF Alexandr Simonov for his project, "New dimensions of electrocatalyst design for sustainable energy future"	2021-2025
NHMRC Ideas Grants: $805,064	ACES CI Jeremy Crook for his research "A wireless electric nerve-guide for peripheral nerve repair"	2021-2026
NHMRC Ideas Grants: $808,012	ACES CI Robert Kapsa on his work "Autologous Constructs for Muscle Engineering and Repair"	2021-2026

Global Engagement

Strengthening links to India

A lack of international travel did not stop ACES researchers showcasing their latest advances in biofabrication across the world. In pre-COVID times, the week would have seen advanced medical technology collaborators from India join ACES researchers at the University of Wollongong to further 3D printing and bioprinting applications between India and Australia. Instead, the team organised a week of online activities, including demonstrations and workshops, to discuss the latest developments in project work between the two countries. The online events included demonstrations of ACES' latest advances in customised 3D bioprinters, including 3D Genii, for printing prosthetic ears.

International Linkages

ACES has strategically engaged in international partnerships and research through our formal partner organisations and formation of strategic partner collaborations.

As at the end of 2020, ACES has progressed 12 ongoing formal research collaboration arrangements with the following:

- Korean Society of 3D Printing in Medicine (KS3DPM), Korea;
- Institute of Electronics (BETRC) at the National Chaio-Tung University (NCTU) in Taiwan;
- Nanotechnology & Integrated BioEngineering Centre (NIBEC), Ulster University, Ireland;
- CIC Energigune (The Energy Cooperative Research Centre in the Basque area), Spain;
- Andhra Pradesh MedTech Zone Limited (AMTZ), India;
- Åbo Akademi University, Finland;
- Istituto Ortopedico Rizzoli, Bologna, Italy;
- Biomedical Engineering Research Center of Asan Medical Center (AMCBMERC), Korea;
- The Institute of Materials Jean Rouxel, researchers from both the CNRS (The French National Centre for Scientific Research) and the University of Nantes, France;
- Sunchon University, South Korea;
- University of Houston, Texas, USA;
- The University of British Columbia, Vancouver, Canada.

Partner Investigators

ACES has five partner investigators; Dublin City University, University of Warwick, Friedrich Alexander University, Hanyang University and Yokohama National University. Our partner universities enhance the specialist expertise available to our researchers and allow ACES access to world class facilities. Our partner investigators have also been engaged with ACES through virtual events held during 2020.

PROFESSOR ROBERT COWAN

PROFESSORIAL RESEARCH FELLOW
DIRECTOR - HEARNET CLINICAL STUDIES,
THE UNIVERSITY OF MELBOURNE

On the ACES symposium "It was a great pleasure to see how many interesting and enthusiastic young PhD students you have in the programme – let alone what they are achieving through their research. The entire centre and staff should be extraordinarily pleased and proud of this outcome."

Putting ACES on the Global Stage

International Workshops

International workshops are essential to scientific endeavours and are an important component of ACES activities. These events provide the opportunity to communicate research and showcase achievements. ACES conducted nine international workshops during 2020 (appendix 15).

International Conferences hosted by ACES

In February 2020, ACES hosted the 14th Annual International Electromaterials Science Symposium, over three days in Canberra. The Symposium featured an impressive line-up of Australian and international speakers, who covered both fundamental and applied aspects of electromaterials across areas of research in Health, Energy and Ethics. Over 120 people participated in the three day event, which included plenary and invited speaker sessions, ethics and equity and diversity panel sessions, a poster session, and the ACES Showcase to display the latest breakthroughs in research from within ACES.

ACES team members were the local organising committee for the 9th International Workshop Advances in Cleaner Production (IWACP) Towards Sustainable Energy-Water-Food Nexus - The Contribution of Cleaner Production. The conference was held successfully in May for over 600 international attendees.

Ammonia = Hydrogen 2.0 conference was hosted by ACES on 27-28 August 2020. The conference was moved to a complete virtual event with more than 250 global participants from industry and academia.

2020 International Conference on Biofabrication was postponed until 2021. Organisation was well underway and will be carried forward with the same program of international participants.

Plenary and Keynotes

ACES members gave 15 plenary or keynote addresses in 2020 (appendix 11).

Invited presentations

ACES members gave 35 invited talks at international conferences in 2020 (appendix 12).

Conference presentations

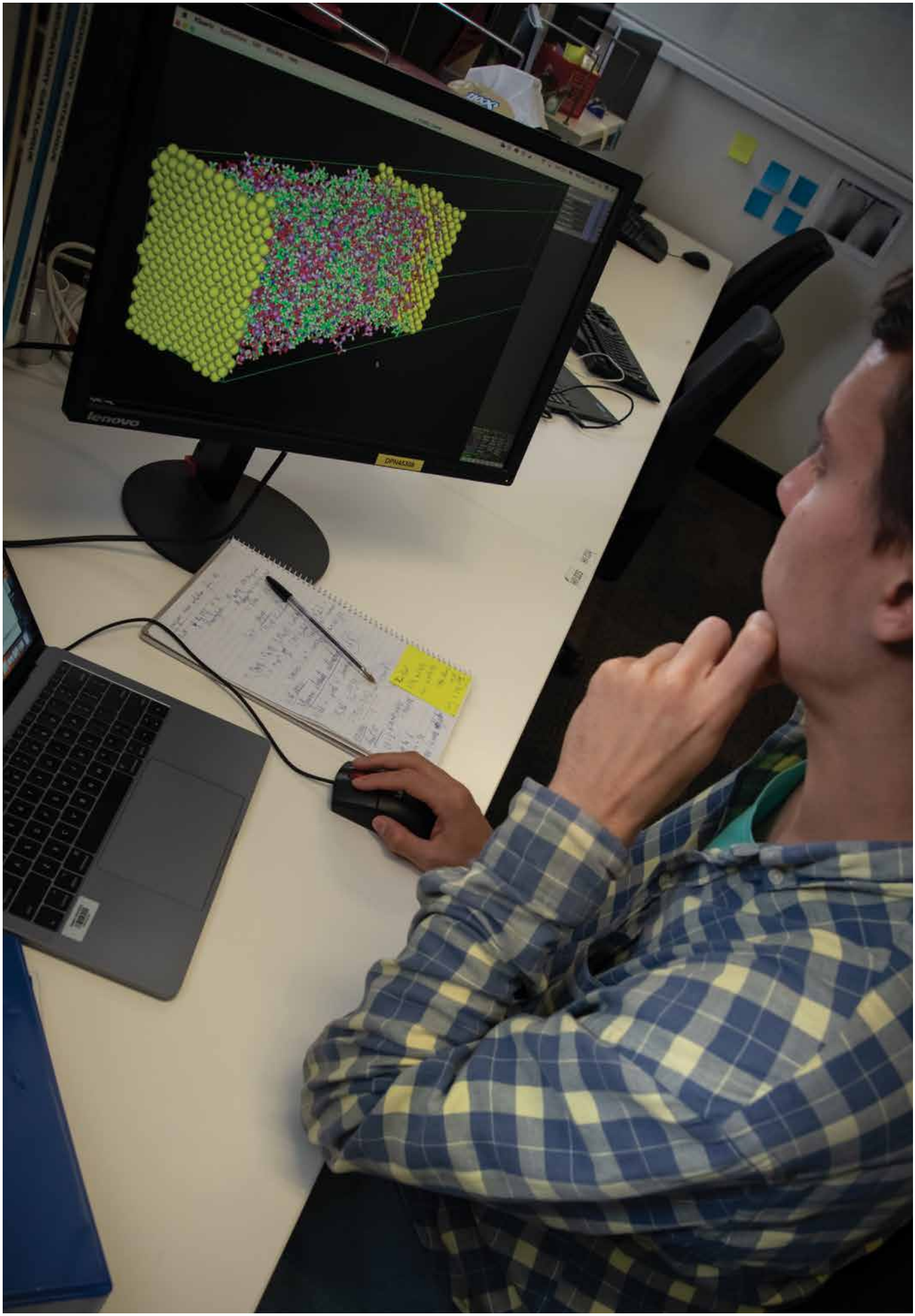
34 conference presentations were given by ACES members in 2020 (appendix 13). Please note that presentations given by ACES members at ACES events would be additional to those listed in the appendices.

Collaborative Visits

Inbound and outbound visits are summarised in appendix 14. After March in person visits were not possible due to COVID travel restrictions, and all collaboration interactions were moved to virtual engagements.

Outputs

International linkages are clearly demonstrated through the resultant research outputs. ACES published 121 (55.8%) journal articles with international collaborations in 2020 and 750 (54.7%) since 2014. The articles published also demonstrate a global reach receiving 538 citations from 56 countries in 2020 and 33,380 citations from 115 countries 2014-2020 (SCIVAl, Scopus data 14.01.21 Table 7).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Communications

ACES has a strong focus on communicating research findings to a diverse audience. Our highly successful communications strategy creates effective platforms that disseminate our science and promote engagement while targeting a variety of different stakeholders in areas including commercial sectors, healthcare, government and the community.

Our outreach efforts involve six key stakeholder audiences:

- Global research community: to provide insight into our state-of-the-art electromaterials science and integrated device fabrication knowledge and facilities, that are readily accessible for scientists, engineers, clinicians, regulators and policy makers;
- Prospective students: to provide an inclusive and supportive global research training opportunity, by giving access to the most innovative and dynamic research training programs and laboratories in Australia, also facilitated by global connections;
- Investors: to facilitate the development of technologies to create new disruptive business opportunities and to enhance existing businesses;
- Government and Regulators: to provide information on the effectiveness of funding programs (for research training) and issues affecting policy and regulation in Energy and Health;
- Community: to provide access to the exciting world of science, the wonder of discovery, and what can be achieved through open engagement for the community, using multidisciplinary research to address real community needs so that science can positively influence people's daily lives;
- Internal: to unite with a common purpose to build a sense of community for the communication of research progress.

Media

Table 5: Media Outreach Summary

Public Communication	20202 KPI Target	Actual
Podcast	0	4
Print	20	9
Radio	10	7
Television	5	1
Web Stories	100	109

During 2020, ACES members and their research activities were highlighted in 118 print and electronic articles and 12 radio, podcast and television stories in Australian and international media (see Table 5).

Media Highlights

Your 3D Printed Body on ABC Radio National

ACES Director Prof Gordon Wallace and EPPE Theme Leader Prof Susan Dodds were part of an ABC Radio National program titled 'Science Friction' hosted by Natasha Mitchell. The program examined the mind-blowing medical frontier of 3D bioprinting, introduced pioneers at the cutting edge of the industry, and examined the area from medical and bioethical perspectives. ACES collaborators Dr Pia Winberg and Prof Fiona Wood were also interviewed for the program.

A Roadmap to the Ammonia Economy

SES Theme Leader Prof Doug MacFarlane's perspective article on 'A Roadmap to the Ammonia Economy' was published in Joule in May 2020 and received worldwide attention. The article was shared hundreds of times on social media, and the Chinese version of the article received over 25,000 reads. The key areas of interest from the Joule paper were published as an article on the Monash University website, which then received coverage from a number of other media publications.

Highly Efficient Energy Storage One Step Closer

When ACES researchers at Deakin University revealed their latest research in the development of high energy density sodium metal batteries for more efficient, longer storage capacity, the breakthrough received impressive coverage across a number of media outlets including The Herald Sun, Australian Manufacturing, Renew Economy, The Geelong Advertiser, PV Magazine, and The Adelaide Advertiser.

ACES Answers the Call to Assist In COVID-19 Crisis

During the height of the COVID-19 pandemic in Australia, ACES researchers at UOW assisted in 3D printing face shields to protect the region's healthcare workers. This initiative received significant coverage in local, state and national media including the Illawarra Mercury, the Canberra Times, Sydney Morning Herald, Times Higher Education, The Age, PV Magazine, and Engineers Australia.

World-First Epilepsy Treatment to be Rolled Out to Dozens more Patients

In an incredibly moving article in the Sydney Morning Herald, ACES SBS Theme Leader Prof Mark Cook provided an overview of the results from a latest trial of an epilepsy treatment, which was published in the prestigious Lancet Medical Journal in December. The game-changing treatment sees a pump implanted into a epilepsy sufferer's abdomen

with a small tube under the skin that sends a type of sodium valproate, an anti-convulsant drug used for complex seizures, directly into a cavity in the skull. The medication is injected into an intra-abdominal pump that travels via a catheter into the fluid-filled spaces in the centre of the brain. The second phase of the trial is now being rolled out to dozens more Australians who suffer debilitating, drug-resistant seizures.

Searching for Superhuman

ABC filmed a documentary series across 2019 and 2020 titled 'Searching for Superhuman'. The six-part series examines discoveries that have revolutionised our understanding of what it means to be human, allowing us to live longer, better, smarter and stronger. An episode titled 'Bionic People' featured ACES Director Prof Gordon Wallace and ACES Soft Robotics CI Prof Geoff Spinks, and looks at efforts to unlock 'superhuman' potential with the power of machines.

Communications Platforms

The ACES Website

The ACES website (electromaterials.edu.au) has many functions and serves as our main online communications platform. We want people to know about what we do and use our website to do just that, as well as promoting our content via our integrated social media channels.

Our ACES research is often in the news and attracts international headlines, but not all ACES stories can be covered in the media. The ACES website provides an effective medium for us to showcase our work and to distribute it to a broad audience. We use the ACES website to publish news stories, interviews, events, and interesting research achievements described in plain English.

In 2020, due to the COVID-19 pandemic, it became necessary to further utilise our website as the ability to have research covered in the media became stymied due to COVID lockdown restrictions.

The ACES Communications Team ran a number of communications initiatives through the ACES website that promoted ACES research and the ACES members behind the research, often in place of initiatives that would have otherwise taken place face-to-face through workshops, public events and media interviews.

These initiatives included farewell interviews with ACES researchers and students who finished their time with ACES, interviews with PhD students, interviews with staff members to promote their profiles, and technology features.

Facebook

Facebook continued to be an effective platform to promote ACES work, linking back to both our website and external media content. Our Facebook page (facebook.com/electromaterials) currently has over 1,399 Likes (people who support our page), compared to 1,338 in 2019.

Twitter

Our Twitter account (twitter.com/ARC_ACES) has over 1,743 followers compared to 1,317 in 2019. In addition to the ACES Twitter account, our team, including many of our Chief Investigators, are active on twitter and frequently retweet posts. ACES Director Prof Gordon Wallace has 3,199 followers, compared to 2,636 followers in 2019.

Youtube

Videos are a powerful communication tool that allow you to reach a broad, diverse audience. The ACES YouTube channel has over 870 subscribers, and our videos have gained thousands of views.

ACES added 59 videos to the ACES channel in 2020. Our video content on YouTube increased as a result of the Centre adapting to the socially-distanced reality of COVID-19. The majority of our Webinar Series were recorded and videos then made available for later viewing (with the presenter's permission).

Instagram

After introducing ACES on Instagram in 2019, the ACES Communications Team continued to maintain the Centre's presence on the platform. In 2020, the ACES Instagram account had 124 new posts, and 106 new followers, bringing the Centre's followers to 236 in total.

Linkedin

In 2019, ACES renewed its presence on LinkedIn, and in 2020 the team maintained this presence, providing 491 new updates to our 1,103 followers.

New Initiatives

ACES Podcast

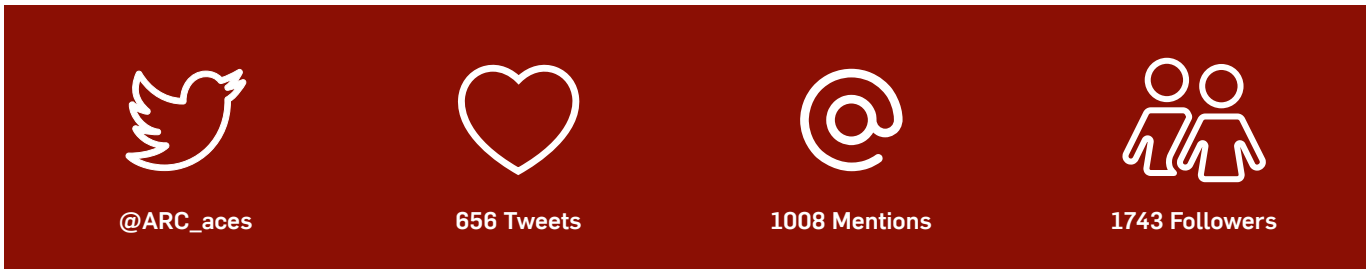
In 2020, ACES launched its very own podcast (aptly named 'The ACES Podcast'!). The ACES Podcast features interviews with former ACES students, current researchers, and ACES collaborators making a difference in their field.

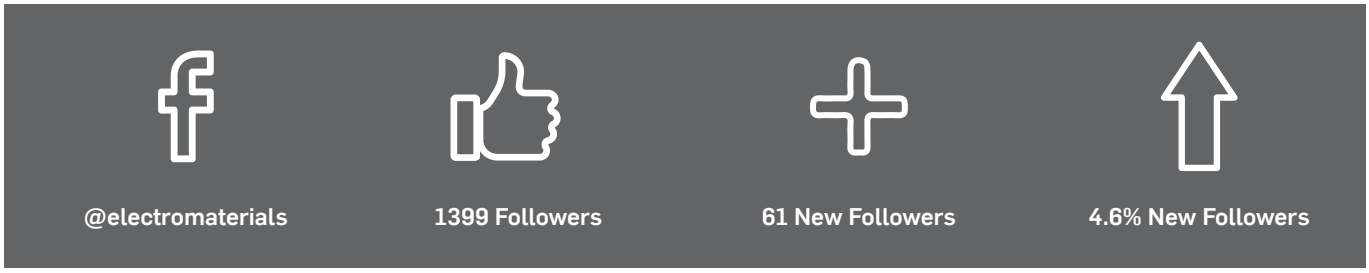
The podcast provided a fresh way to reach a broad audience and introduce them to ACES research during the significant lockdown period due to COVID-19.

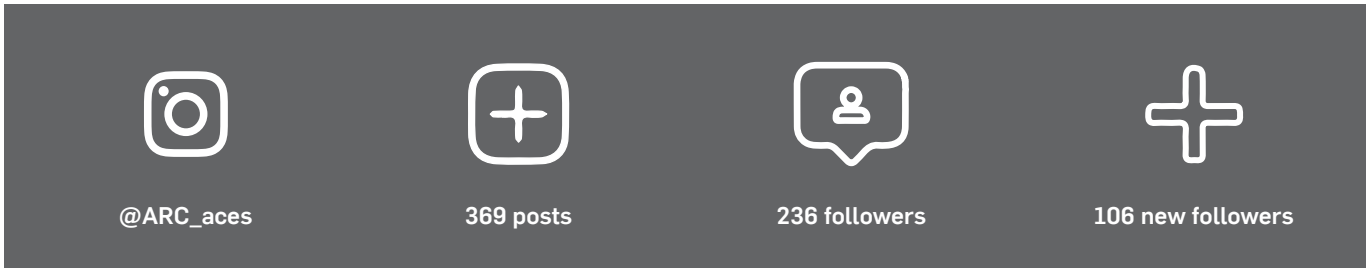
Episodes include chats with Australian of the Year Prof Fiona Wood, ACES Chief Investigator Prof Doug MacFarlane, chemistry legend Prof Alan Bond, and orthopaedic surgeon A/Prof Claudia Di Bella.

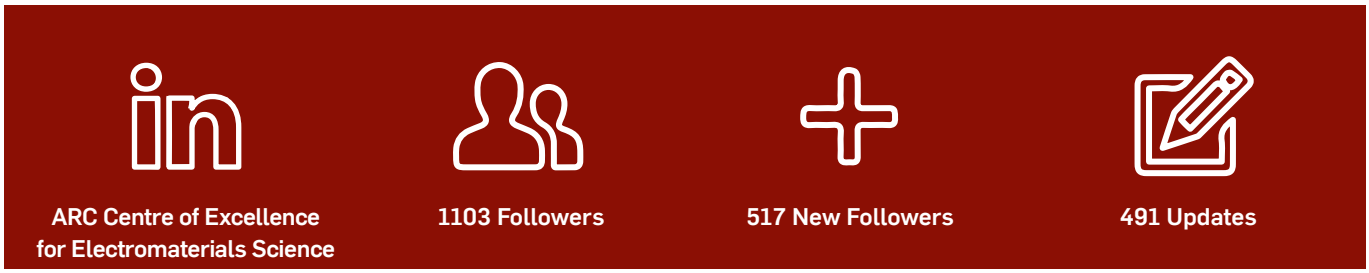
After only a few months of being launched, The ACES Podcast made it onto the Great Australian Pods website and directory. Since its launch in April 2020, The ACES Podcast has received 1,705 plays across the eight different platforms it is available on.

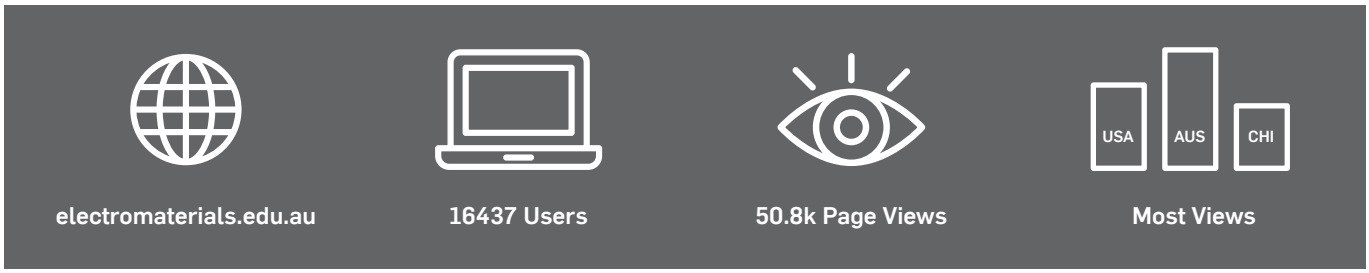
ACES 2020 Communications Snapshot











ACES Webinar Series

The impact of COVID-19 saw ACES, like much of the world, scramble to host learning and engagement opportunities online. The ACES Communications Team held two extremely popular webinar series that saw over 2,600 in total from across the world register for the variety of weekly talks, from latest advances in research to how to craft a LinkedIn profile, to using proper English in academic papers.

The ACES Webinar Series I (April – June) showcased ACES researchers, who were given the opportunity to present webinars on their latest research or other useful skills in the world of research.

The ACES Webinar Series II (July – October) invited speakers from around the world to present on their latest breakthroughs.

The webinars were advertised both internally within ACES and externally via social media, making the initiative (and the latest in electromaterials science research) accessible to the research community, end-users, industry and the community simultaneously.

Online Events

As well as the ACES Webinar Series, the Communications Team also ran a series of special online events that were publicly advertised and freely available.

The team worked to provide a variety of events that would interest ACES' different stakeholders, including:

- ACES Technology Showcases that featured the latest advances in ACES research for end-users and industry partners looking for potential engagement opportunities. Weekly Showcases were held on latest technologies including our Quantitative Ultrasound Imaging, the Soft Robotic Hand, Edge Functionalised Graphene, and Building Electric Tissue using Ultrasound.
- Online Workshops, such as 'New Technologies and Dynamic Ageing' that brought together clinicians and technologists to discuss the challenges and opportunities of ageing and the emerging technologies that can assist in providing a dynamic lifestyle.
- Discussion Panels, including 'Making a PhD Work for You' featuring current and former PhD students to assist current and future PhD students in getting the most out of their studies.
- Online Public Events, including the annual Bill Wheeler Symposium (held online for the first time in 2020); the ACES 2020 Public Lecture titled 'The Brain on the Bench Project – The Science, The Application, The Implications'.

These events were well attended, with more than 600 people registering to attend these sessions from a broad cross-section of the community.

Outreach

While COVID-19 somewhat limited our team in being able to share their knowledge and expertise in person, a number of our researchers took on the opportunity to educate, inspire and engage the broader community through a number of online public lectures and other outreach events.

Table 6: A summary of ACES outreach activities and involvement with community and professional bodies in 2020

	Outreach Activities	When	Where
1.	**Public Lecture:** Sparrow, R, CI Monash, Summer School January 2020, "Resisting the Rise of the Machines: AI and Ethics.", Melbourne.	6 January	U3A Hawthorn
2.	**Public Lecture:** Sparrow, R, CI Monash "In the hands of machines: the future of aged care", Melbourne.	6 January	U3A Deepdene
3.	**RACI 20th Australasian Polymer Summer School:** Michelle Coote, CI ANU, was organiser, Chair and presenter for school of 50 graduate students from around Australia.	11-12 February	ANU
4.	**Open Day Talk:** presented by Robert Forster, AI DCU/UOW, discussing collaborative work with ACES on electromaterials at Portmarnock Community Secondary School.	16 January	Dublin, Ireland
5.	**Open Day Talk:** presented by Robert Forster, AI DCU/UOW, "Electromaterials Going Wireless: From Health to the Environment" at Cabra Community College, Secondary School.	17 January	Dublin, Ireland
6.	**IUPAC Global Women's Breakfast Event:** "Building bonds to create future leaders", Professor Maria Forsyth, CI Deakin, shared her research group motto for 2020 'Work hard, work happy' an annual event designed to be a catalyst for change towards greater diversity in science.	12 February	IUPAC Global Women's Breakfast CSIRO Clayton
7.	**Training Secondary Science Teachers Event:** Deakin University researchers and students presented seminars for Secondary Science Teachers to develop online resources related to this research. • Yan Liang - 'Polymer electrolytes/solid-state batteries' • Cristina Pozo-Gonzalo - 'Circular Economy and E-Waste' • Rob Kerr - 'Ultra-Batteries: from Research to Application' • Faezeh Makhlooghiazad - 'Beyond Li-ion batteries; Cheaper and safe sodium batteries using plastic crystal electrolytes' • Natalie Ralph - 'Energy Ethics Research and the Circular Economy' • Yady Senayda Garcia Castillo - 'Polymer electrolytes/solid-state batteries'	4 May	School of Education at Deakin University
8.	**BrainSTEM Innovation Challenge:** Saimon Moraes Silva, Swinburne PhD, presented to 25 high school students and teachers involved in the BrainSTEM innovation challenge "Creativity in scientific research" in the ASK BrainSTEM (https://brainstem.org.au/index.html).	15 May	Virtual
9.	**Public Lecture:** Brain on a Bench ACES CI UOM Mark Cook, Katina Michael and ACES CI Gordon Wallace. From science fiction to science fact, researchers continue to work towards the creation of a 'brain on the bench' using 3D bioprinting of stem cells to assist neuroscientists in better understanding and treating neurological diseases. The ACES 2020 Public Lecture brought together researchers, clinicians and ethicists involved in this groundbreaking work. At the online event, the public audience heard from: Prof Gordon Wallace, describing how advances in stem cell technologies and biofabrication are making this vision seem possible; Prof Mark Cook, a neurologist explaining the significance of advances in materials and fabrication in terms of understanding and treating neurological disorders such as epilepsy; and Prof Katina Michael, who encouraged us to consider the social and ethical implications of such advances for our communities as a whole.	19 August	Virtual
10.	**Bill Wheeler Award and Public Lecture:** presented by Mori Aghmesheh a senior staff specialist medical oncologist at the Illawarra and Shoalhaven Cancer Care Centres, and an honorary Clinical Professor at the UOW Graduate School of Medicine. He is a co-director of the Southern Cancer Institute and Southern Medical Day Care Centre in Wollongong. He has been the Principal Investigator for more than 30 international clinical trials in solid tumours. He has been involved in many pivotal studies that led to the changing of practices in oncology.	22 September	Virtual
11.	**Public Talk:** Robert Forster, AI DCU/UOW, presented "Improving Health Through Rapid, Early Disease Detection: From COVID-19 to Epilepsy".	20 October	Royal College of Surgeons in Ireland

Awards

ACES members have been recognised for their outstanding contribution to science and research through a number of honours, prizes and awards.

ACES students in the 3MT® Competition

The 3MT® is an international competition that challenges PhD students to present their research in three minutes to a non-specialist audience. ACES UOW PhD student Abdul Moqeet Hai was awarded runner-up at the full UOW 2020 3MT Final presenting "An Electrifying Solution to Unnerving Problems" on 18 August 2020, after being awarded first place at this year's AIIM 3MT. ACES Monash PhD student Thomas Blesch was the Monash School of Chemistry winner, presenting "In for the long run: Redox flow batteries for a clean grid".

Victorian Honour Roll of Women

Maria Forsyth, ACES deputy director, was inducted into the Victorian Honour Roll of Women. The Roll "celebrates the outstanding contributions made by women from all walks of life and acknowledges the many ways in which they have made a lasting impact", and this year 32 women were inducted. Maria was recognised for her pioneering research contributing to Australia's environmental sustainability.

Climate KIC

Climate-KIC Australia's ClimateLaunchpad program is the world's biggest cleantech and green business ideas competition. The initiative is designed to help aspiring entrepreneurs to grow their cleantech ideas into global businesses.

ACES Deakin PhD candidate Karolina Biernacka, ACES RF Faezeh Makhlooghi Azad, Jenny Sun and Vahide Ghanooni Ahmadabadi formed the all-female Elevenstore team which is focusing on sodium batteries for mobility applications in SE Asia. The team successfully competed through multiple rounds to win the National finals of the ClimateLaunchpad competition. This win secured them a coveted place in the EIT Climate-KIC Accelerator. Elevenstore also went on to win the Theme Award for Sustainable mobility, which came with a €5,000 prize to reinvest in their business.

2020 Bill Wheeler Prize Winner

The 2020 Bill Wheeler Prize was awarded to ACES UOW PhD student Grishmi Rajbhandari for communication of the social impact of her research on Printing Antennas for Cochlear Implants. The overall research objective is to create affordable hearing implants, by using both 2D and 3D printing methods to fabricate alternate cost effective antennas for the Cochlear implants.

The award includes community-raised funds ($2000) to assist the winner to collaborate and share their research with an international audience.

League of Scholars

Maria Forsyth, ACES deputy director was named as the leading scholar for electrochemistry by the League of Scholars, published in The Australian. In each field the leader was determined as "the Australian-based researcher whose papers published in the 20 top journals in their field in the past five years have had the most citations by other researchers".

MedTech Actuator Menzies Fellowship

ACES UOW CI Jeremy Crook was awarded a Menzies Fellowship - a prestigious award sponsored by the Menzies Foundation and MedTech Actuator valued at $70,000. The fellowship is awarded to "high potential, career life science researchers" providing "training in entrepreneurship and leadership". This award is timely given our current drive towards refining and growing our translational activities.

ELVIS 'FIL4IT' SMUGRESKI

ADMINISTRATIVE ASSISTANT, INTELLIGENT POLYMER RESEARCH INSTITUTE, UNIVERSITY OF WOLLONGONG

"To sum up my 25 years here is no easy task. But what I can say is that it has been fantastic, interesting, long, and forever inspiring and tremendous. I've developed so many skills over my time and have always tried to bring integrity, intensity and intelligence to the job. It has truly been a pleasure."

Additional Accolades and Awards

ACES Deakin PhD student Karolina Biernacka was selected to participate in EnergyLab's Women in Clean Energy Fellowship (WICEF). She has also been announced as a finalist in Women's Weekly 2020 Women of the Future Awards

ACES Deakin PhD student Ghulam Murtaza Panhwar was successful in obtaining a one year participation in Industry Mentoring Network in STEM (IMNIS) mentoring program for 2020, an award-winning industry-led initiative of the Australian Academy of Technology and Engineering (ATSE).

ACES CI Douglas MacFarlane was named in the 2020 Report for the Clarivate Web of Science Highly Cited Researchers - Cross-Field Category.

ACES CI Jun Chen was named in the 2020 Report for the Clarivate Web of Science Highly Cited Researchers - Cross-Field Category.

ACES Monash RF Alexandr Siminov was recognised by the RSC editors as an "Outstanding Reviewer for Energy & Environmental Science in 2019" - a top-ranked journal in the renewable energy and environmental science (impact factor 33).

ACES CI Brett Paull was awarded the "Top downloaded paper 2018-2019 in Journal of Separation Science", by John Wiley & Sons, Inc. publishers.

ACES UOW PhD student Abdul Moqeet Hai received Global Challenges $2000 travel award.

ACES UOW PhD student Jaiwara Khan was awarded Best Poster for "3D Textile Structures as electrophoresis platforms for selective delivery and separation of complex matrices" at the International Conference on Nanoscience and Nanotechnology ICONN 2020, Brisbane, Australia.

ACES UOW PhD student Sujani Abeywardena was awarded 2020 Symposium Research Training Grant Award in support of her future research efforts.

ACES RF Faezeh Makhlooghiazad was awarded 2020 Symposium Research Training Grant Award to present her work on new solid state electrolytes to researchers and industry at a conference in 2021.

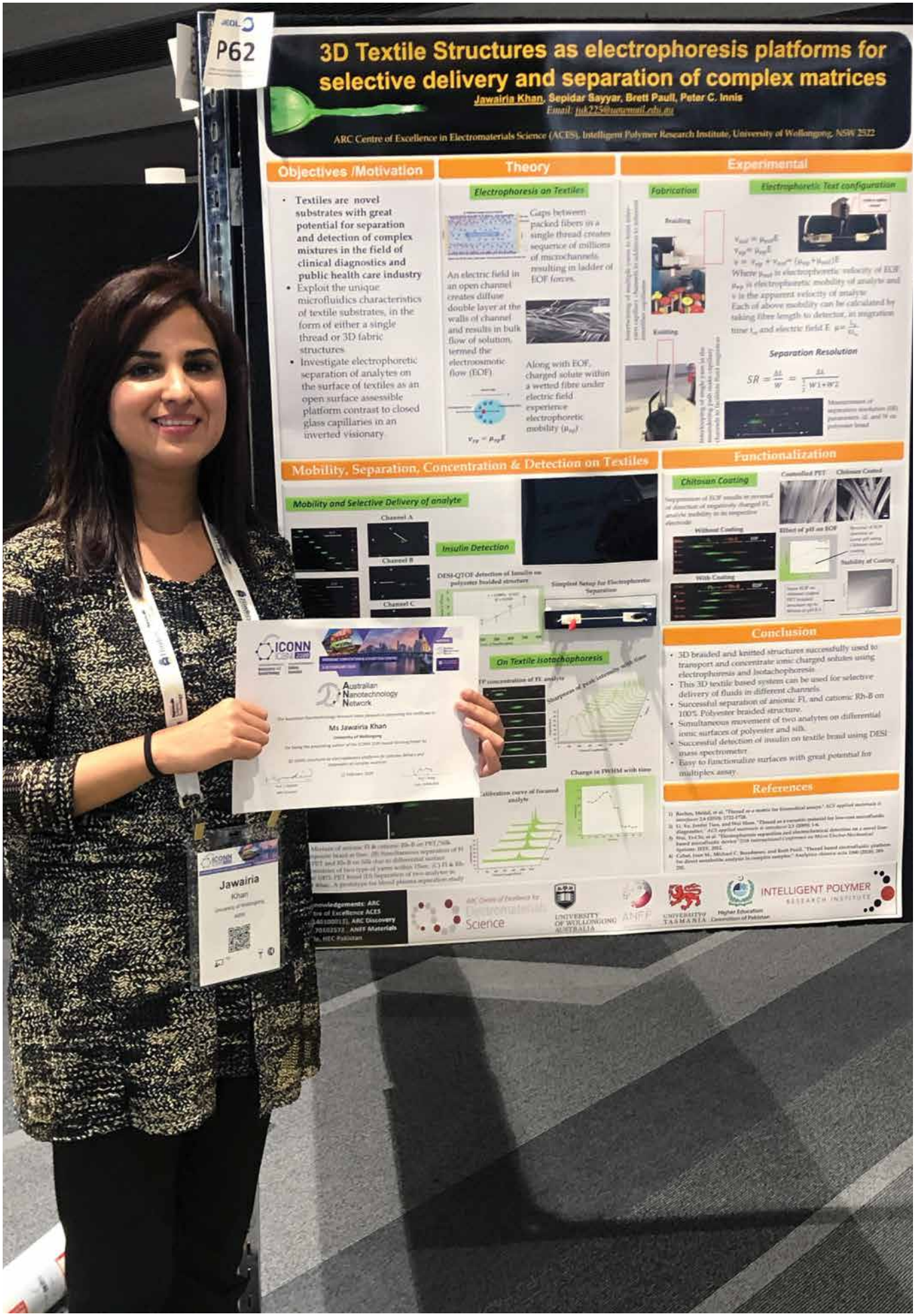
ACES AI Vipul Gupta received a Commendation for Service Excellence to UTAS College of Science and Engineering. He was also a selected as a finalist by the Australian Academy of Science for the Falling Walls Lab Australia 2020.

ACES UOW long-serving employee Phil Smugreski received a twenty-five years of service award from the UOW Vice-Chancellor.

ACES RF Johnson Chung and his team were the recipients of the main prize at AIIM GOLD Day 2020 which entailed a $5000 prize to enable electron microscopy based research.

ACES researchers Charbel Tawk, Gursel Alici, Geoffrey Spinks and Mac in het Panhuis' paper on 'Soft Pneumatic Sensing Chambers for Generic and Interactive Human–Machine Interfaces' selected as an Advanced Intelligent Systems Editor's Choice Article (also recognised in May for generating immediate impact and helping to raise the visibility of the journal.

ACES Director Gordon Wallace's two publications ('Wet-spinning and carbonisation of graphene/PAN-based fibers' and 'Discussion paper on proposed new regulatory changes on 3D technology: a surgical perspective') recognised as top papers by Wiley Polymers and ANZ Journal of Surgery.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3D Textile Structures as electrophoresis platforms for selective delivery and separation of complex matrices
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Objectives /Motivation
Textiles are novel substrates with great potential for separation and detection of complex mixtures in the field of clinical diagnostics and public health care industry
Exploit the unique microfluidics characteristics of textile substrates, in the form of either a single thread or 3D fabric structures
Investigate electrophoretic separation of analytes on the surface of textiles as an open surface assessible platform contrast to closed glass capillaries in an inverted visionary
Theory
Electrophoresis on Textiles
Gaps between packed fibers in a single thread creates sequence of millions of microchannels resulting in ladder of EOF forces.
An electric field in an open channel creates diffuse double layer at the walls of channel and results in bulk flow of solution, termed the electroosmotic flow (EOF)
Along with EOF, charged solute within a wetted fibre under electric field experience electrophoretic mobility (μ_{ep})
Experimental
Fabrication
Electrophoretic Test configuration
Separation Resolution
Mobility, Separation, Concentration & Detection on Textiles
Mobility and Selective Delivery of analyte
Insulin Detection
On Textile Isotachophoresis
Functionalization
Chitosan Coating
Conclusion
3D braided and knitted structures successfully used to transport and concentrate ionic charged solutes using electrophoresis and isotachophoresis
This 3D textile based system can be used for selective delivery of fluids in different channels
Successful separation of anionic Fl, and cationic Rh-B on 100% Polyester braided structure.
Simultaneous movement of two analytes on differential ionic surfaces of polyester and silk.
Successful detection of insulin on textile braid using DESI mass spectrometer
Easy to functionalize surfaces with great potential for multiplex assay
References
ICONN
Australian Nanotechnology Network
Ms Jawairia Khan
Jawairia
Khan
INTELLIGENT POLYMER RESEARCH INSTITUTE


Lithium metal (USE)
CR2032

Performance Indicators

Key Performance Indicators (KPI)	Target 2019	Actual 2019	Target 2020	Actual 2020
Number of research outputs				
Journal publications	130	**210**	**140**	**217**
Book chapters	2	**7**	**3**	**18**
Conference publications/ abstracts	70	**186** • 12 refereed papers • 174 abstracts non-ACES conferences	**90**	**93** • 9 refereed papers • 84 abstracts non-ACES conferences
Patents (filed)	2	**3**	**2**	**5**
Quality of research outputs				
Quality of research outputs	50% with impact factor >3.15	**74%** (156 publications)	50% with impact factor >3.2	**70%** (153 publications)
Cumulative Citation data Average cumulative citation per publication	20 Av cumulative citation per publication	**19.1** (990 cited publications from 1145 captured in database 2014-2019)	22 Av cumulative citation per publication	**24.3** (1225 cited publications from 1382 captured in database 2014-2020)
Overall publication and citation activity of ACES publications	Overall Field weighted citation impact: 1.7 Outputs in top 10% most cited: 25% Views in top 10% world % views: 30%	**2.13** **36.9%** **50.6%**	Overall Field weighted citation impact: 1.7 Outputs in top 10% most cited: 25% Views in top 10% world % views: 30%	**2.02** **35.3%** **48.2%**
Number of invited talks/papers/ keynote lectures given at major international meetings	35	**102** 33 plenary/keynote 69 invited talks	40	**50** 15 plenary/keynote 35 invited talks
Student prizes and awards	1	**9**	2	**9**
Training and Professional Education				
Number of training courses held/offered by the Centre Annually	Total = 17 Thematic workshops: 5 Summer scholarships: 2 Researcher exchanges: 10	**Total = 59** Thematic workshops: 15 Summer scholarships: 12 Researcher exchanges: 32 • 26 international students hosted by ACES (>5 days) • 6 ACES national X-nodal student or ECR exchanges (>3 days)	Total = 17 Thematic workshops: 5 Summer scholarships: 2 Researcher exchanges: 10	**Total = 24** Thematic workshops: 14 Summer scholarships: 5 Researcher exchanges: 5 • 0 international students hosted by ACES (>5 days) • 5 ACES national X-nodal student or ECR exchanges (>3 days)

Key Performance Indicators (KPI)	Target 2019	Actual 2019	Target 2020	Actual 2020
Number of workshops/ conference held/offered by the Centre	Total = 6 Full Centre Meeting: 1 International Symposium/Event: 1 International or National Joint workshops: 2 End-User sessions: 2	**Total = 40** Full Centre Meeting: 1 International Symposium/Event: 3 International or National Joint workshops: 12 End-User sessions: 24	Total = 7 Full Centre Meeting: 1 International Symposium/Event: 1 International or National Joint workshops: 2 End-User sessions: 3	**Total = 23** Full Centre Meeting: 1 International Symposium/Event: 2 International or National Joint workshops: 9 End-User sessions: 11
Number of additional researchers working on Centre research • Postdoctoral researchers • Honours students • PhD students • Masters by research students • Masters by coursework students • Associate Investigators	Associate Postdoctoral researchers: 15 Affiliate PhD students: 20 Masters by research students: 5 Associate Investigators: 15	Associate Postdoc researchers: **21** Affiliate PhD students: **30** Masters by research students: 18 Associate Investigators: **18** Grad Cert Biofabrication: **6**	Associate Postdoctoral researchers: 15 Affiliate PhD students: 20 Masters by research students: 5 Associate Investigators: 15	Associate Postdoctoral researchers: **17** Affiliate PhD students: **32** Masters by research students: **7** Associate Investigators: **25**
Number of postgraduate completions	10	**33** • 23 PhD • 7 Masters • 2 Grad Cert • 1 Honours	12	**16** • 11 PhD • 5 Masters
Number of mentoring programs offered by the Centre	Total = 5 Webinars: 2 Additional skill training activities: 3 Enduser mentoring program: 1	**Total = 7** Webinars: 4 Additional skill training activities: 2 Enduser mentoring program: 1 APR Internship	Total = 6 Webinars: 2 Additional skill training activities: 3 Enduser mentoring program: 1	**Total = 47** Webinars: 40 Additional skill training activities: 6 Enduser mentoring program: 2 APR internships
International, national and regional links and networks				
Number of presentations/ briefings To the public To government (parliamentarians and departments/agencies at both State and Federal level) To industry/business/end-users To non-government organisations To professional organisations and bodies Other (please specify)	To the public: • 100 web • 20 print • 10 radio • 5 television To government (parliamentarians and departments/ agencies at both State and Federal level): 6 To industry/business/ end-users: 35 To professional organisations and bodies: 10 Other (STEM education activities): 1	To the public: • 156 web • 17 print • 13 radio • 5 television • 6 podcasts To government: 16 (appendix 5) To industry/business/ end-users: 97 (appendices 4 & 6) To professional organisations and bodies: 6 Other (STEM education activities): 8	To the public: • 100 web • 20 print • 10 radio • 5 television To government (parliamentarians and departments/ agencies at both State and Federal level): 6 To industry/business/ end-users: 40 To professional organisations and bodies: 10 Other (STEM education activities): 1	To the public: • 109 web • 9 print • 7 radio • 1 television • 4 podcasts To government: 10 (appendix 8) To industry/business/ end-users: 57 (appendices 7&9) To professional organisations and bodies: 17 Other (STEM education activities): 11

Key Performance Indicators (KPI)	Target 2019	Actual 2019	Target 2020	Actual 2020
Number of new organisations collaborating with, or involved in, the Centre since 2014	1	**2** • AMTZ, India • Max Plank Institute, Germany	1	**5** • UWA • Inventia Life Science • Åbo Akademi University • CALHN • IFix Medical Pty Ltd
Centre-specific Key Performance Indicators				
Commercial translation of Centre research	Ongoing through life of Centre	See main body of report	Ongoing through life of Centre	See main body of report
Attraction of new funding from endusers and stakeholders in government, NGOs, industry and the private sector	Ongoing through life of Centre	See main body of report	Ongoing through life of Centre	See main body of report
Specific training courses in entrepreneurial skills for Centre staff and students	Run a Certificate in Innovation and Entrepreneurship each year	**1**	Run a Certificate in Innovation and Entrepreneurship each year	**1**
Initiatives on gender equity and diversity for Centre staff and students	Organise one training activity on equity or diversity each year ACES Code of Conduct ACES Conference Code of Conduct Metrics • Gender Identity	**1** Code conduct and conference policy are now available on the ACES website. Gender of ACES members (excluding CIs or PIs) • 53% identified as female • 47% identified as male • 0% identified as an indigenous Australian Response rate 91%.	Organise one training activity on equity or diversity each year ACES Code of Conduct ACES Conference Code of Conduct Metrics • Gender Identity	**1** Webinar held Code of conduct and conference policy on the ACES website. Gender of ACES members (excluding CIs or PIs) • 47% identified as female • 53% identified as male 0% identified as an indigenous Australian

Publications

Table 7: ACES Publication Data

Overall publication and citation activity for ACES affiliated publications (Source: Scival-SCOPUS data 14.01.2021)

Output Description	2020	2014-2020
Number ACES publications (SCOPUS)	217	1382
Number of ACES publications (SciVal)	217	1371
Number of subject areas (main categories) ACES published in	22	25
^^ Views count	3,739	65,760
^Views per Publication (articles and reviews)	17.2	50.1
Outputs in Top 1% of world views	10 (4.6%)	106 (7.7%)
Outputs in Top 10% of world views	69 (31.8%)	661 (48.2%)
Outputs in Top 25% of world views	135 (62.2%)	1,050 (76.6%)
Number of citations	538	33,380
Number of citing countries	56	115
Average citations/publication	2.5 (128 cited pubs)	24.3 (1,225 cited pubs)
Outputs in top 1% most cited	8 (3.7%)	106 (7.7%)
Outputs in top 10% most cited	56 (25.8%)	484 (35.3%)
Outputs in top 25% most cited	128 (59.0%)	900 (65.6%)
Field Weighted Citation Impact (#FWCI - for articles and reviews)	1.70	2.02
International collaboration	121 (55.8%)	750 (54.7%)
National collaboration	89 (41.0%)	590 (43.0%)
Publications in top 1% journal percentile by SJR	24 (12.1%)	122 (9.7%)
Publications in top 10% journal percentile by SJR	113 (56.8%)	806 (63.9%)
Publications in top 25% journal percentile by SJR	164 (82.4%)	1,116 (88.4%)

Legend:

^^ **Views count** is total views received by publications of the selected entities (Source: SCOPUS data).

^**The average number of views per publication** (Source: SCOPUS data).

 # The Field Weighted Citation Impact (FWCI) - World Average is 1.00.

Books and Book Chapters

1. Book: Cherian, M., "Ageing and Poverty in India", **2020** (AuthorsUpFront) ISBN 9789387280724.

2. Edited Book: Crook, J. M., "3D Bioprinting: Principles and Protocols", Methods in Molecular Biology, **2020** (Springer Nature) ISBN 9781071605202

3. Book Chapter: Crook, J. M., "Preface". In Crook J.M.(Ed) 3D Bioprinting: Principles & Protocols. **2020**; pp v. (Springer Nature) ISBN 9781071605202.

4. Book Chapter: Crook, J. M., "Cell Processing for 3D Bioprinting: Quality Requirements for Quality Assurance in Fundamental Research and Translation". In Crook J.M.(Ed) 3D Bioprinting: Principles & Protocols. **2020**; pp 19-26. (Springer Nature) ISBN 9781071605202.

5. Book Chapter: Goddard, E.; Dodds, S., "Ethics and Policy for Bioprinting". In Crook J.M.(Ed) 3D Bioprinting: Principles & Protocols. **2020**; pp 43-64. (Springer Nature) ISBN 9781071605202.

6. Book Chapter: Duchi, S.; Onofrillo, C.; O'Connell, C.; Wallace, G. G.; Choong, P.; Di Bella, C., "Bioprinting Stem Cells in Hydrogel for *in situ* Surgical Application: A Case for Articular Cartilage". In Crook J.M.(Ed) 3D Bioprinting: Principles & Protocols. **2020**; pp 145-157. (Springer Nature) ISBN 9781071605202.

7. Book Chapter: Tomaskovic-Crook E, Crook J.M., "3D Bioprinting Electrically Conductive Bioink with Human Neural Stem Cells for Human Neural Tissues". In Crook J.M.(Ed) 3D Bioprinting: Principles & Protocols. **2020**; pp 159-170, (Springer Nature) ISBN 9781071605202.

8. Book Chapter: Ngan, C., Quigley, A., O'Connell, C., Kita, M., Bourke, J., Wallace, G. G., Choong, P., Kapsa, R. M. I., "3D Bioprinting and Differentiation of Primary Skeletal Muscle Progenitor Cells. In Crook J.M.(Ed) 3D Bioprinting: Principles & Protocols. **2020**; pp 229-242. (Springer Nature) ISBN 9781071605202.

9. Book Chapter: Crook J.M., Tomaskovic-Crook E., "Bioprinting 3D Human Induced Pluripotent Stem Cell Constructs for Multilineage Tissue Engineering and Modelling" In Crook J.M. (Ed) 3D Bioprinting: Principles and Protocols. **2020**; pp251-258. (Springer Nature) ISBN 9781071605202.

10. Book Chapter: Hancock, L., "Commercialization and Corporatization: Academic Freedom and Autonomy under Constraints in Australian Universities". In Hao, Z., Zabielskis, P. (Eds.) Academic Freedom under Siege. **2020**; pp 219-246. (Springer) ISBN 9783030491192.

11. Book Chapter: Caballero-Aguilar, L.M., Silva, S.M., Moulton, S., "Three-Dimensional Printed Drug Delivery Systems". In Seyedehsara, Dezfooli, Greene (Eds.) Engineering Drug Delivery Systems. **2020**; pp 147-162. (Woodhead Publishing, Elsevier) ISBN 9780081025482.

12. Book Chapter: Makhlooghiazad, F., Pozo-Gonzalo, C., Johansson, P., and Forsyth M., "Electrolytes for Sodium Batteries". In Monconduit and Croguennec (Eds.) Na-Ion Batteries **2020**; pp 205-242. (Wiley) ISBN 9781789450132.

13. Book Chapter: Paviolo, C., Gietman, S., Duc, D., Moulton, S. E., and P. R. Stoddart, "Applications of Nanoparticles for Optical Modulation of Neuronal Behavior". In Pavone F. S. and Shoham, S. (Eds.) Handbook of Neurophotonics **2020**; pp 293-316. (CRC Press) ISBN 9781498718752.

14. Book Chapter: Tomaskovic-Crook E., Higginbottom S.L., James E.C., Rathbone S.J.C., Crook J.M., "Electroceuticals for Neural Regenerative Nanomedicine". In Razavi M. (Ed) Neural Regenerative Nanomedicine **2020**; pp 213-258. (Elsevier) ISBN 9780128202234.

15. Book Chapter: Gilbert, F. and Dodds, S., "Is there Anything Wrong with using Invasive and Predictive Brain Devices to Prevent Convicted Offenders from Reoffending?" In Vincent N. (Ed.) Neuro-Interventions and the Law: Regulating Human Mental Capacity **2020**; pp 113-126. (Oxford University Press) ISBN 9780190651145.

16. Book Chapter: Dodds, S. "Biomedical Technologies - Feminist Engagement with Interdisciplinary Theories and Movements". In Hall, K.Q. and Ásta S. (Eds.) The Oxford Handbook of Feminist Philosophy. (Oxford University Press) ISBN: 9780190628925 (In press).

17. Book Chapter: Howard, M. and Sparrow, R., "Nudge Nudge, Wink Wink: Sex Robots as Social Influencers. In Cherry and Ruiping Fan (Eds.) Sex Robots: Their Social Impact and the Future of Human Relations. Springer Academic Publishers (Accepted).

18. Book Chapter: Lee, C.-Y., "Earth Abundant Electrocatalysts for Sustainable Energy Conversions". In Cheong (Ed.) Sustainable Materials and Green Processing for Energy Conversion. (Elsevier) ISBN 9780128228388. (Accepted).

Journal Articles

The publications are listed in order of impact factor, captured by SCOPUS database with ACES in the address line (14.01.2021). This list contains the articles that were used to calculate the statistics in Table 7 in conjunction with the published conference articles listed below.

1. Rakov, D. A.; Chen, F.; Ferdousi, S. A.; Li, H.; Pathirana, T.; Simonov, A. N.; Howlett, P. C.; Atkin, R.; Forsyth, M., Engineering High-Energy-Density Sodium Battery Anodes for Improved Cycling with Superconcentrated Ionic-Liquid Electrolytes. *Nature Materials* **2020**, *19*, 1096-1101. IF=38.663

2. Talebian, S.; Wallace, G. G.; Schroeder, A.; Stellacci, F.; Conde, J., Nanotechnology-Based Disinfectants and Sensors for Sars-Cov-2. *Nature Nanotechnology* **2020**, *15,* 618-621. IF=31.538

3. MacFarlane, D. R.; Cherepanov, P. V.; Choi, J.; Suryanto, B. H. R.; Hodgetts, R. Y.; Bakker, J. M.; Ferrero Vallana, F. M.; Simonov, A. N., A Roadmap to the Ammonia Economy. *Joule* **2020**, *4,* 1186-1205. IF=29.155

4. McPherson, I.; Zhang, J., Can Electrification of Ammonia Synthesis Decrease Its Carbon Footprint? *Joule* **2020**, *4,* 12-14. IF=29.155

5. Jang, Y.; Kim, S. M.; Spinks, G. M.; Kim, S. J., Carbon Nanotube Yarn for Fiber-Shaped Electrical Sensors, Actuators, and Energy Storage for Smart Systems. *Advanced Materials* **2020**, *32.* IF=27.398

6. Li, M.; Wang, H.; Luo, W.; Sherrell, P. C.; Chen, J.; Yang, J., Heterogeneous Single-Atom Catalysts for Electrochemical CO_2 Reduction Reaction. *Advanced Materials* **2020**, *32.* IF=27.398

7. MacFarlane, D. R.; Choi, J.; Suryanto, B. H. R.; Jalili, R.; Chatti, M.; Azofra, L. M.; Simonov, A. N., Liquefied Sunshine: Transforming Renewables into Fertilizers and Energy Carriers with Electromaterials. *Advanced Materials* **2020**, *32.* IF=27.398

8. Wang, G.; Yu, C.; MacFarlane, D.; Zhao, H., Materials Science in Australia. *Advanced Materials* **2020**, *32.* IF=27.398

9. Wang, X.; Jia, Y.; Mao, X.; Liu, DB.; He, WX.; Li, J.; Liu, J.G.; Yan, X.C.; Chen, J.; Song, L.; Du, A.J.; Yao, X.D., Edge-Rich Fe–N-4 Active Sites in Defective Carbon for Oxygen Reduction Catalysis. *Advanced Materials* **2020**, *32.* IF=27.398

10. Wang, X.; Kerr, R.; Chen, F.; Goujon, N.; Pringle, J. M.; Mecerreyes, D.; Forsyth, M.; Howlett, P. C., Toward High-Energy-Density Lithium Metal Batteries: Opportunities and Challenges for Solid Organic Electrolytes. *Advanced Materials* **2020**, *32.* IF=27.398

11. Zhang, W.J.; Dong, G.X.; Feng, H.H.; Shan, S.Y.; Huang, L.B.; Yuan, F.; Bao, B.J.; Yan, L.; Xia, Z.L.; Lawson, T.; Chen, J.; Qu, J.; Liu, Y., Wearable Corneal Biosensors Fabricated from PEDOT Functionalized Sulfur-Doped Graphene for Use in the Early Detection of Myopia. *Advanced Materials Technologies* **2020**, *5.* IF=27.398

12. Lin, L.; Chen, J.; Liu, D.; Li, X.; Wallace, G. G.; Zhang, S., Engineering 2D Materials: A Viable Pathway for Improved Electrochemical Energy Storage. *Advanced Energy Materials* **2020**, *10.* IF=25.245

13. Lin, L.; Sherrell, P.; Liu, Y.; Lei, W.; Zhang, S.; Zhang, H.; Wallace, G. G.; Chen, J., Engineered 2D Transition Metal Dichalcogenides—a Vision of Viable Hydrogen Evolution Reaction Catalysis. *Advanced Energy Materials* **2020**, *10.* IF=25.245

14. Liu, Y.Q.; Zhang, S.; Zhou, Y.T.; Buckingham, M.A.; Aldous, L.; Sherrell, P.C.; Wallace, G.G.; Ryder, G.; Faisal, S.; Officer, D.L.; Beirne, S.; Chen, J., Advanced Wearable Thermocells for Body Heat Harvesting. *Advanced Energy Materials* **2020**, *10.* IF=25.245

15. Yang, F.; Hao, J.; Long, J.; Liu, S.; Zheng, T.; Lie, W.; Chen, J.; Guo, Z., Achieving High-Performance Metal Phosphide Anode for Potassium Ion Batteries Via Concentrated Electrolyte Chemistry. *Advanced Energy Materials* **2020**. IF=25.245

16. Yang, F.H; Hong, J.; Hao, J.N.; Zhang, S.L.; Liang, G.M.; Long, J.; Liu, Y.Q.; Liu, N.N.; Pang, W.K.; Chen, J.; Guo, Z.P., Ultrathin Few-Layer Gep Nanosheets Via Lithiation-Assisted Chemical Exfoliation and Their Application in Sodium Storage. *Advanced Energy Materials* **2020**, *10.* IF=25.245

17. Wang, X.; Jia, Y.; Mao, X.; Zhang, L.Z.; Liu, D.B.; Song, L.; Yan, X.C.; Chen, J.; Yang, D.J.; Zhou, J.Z.; Wang, K.; Du, A.J.; Yao, X.D., A Directional Synthesis for Topological Defect in Carbon. *Chem* **2020**, *6,* 2009-2023. IF=19.735

18. Choi, J.; Du, H.L.; Nguyen, C.K.; Suryanto, B.H.R.; Simonov, A.N.; MacFarlane, D.R., Electroreduction of Nitrates, Nitrites, and Gaseous Nitrogen Oxides: A Potential Source of Ammonia in Dinitrogen Reduction Studies. *ACS Energy Letters* **2020**, *5,* 2095-2097. IF=19.003

19. Hodgetts, R. Y.; Kiryutin, A. S.; Nichols, P.; Du, H. L.; Bakker, J. M.; MacFarlane, D. R.; Simonov, A. N., Refining Universal Procedures for Ammonium Quantification via Rapid ^{1}H NMR Analysis for Dinitrogen Reduction Studies. *ACS Energy Letters* **2020**, *5,* 736-741. IF=19.003

20. Kunzel, M.; Panhuis, M. I. H., Strain Sensors Based on Conducting Poly(Acrylamide) Hydrogels. *MRS Advances* **2020**, *5,* 917-925. IF=19.003

21. Keller, A.; Warren, H.; Panhuis, M. I. H., Development of a Facile One-Pot Synthesis Method for an Ingestible pH Sensitive Actuator. *MRS Advances* **2020**, *5,* 881-889. IF=19.003

22. Ortiz-Vitoriano, N.; Monterrubio, I.; Garcia-Quintana, L.; López Del Amo, J. M.; Chen, F.; Rojo, T.; Howlett, P. C.; Forsyth, M.; Pozo-Gonzalo, C., Highly Homogeneous Sodium Superoxide Growth in Na-O_2 Batteries Enabled by a Hybrid Electrolyte. *ACS Energy Letters* **2020**, *5*, 903-909. IF=19.003

23. Kumar, A.; Ghosh, A.; Forsyth, M.; MacFarlane, D.R.; Mitra, S., Free-Radical Catalysis and Enhancement of the Redox Kinetics for Room-Temperature Sodium-Sulfur Batteries. *ACS Energy Letters* **2020**, *5,* 2112-2121. IF=19.003

24. Zhang, Y.; Guo, S. X.; Zhang, X.; Bond, A. M.; Zhang, J., Mechanistic Understanding of the Electrocatalytic CO_2 Reduction Reaction – New Developments Based on Advanced Instrumental Techniques. *Nano Today* **2020**, *31.* IF=16.907

25. Fretz, S. J.; Pal, U.; Girard, G. M. A.; Howlett, P. C.; Palmqvist, A. E. C., Lithium Sulfonate Functionalisation of Carbon Cathodes as a Substitute for Lithium Nitrate in the Electrolyte of Lithium–Sulfur Batteries. *Advanced Functional Materials* **2020**, *30.* IF=16.836

26. Ghosh, A.; Kumar, A.; Das, T.; Ghosh, A.; Chakraborty, S.; Kar, M.; MacFarlane, D. R.; Mitra, S., Lewis Acid–Base Interactions between Polysulfides and Boehmite Enables Stable Room-Temperature Sodium–Sulfur Batteries. *Advanced Functional Materials* **2020**, *30.* IF=16.836

27. Hao, J.; Li, X.; Zhang, S.; Yang, F.; Zeng, X.; Zhang, S.; Bo, G.; Wang, C.; Guo, Z., Designing Dendrite-Free Zinc Anodes for Advanced Aqueous Zinc Batteries. *Advanced Functional Materials* **2020**, *30*. IF=16.836

28. Kim, J.; Hope, C.M.; Gantumur, N.; Perkins, G.B.; Stead, S.O.; Yue, Z.L.; Liu, X.; Asua, A.U.; Kette, F.D.; Penko, D.; Drogemuller, C.J.; Carroll, R.P.; Barry, S.C.; Wallace, G.G; Coates, P.T., Encapsulation of Human Natural and Induced Regulatory T-Cells in IL-2 and CCL1 Supplemented Alginate-Gelma Hydrogel for 3D Bioprinting. *Advanced Functional Materials* **2020**, *30.* IF=16.836

29. Fan, L.L.; Lei, S.L.; Sari, H.M.K.; Zhong, L.S.; Kakimov, A.; Wang, J.J.; Chen, J.; Liu, D.Z.; Huang, L.; Hu, J.H.; Lin, L.X.; Li, X.F., Controllable S-Vacancies of Monolayered Mo–S Nanocrystals for Highly Harvesting Lithium Storage. *Nano Energy* **2020**, *78.* IF=16.602

30. Xie, C.; Chen, W.; Du, S.; Yan, D.; Zhang, Y.; Chen, J.; Liu, B.; Wang, S., *in situ* Phase Transition of WO_3 Boosting Electron and Hydrogen Transfer for Enhancing Hydrogen Evolution on Pt. *Nano Energy* **2020**, *71*. IF=16.602

31. Blyth, M. T.; Noble, B. B.; Russell, I. C.; Coote, M. L., Oriented Internal Electrostatic Fields Cooperatively Promote Ground- and Excited-State Reactivity: A Case Study in Photochemical CO_2 Capture. *Journal of the American Chemical Society* **2020**, *142,* 606-613. IF=14.612

32. Xu, L.; Izgorodina, E. I.; Coote, M. L., Ordered Solvents and Ionic Liquids Can Be Harnessed for Electrostatic Catalysis. *Journal of the American Chemical Society* **2020**, *142,* 12826-12833. IF=14.612

33. Castilho, M.; de Ruijter, M.; Beirne, S.; Villette, C. C.; Ito, K.; Wallace, G. G.; Malda, J., Multitechnology Biofabrication: A New Approach for the Manufacturing of Functional Tissue Structures? *Trends in Biotechnology* **2020**, *38,* 1316-1328. IF=14.343

34. Nothling, M.D.; Xiao, Z.Y.; Hill, N.S.; Blyth, M.T.; Bhaskaran, A.; Sani, M.A.; Espinosa-Gomez, A.; Ngov, K.; White, J.; Buscher, T.; Separovic, F.; O'Mara, M.L.; Coote, M.L.; Connal, L.A., A Multifunctional Surfactant Catalyst Inspired by Hydrolases. *Science Advances* **2020**, *6.* IF=13.117

35. Aziz, S.; Spinks, G. M., Torsional Artificial Muscles. *Materials Horizons* **2020**, *7,* 667-693. IF=12.319

36. Choi, J.; Suryanto, B. H. R.; Wang, D.; Du, H. L.; Hodgetts, R. Y.; Ferrero Vallana, F. M.; MacFarlane, D. R.; Simonov, A. N., Identification and Elimination of False Positives in Electrochemical Nitrogen Reduction Studies. *Nature Communications* **2020**, *11.* IF=12.121

37. Vogel, Y.B.; Evans, C.W.; Belotti, M.; Xu, L.K.; Russell, I.C.; Yu, L.J.; Fung, A.K.K.; Hill, N.S.; Darwish, N.; Goncales, V.R.; Coote, M.L.; Iyer, K.S.; Ciampi, S., The Corona of a Surface Bubble Promotes Electrochemical Reactions. *Nature Communications* **2020**, *11.* IF=12.121

38. Pham, S. T.; Tieu, K. A.; Wan, S.; Hao, J.; Nguyen, H. H.; Mitchell, D. R. G.; Sencadas, V., Intrinsic Effect of Nanoparticles on the Mechanical Rupture of Doubled-Shell Colloidal Capsule via *in situ* TEM Mechanical Testing and STEM Interfacial Analysis. *Small* **2020**, *16.* IF=11.459

39. Zou, J.; Iqbal, M.; Vijayakumar, A.; Wang, C.; MacFarlane, D. R.; Yamauchi, Y.; Lee, C. Y.; Wallace, G. G., Hierarchical Architectures of Mesoporous Pd on Highly Ordered TiO_2 Nanotube Arrays for Electrochemical CO_2 Reduction. *Journal of Materials Chemistry A* **2020**, *8*, 8041-8048. IF=11.301

40. Choi, J.; Kim, J.; Wagner, P.; Na, J.; Wallace, G. G.; Officer, D. L.; Yamauchi, Y., Highly Ordered Mesoporous Carbon/Iron Porphyrin Nanoreactor for the Electrochemical Reduction of CO_2. *Journal of Materials Chemistry A* **2020**, *8*, 14966-14974. IF=11.301

41. Zhou, Y.N.; Yan, P.F.; Jia, J.; Zhang, S.Y.; Zheng, X.L.; Zhang, L.; Zhang, B.; Chen, J.; Hao, W.C.; Chen, G.J.; Xu, Q.; Han, B.X., Supercritical CO_2-Constructed Intralayer $Bi_2O_2^{2+}$ Structural Distortion for Enhanced CO_2 Electroreduction. *Journal of Materials Chemistry A* **2020**, *8,* 13320-13327. IF=11.301

42. Zhu, H.; Xu, T.; Chen, L.; Forsyth, M., Proton Transport in Crystalline, Porous Covalent Organic Frameworks: A NMR Study. *Journal of Materials Chemistry A* **2020**, *8,* 20939-20945. IF=11.301

43. Zhao, C.; Jia, X.; Shu, K.; Yu, C.; Wallace, G. G.; Wang, C., Conducting Polymer Composites for Unconventional Solid-State Supercapacitors. *Journal of Materials Chemistry A* **2020**, *8,* 4677-4699. IF=11.301

44. Pal, U.; Chen, F.; Gyabang, D.; Pathirana, T.; Roy, B.; Kerr, R.; MacFarlane, D. R.; Armand, M.; Howlett, P. C.; Forsyth, M., Enhanced Ion Transport in an Ether Aided Super Concentrated Ionic Liquid Electrolyte for Long-Life Practical Lithium Metal Battery Applications. *Journal of Materials Chemistry A* **2020**, *8,* 18826-18839. IF=11.301

45. Periyapperuma, K.; Arca, E.; Harvey, S.; Ban, C.; Burrell, A.; Macfarlane, D. R.; Pozo-Gonzalo, C.; Forsyth, M.;

Howlett, P. C., Towards High Rate Li Metal Anodes: Enhanced Performance at High Current Density in a Superconcentrated Ionic Liquid. *Journal of Materials Chemistry A* **2020**, *8,* 3574-3579. IF=11.301

46. Chen, Y.; Cai, J.; Li, P.; Zhao, G.; Wang, G.; Jiang, Y.; Chen, J.; Dou, S. X.; Pan, H.; Sun, W., Hexagonal Boron Nitride as a Multifunctional Support for Engineering Efficient Electrocatalysts toward the Oxygen Reduction Reaction. *Nano Letters* **2020**, *20,* 6807-6814. IF=11.238

47. Liao, J.; Ni, W.; Wang, C.; Ma, J., Layer-Structured Niobium Oxides and Their Analogues for Advanced Hybrid Capacitors. *Chemical Engineering Journal* **2020**, *391.* IF=10.652

48. Hejazi, M.A.; Tong, W.; Stacey, A; Soto-Breceda, A.; Ibbotson, M.R.; Yunzab, M.; Maturana, M.I.; Almasi, A.; Jung, Y.J.; Sun, S.; Meffin, H.; Fang, J.; Stamp, M.E.M.; Ganesan, K.; Fox, K.; Rifai, A.; Nadarajah, A.; Falahatdoost, S.; Prawer, S.; Apollo, N.V. ; Garrett, D.J., Hybrid Diamond/ Carbon Fiber Microelectrodes Enable Multimodal Electrical/Chemical Neural Interfacing. *Biomaterials* **2020**, *230.* IF=10.317

49. Singh, M.; Yin, C.S.; Page, S.J.; Liu, Y.Q; Wicaksono, G.; Pujar, R.; Choudhary, S.K.; Kulkarni, G.U.; Chen, J.; Hanna, J.V.; Webster, R.D.; Steele, T.W.J., Synergistic Voltaglue Adhesive Mechanisms with Alternating Electric Fields. *Chemistry of Materials* **2020**, *32*, 2440-2449. IF=9.567

50. Bathellier, C.; Yu, L. J.; Farquhar, G. D.; Coote, M. L.; Lorimer, G. H.; Tcherkez, G., Ribulose 1,5-Bisphosphate Carboxylase/ Oxygenase Activates O_2 by Electron Transfer. *Proceedings of the National Academy of Sciences of the United States of America* **2020**, *117,* 24234-24242. IF=9.412

51. Hu, M ; Wu, X.L.; Tan, W.L.; Tan, B.; Scully, A.D.; Ding, L.; Zhou, C.; Xiong, Y.L.; Huang, F.Z.; Simonov, A.N.; Bach, U.; Cheng, Y.B.; Wang, S.X.; Lu, J.F., Solvent Engineering of a Dopant-Free Spiro-Ometad Hole-Transport Layer for Centimeter-Scale Perovskite Solar Cells with High Efficiency and Thermal Stability. *ACS Applied Materials and Interfaces* **2020**, *12,* 8260-8270. IF=8.758

52. Khan, J. U.; Sayyar, S.; Paull, B.; Innis, P. C., Novel Approach toward Electrofluidic Substrates Utilising Textile-Based Braided Structure. *ACS Applied Materials and Interfaces* **2020**, *12,* 45618-45628. IF=8.758

53. Kalsoom, U., Waheed, S., Paull, B., Fabrication of Humidity Sensor Using 3D Printable Polymer Composite Containing Boron-Doped Diamonds and LiCl, *ACS Applied Materials and Interfaces* **2020**, *12,* 4962-4969, IF=8.758

54. Li, F. ; Kaiser, M.R.; Ma, J.M. ; Hou, Y.Y.; Zhou, T.F.; Han, Z.J.; Lai, W.H.; Chen, J.; Guo, Z.P.; Liu, H.K.; Wang, J.Z., Uniform Polypyrrole Layer-Coated Sulfur/Graphene Aerogel via the Vapor-Phase Deposition Technique as the Cathode Material for Li-S Batteries. *ACS Applied Materials and Interfaces* **2020**, *12,* 5958-5967. IF=8.758

55. Periyapperuma, K.; Arca, E.; Harvey, S.; Pathirana, T.; Ban, C.; Burrell, A.; Pozo-Gonzalo, C.; Howlett, P. C., High Current Cycling in a Superconcentrated Ionic Liquid Electrolyte to Promote Uniform Li Morphology and a Uniform LiF-Rich Solid Electrolyte Interphase. *ACS Applied Materials and Interfaces* **2020**, *12,* 42236-42247. IF=8.758

56. Shao, L.; Li, Y.; Ma, Z.L; Bai, Y.; Wang, J.; Zeng, P.Y.; Gong, P.; Shi, F.X.; Ji, Z.Y.; Qiao, Y.; Xu, R.; Xu, J.J.; Zhang, G.H.; Wang, C.Y.; Ma, J.Z., Highly Sensitive Strain Sensor Based on a Stretchable and Conductive Poly(Vinyl Alcohol)/Phytic acid/NH_2-POSS Hydrogel with a 3D Microporous Structure. *ACS Applied Materials and Interfaces* **2020**, *12,* 26496-26508. IF=8.758

57. Ribeiro, S.; Puckert, C.; Ribeiro, C.; Gomes, A. C.; Higgins, M. J.; Lanceros-Méndez, S., Surface Charge-Mediated Cell-Surface Interaction on Piezoelectric Materials. *ACS Applied Materials and Interfaces* **2020**, *12,* 191-199. IF=8.758

58. Lee, D.W.; Kim, H.; Hyeon, J.S.; Moon, J.H.; Kim, B.J.; Jeong, J.H.; Choi, J.; Baughman, R.H.; Spinks, G.M.; Wallace, G.G.; Kim, S.J., Bidirectional Core Sandwich Structure of Reduced Graphene Oxide and Spinnable Multiwalled Carbon Nanotubes for Electromagnetic Interference Shielding Effectiveness. *ACS applied materials and interfaces* **2020**, *12,* 46883-46891. IF=8.758

59. Qin, C.; Yue, Z.; Chao, Y.; Forster, R. J.; Maolmhuaidh, F. Ó.; Huang, X. F.; Beirne, S.; Wallace, G. G.; Chen, J., Bipolar Electroactive Conducting Polymers for Wireless Cell Stimulation. *Applied Materials Today* **2020**, *21.* IF=8.352

60. Aldalur, I.; Wang, X.E.; Santiago, A.; Goujon, N.; Echeverria, M.; Martinez-Ibanez, M.; Piszcz, M.; Howlett, P.C; Forsyth, M.; Armand, M.; Zhang, H., Nanofiber-Reinforced Polymer Electrolytes toward Room Temperature Solid-State Lithium Batteries. *Journal of Power Sources* **2020**, *448.* IF=8.247

61. Oveissi, F.; Spinks, G. M.; Naficy, S., Bond Reformation, Self-Recovery, and Toughness in Hydrogen- Bonded Hydrogels. *ACS Applied Polymer Materials* **2020**. IF= 8.097

62. Vijayakumar, A.; Zhao, Y.; Zou, J.; Wang, K.; Lee, C. Y.; MacFarlane, D. R.; Wang, C.; Wallace, G. G., A Self-Assembled CO_2 Reduction Electrocatalyst: Posy-Bouquet-Shaped Gold- Polyaniline Core-Shell Nanocomposite. *ChemSusChem* **2020**, *13,* 5023-5030. IF=7.962

63. Wang, Z.L. ; Choi, J.; Xu, M.Q.; Hao, X.F.; Zhang, H.; Jiang, Z.; Zuo, M.; Kim, J.; Zhou, W.; Meng, X.G.; Yu, Q.; Sun, Z.H.; Wei, S.Q.; Ye, J.H.; Wallace, G.G.; Officer, D.L.; Yamauchi, Y. Optimising Electron Densities of Ni-N-C Complexes by Hybrid Coordination for Efficient Electrocatalytic CO_2 Reduction. *ChemSusChem* **2020**, *13,* 929-937. IF=7.962

64. Zhang, Y.; Li, L.; Guo, S. X.; Zhang, X.; Li, F.; Bond, A. M.; Zhang, J., Two-Dimensional Electrocatalysts for Efficient Reduction of Carbon Dioxide. *ChemSusChem* **2020**, *13,* 59-77. IF=7.962

65. Zhang, Y.; Zhang, X.; Zhu, Y.; Qian, B.; Bond, A. M.; Zhang, J., The Origin of the Electrocatalytic Activity for CO_2 Reduction Associated with Metal-Organic Frameworks. *ChemSusChem* **2020**, *13,* 2552-2556. IF=7.962

66. Shao, L.; Xu, R.; Wang, J.; Ma, Z.; Ji, Z.; Zhang, W.; Wei, H.; Zhu, C.; Wang, C.; Ma, J., Recyclable and Reprocessable Crosslinked Rubber Enabled by Constructing Ionic Crosslinked Networks. *ACS Sustainable Chemistry and Engineering* **2020**, *8,* 12999-13006. IF=7.632

67. Wade, S. J.; Sahin, Z.; Piper, A. K.; Talebian, S.; Aghmesheh, M.; Foroughi, J.; Wallace, G. G.; Moulton, S. E.; Vine, K. L., Dual Delivery of Gemcitabine and Paclitaxel by Wet-Spun Coaxial Fibers Induces Pancreatic Ductal Adenocarcinoma Cell Death, Reduces Tumor Volume, and Sensitizes Cells to Radiation. *Advanced Healthcare Materials* **2020**, *9.* IF=7.367

68. Zhou, Y.; Yue, Z.; Chen, Z.; Wallace, G., 3D Coaxial Printing Tough and Elastic Hydrogels for Tissue Engineering Using a Catechol Functionalized Ink System. *Advanced Healthcare Materials* **2020**, *9.* IF=7.367

69. Chen, Z.; Liu, X.; You, J.; Song, Y.; Tomaskovic-Crook, E.; Sutton, G.; Crook, J. M.; Wallace, G. G., Biomimetic Corneal Stroma Using Electro-Compacted Collagen. *Acta Biomaterialia* **2020**, *113,* 360-371. IF=7.242

70. Puckert, C.; Tomaskovic-Crook, E.; Gambhir, S.; Wallace, G. G.; Crook, J. M.; Higgins, M. J., Molecular Interactions and Forces of Adhesion between Single Human Neural Stem Cells and Gelatin Methacrylate Hydrogels of Varying Stiffness. *Acta Biomaterialia* **2020**, *106,* 156-169. IF=7.242

71. Wu, D.; Wang, C.; Wu, M.; Chao, Y.; He, P.; Ma, J., Porous Bowl-Shaped VS_2 Nanosheets/ Graphene Composite for High-Rate Lithium-Ion Storage. *Journal of Energy Chemistry* **2020**, *43,* 24-32. IF=7.216

72. Li, S.; Zhao, L.; Lei, S.; Liu, A.; Chen, J.; Li, C.; Wu, H.; Lin, L., Improved Charge Injection of Edge Aligned MoS_2/ MoO_2 Hybrid Nanosheets for Highly Robust and Efficient Electrocatalysis of H_2 Production. *Nanoscale* **2020**, *12,* 5003-5013. IF=6.895

73. Zheng, T.; Yue, Z.; Wallace, G. G.; Du, Y.; Higgins, M. J., Nanoscale Piezoelectric Effect of Biodegradable PLA-Based Composite Fibers by Piezoresponse Force Microscopy. *Nanotechnology* **2020**, *31.* IF=6.895

74. Lee, C. Y.; Sayyar, S.; Molino, P. J.; Wallace, G. G., A Robust 3D Printed Multilayer Conductive Graphene/ Polycaprolactone Composite Electrode. *Materials Chemistry Frontiers* **2020**, *4,* 1664-1670. IF=6.788

75. Hemida, M.; Coates, L. J.; Lam, S.; Gupta, V.; Macka, M.; Wirth, H. J.; Gooley, A. A.; Haddad, P. R.; Paull, B., Miniature Multiwavelength Deep UV-LED-Based Absorption Detection System for Capillary LC. *Analytical Chemistry* **2020**, *92,* 13688-13693. IF=6.785

76. Zhu, H.; Forsyth, M., Ion Vacancies and Transport in 1-Methylimidazolium Triflate Organic Ionic Plastic Crystal. *Journal of Physical Chemistry Letters* **2020**, *11*, 510-515. IF=6.710

77. Harris, A. R.; McGivern, P.; Ooi, L., Modeling Emergent Properties in the Brain Using Tissue Models to Investigate Neurodegenerative Disease. *Neuroscientist* **2020**, *26,* 224-230. IF=6.500

78. Biernacka, K.; Al-Masri, D.; Yunis, R.; Zhu, H.; Hollenkamp, A. F.; Pringle, J. M., Development of New Solid-State Electrolytes Based on a Hexamethylguanidinium Plastic Crystal and Lithium Salts. *Electrochimica Acta* **2020**, *357.* IF=6.215

79. Dong, S.; Cabral, D. M.; Pringle, J. M.; Macfarlane, D. R., Exploring the Electrochemical Properties of Mixed Ligand Fe(Ii) Complexes as Redox Couples. *Electrochimica Acta* **2020**, *362.* IF=6.215

80. Jin, D.; Bae, H. S.; Hong, J.; Kim, S.; Oh, J.; Kim, K.; Jo, T.; Lee, Y. M.; Lee, Y. G.; Ryou, M. H., Scaffold-Structured Polymer Binders for Long-Term Cycle Performance of Stabilized Lithium-Powder Electrodes. *Electrochimica Acta* **2020**, *364.* IF-6.215

81. Rao, J.; Wang, X.; Yunis, R.; Ranganathan, V.; Howlett, P. C.; MacFarlane, D. R.; Forsyth, M.; Zhu, H., A Novel Proton Conducting Ionogel Electrolyte Based on Poly(Ionic Liquids) and Protic Ionic Liquid. *Electrochimica Acta* **2020**, *346.* IF=6.215

82. Laba, K.; Lapkowski, M.; Officer, D. L.; Wagner, P.; Data, P., Electrochemical and Optical Aspects of Cobalt Meso-Carbazole Substituted Porphyrin Complexes. *Electrochimica Acta* **2020**, *330.* IF=6.215

83. Russo, M. J.; Han, M.; Quigley, A. F.; Kapsa, R. M. I.; Moulton, S. E.; Doeven, E.; Guijt, R.; Silva, S. M.; Greene, G. W., Lubricin (PRG4) Reduces Fouling Susceptibility and Improves Sensitivity of Carbon-Based Electrodes. *Electrochimica Acta* **2020**, *333.* IF=6.215

84. Zhao, C.; Jia, X.; Shu, K.; Yu, C.; Min, Y.; Wang, C., Stretchability Enhancement of Buckled Polypyrrole Electrodes for Stretchable Supercapacitors via Engineering Substrate Surface Roughness. *Electrochimica Acta* **2020**, *343.* IF=6.215

85. Jahanshahi, M.; Kowsari, E; Haddadi-Asl, V.; Khoobi, M.; Bazri, B.; Aryafard, M.; Lee, J.H.; Kadumudi, F.B.; Talebian, S.; Kamaly, N.; Mehrali, M.; Dolatshahi-Pirouz, A., An Innovative and Eco-Friendly Modality for Synthesis of Highly Fluorinated Graphene by an Acidic Ionic Liquid: Making of an Efficacious Vehicle for Anti-Cancer Drug Delivery. *Applied Surface Science* **2020**, *515.* IF=6.182

86. Cecil, F.; Guijt, R. M.; Henderson, A. D.; Macka, M.; Breadmore, M. C., One Step Multi-Material 3D Printing for the Fabrication of a Photometric Detector Flow Cell. *Analytica Chimica Acta* **2020**, *1097,* 127-134. IF=5.977

87. Fornells, E.; Murray, E.; Waheed, S.; Morrin, A.; Diamond, D.; Paull, B.; Breadmore, M., Integrated 3D Printed Heaters for Microfluidic Applications: Ammonium Analysis within Environmental Water. *Analytica Chimica Acta* **2020**, *1098,* 94-101. IF=5.977

88. Abreu, C. M. R.; Rezende, T. C.; Fonseca, A. C.; Guliashvili, T.; Bergerbit, C.; D'Agosto, F.; Yu, L. J.; Serra, A. C.; Coote, M. L.; Coelho, J. F. J., Polymerisation of Vinyl Chloride at Ambient Temperature Using Macromolecular Design via the Interchange of Xanthate: Kinetic and Computational Studies. *Macromolecules* **2020**, *53,* 190-202. IF=5.918

89. Hill, N. S.; Fule, M. J.; Morris, J.; Clément, J. L.; Guillaneuf, Y.; Gigmes, D.; Coote, M. L., Mesolytic versus Homolytic Cleavage in Photochemical Nitroxide-Mediated Polymerisation. *Macromolecules* **2020**, *53,* 1567-1572. IF=5.918

90. Olmedo-Martínez, J. L.; Porcarelli, L.; Porcarelli, L.; Alegría, Á.; Alegría, Á.; Mecerreyes, D.; Müller, A. J., High Lithium Conductivity of Miscible Poly(Ethylene Oxide)/Methacrylic Sulfonamide Anionic Polyelectrolyte Polymer Blends. *Macromolecules* **2020**, *53,* 4442-4453. IF=5.918

91. Li, J.; Liu, X.; Crook, J. M.; Wallace, G. G., Electrical Stimulation-Induced Osteogenesis of Human Adipose Derived Stem Cells Using a Conductive Graphene-Cellulose Scaffold. *Materials Science and Engineering C* **2020**, *107*. IF=5.88

92. Alshahrani, A. A.; Algamdi, M. S.; Alsohaimi, I. H.; Nghiem, L. D.; Tu, K. L.; Al-Rawajfeh, A. E.; in het Panhuis, M., The Rejection of Mono- and Di-Valent Ions from Aquatic Environment by MWNT/Chitosan Buckypaper Composite Membranes: Influences of Chitosan Concentrations. *Separation and Purification Technology* **2020**, *234.* IF=5.774

93. Shu, K.; Wang, C.; Li, W.; Bussell, T.; Ding, J., Electrolytes with Reversible Switch between Liquid and Solid Phases. *Current Opinion in Electrochemistry* **2020**, *21,* 297-302. IF=5.579

94. Mendes, T. C.; Nguyen, C.; Barlow, A. J.; Cherepanov, P. V.; Forsyth, M.; Howlett, P. C.; MacFarlane, D. R., A Safe Li-Se Battery in an Ionic Liquid-Based Electrolyte Operating at 25-70 °C by Using a N,S,O Tri-Doped Mesoporous Carbon Host Material. *Sustainable Energy and Fuels* **2020**, *4,* 2322-2332. IF=5.503

95. Sun, B.; Ariawan, A. D.; Warren, H.; Goodchild, S. C.; In Het Panhuis, M.; Ittner, L. M.; Martin, A. D., Programmable Enzymatic Oxidation of Tyrosine-Lysine Tetrapeptides. *Journal of Materials Chemistry B* **2020**, *8,* 3104-3112. IF=5.344

96. Pirovano, P.; Dorrian, M.; Shinde, A.; Donohoe, A.; Brady, A. J.; Moyna, N. M.; Wallace, G.; Diamond, D.; McCaul, M., A Wearable Sensor for the Detection of Sodium and Potassium in Human Sweat During Exercise. *Talanta* **2020**, *219.* IF=5.339

97. Jia, X.; Wang, C.; Lee, C. Y.; Yu, C.; Wallace, G. G., Energy Materials for Transient Power Sources. *MRS Bulletin* **2020**, *45,* 121-128. IF=5.177

98. Gyabeng, D.; Qiao, L.; Zhang, H.; Oteo, U.; Armand, M.; Forsyth, M.; Chen, F.; O'Dell, L. A., Anion-Cation Interactions in Novel Ionic Liquids Based on an Asymmetric Sulfonimide Anion Observed by NMR and MD Simulations. *Journal of Molecular Liquids* **2020**. IF=5.065

99. Hilder, M.; Pointu, T.; Zhu, H.; Armand, M.; Howlett, P.; Forsyth, M., Ion Interactions and Dynamics in Pseudohalide Based Ionic Liquid Electrolytes Containing Sodium Solutes. *Journal of Molecular Liquids* **2020**, *303.* IF=5.065

100. Alsultan, M.; Choi, J.; Jalili, R.; Wagner, P.; Swiegers, G. F., Synergistic Amplification of (Photo)Catalytic Oxygen and Hydrogen Generation from Water by Thin-Film Polypyrrole Composites. *Molecular Catalysis* **2020**, *490.* IF=5.008

101. Wang, X.; Yang, G.; Chai, G.; Nasir, M. S.; Wang, S.; Zheng, X.; Wang, C.; Yan, W., Fabrication of Heterostructured UiO_{66}-NH_2/CNTs with Enhanced Activity and Selectivity over Photocatalytic CO_2 Reduction. *International Journal of Hydrogen Energy* **2020**, *45,* 30634-30646. IF=4.939

102. Shao, L.; Xu, J.; Ma, J.; Zhai, B.; Li, Y.; Xu, R.; Ma, Z.; Zhang, G.; Wang, C.; Qiu, J., MXene/RGO Composite Aerogels with Light and High-Strength for Supercapacitor Electrode Materials. *Composites Communications* **2020**, *19,* 108-113. IF=4.915

103. Bruen, D.; Delaney, C.; Chung, J.; Ruberu, K.; Wallace, G. G.; Diamond, D.; Florea, L., 3D Printed Sugar-Sensing Hydrogels. *Macromolecular Rapid Communications* **2020**, *41.* IF=4.886

104. Zhang, J.; Lalevée, J.; Hill, N. S.; Kiehl, J.; Zhu, D.; Cox, N.; Langley, J.; Stenzel, M. H.; Coote, M. L.; Xiao, P., Substituent Effects on Photoinitiation Ability of Monoaminoanthraquinone-Based Photoinitiating Systems for Free Radical Photopolymerisation under LEDs. *Macromolecular Rapid Communications* **2020**, *41.* IF=4.886

105. Alsultan, M.; Choi, J.; Wagner, P.; Swiegers, G. F., Synergistic Amplification of Oxygen Generation in (Photo) Catalytic Water Splitting by a PEDOT/Nano-Co_3O_4/MWCNT Thin Film Composite. *ChemCatChem* **2020**, *12,* 1580-1584. IF=4.853

106. Gietman, S. W.; Silva, S. M.; del Rosal, B.; Kapsa, R. M. I.; Stoddart, P. R.; Moulton, S. E., Tuning Drug Dosing through Matching Optically Active Polymer Composition

and NIR Stimulation Parameters. *International Journal of Pharmaceutics* **2020**, *575.* IF=4.845

107. Konishi, T.; Kodani, K.; Hasegawa, T.; Ogo, S.; Guo, S. X.; Boas, J. F.; Zhang, J.; Bond, A. M.; Ueda, T., Impact of the Lithium Cation on the Voltammetry and Spectroscopy of $[XVM_{11}O_{40}]^{(N-)}$ (X = P, As (n = 4), S (n= 3); M = Mo, W): Influence of Charge and Addenda and Hetero Atoms. *Inorganic Chemistry* **2020**, *59,* 10522-10531. IF=4.825

108. Feng, L.; Watanabe, H.; Molino, P.; Wallace, G. G.; Phung, S. L.; Uchihashi, T.; Higgins, M. J., Corrigendum to "Dynamics of Inter-Molecular Interactions between Single A beta (42) Oligomeric and Aggregate Species by High-Speed Atomic Force Microscopy". *Journal of Molecular Biology* **2020**, *432*, 633. IF=4.760

109. Lang, X.; Hu, Z.; Wang, C., Bifunctional Air Electrodes for Flexible Rechargeable Zn-Air Batteries. *Chinese Chemical Letters* **2020**. IF=4.632

110. Zhao, L.; Li, Y.; Zhou, G.; Lei, S.; Tan, J.; Lin, L.; Wang, J., First-Principles Calculations of Stability of Graphene-Like BC3 Monolayer and Its High-Performance Potassium Storage. *Chinese Chemical Letters* **2020**. IF=4.632

111. Liu, G.; Karuturi, S. K.; Chen, H.; Wang, D.; Ager, J. W.; Simonov, A. N.; Tricoli, A., Enhancement of the Photoelectrochemical Water Splitting by Perovskite $BiFeO_3$ via Interfacial Engineering. *Solar Energy* **2020**, *202,* 198-203. IF=4.608

112. Yang, J. W.; Yu, Z. Y.; Cheng, S. J.; Chung, J. H. Y.; Liu, X.; Wu, C. Y.; Lin, S. F.; Chen, G. Y., Graphene Oxide–Based Nanomaterials: An Insight into Retinal Prosthesis. *International Journal of Molecular Sciences* **2020**, *21.* IF=4.556

113. Ghosh, A.; Kumar, A.; Roy, A.; Nguyen, C.; Ahuja, A.; Adil, M.; Chatti, M.; Kar, M.; MacFarlane, D. R.; Mitra, S., Ultrathin Lithium Aluminate Nanoflake-Inlaid Sulfur as a Cathode Material for Lithium-Sulfur Batteries with High Areal Capacity. *ACS Applied Energy Materials* **2020**, *3,* 5637-5645. IF=4.473

114. Ahmed, A.; Hassan, I.; Helal, A. S.; Sencadas, V.; Radhi, A.; Jeong, C. K.; El-Kady, M. F., Triboelectric Nanogenerator Versus Piezoelectric Generator at Low Frequency (≪4 Hz): A Quantitative Comparison. *iScience* **2020**, *23.* IF=4.447

115. Yun, J. H.; Mozer, A. J.; Wagner, P.; Offier, D. L.; Amal, R.; Ng, Y. H., Light Soaking Effect Driven in Porphyrin Dye-Sensitized Solar Cells Using 1D TiO_2 Nanotube Photoanodes. *Sustainable Materials and Technologies* **2020**, *24*. IF=4.375

116. Doan, V.; Noble, B. B.; Coote, M. L., Electrostatic Activation of Tetrazoles. *Journal of Organic Chemistry* **2020**, *85,* 10091-10097. IF=4.335

117. Nikahd, M.; Mikusek, J.; Yu, L. J.; Coote, M. L.; Banwell, M. G.; Ma, C.; Gardiner, M. G., Exploiting Chitin as a Source of Biologically Fixed Nitrogen: Formation and Full Characterisation of Small-Molecule Hetero- and Carbocyclic Pyrolysis Products. *Journal of Organic Chemistry* **2020**, *85,* 4583-4593. IF=4.335

118. Noble, B. B.; Nesvadba, P.; Coote, M. L., Mechanistic Insights into N-Acyloxyamine-Initiated Controlled Degradation of Polypropylene: The Unexpected Role of Keto-Enol Tautomerisation in Carboxylate Radical Chemistry. *Journal of Organic Chemistry* **2020**, *85,* 2338-2346. IF=4.335

119. Stewart, S. G.; Harfoot, G. J.; McRae, K. J.; Teng, Y.; Yu, L. J.; Chen, B.; Cammi, R.; Coote, M. L.; Banwell, M. G.; Willis, A. C., High-Pressure-Promoted and Facially Selective Diels-Alder Reactions of Enzymatically Derived cis-1,2-dihydrocatechols and Their Acetonide

Derivatives: Enantiodivergent Routes to Homochiral and Polyfunctionalized Bicyclo[2.2.2]Octenes. *Journal of Organic Chemistry* **2020**, *85,* 13080-13095. IF=4.335

120. Cui, D.; Xu, K.; Dong, X.; Lv, D.; Dong, F.; Hao, W.; Du, Y.; Chen, J., Controlled Hydrogenation into Defective Interlayer Bismuth Oxychloride via Vacancy Engineering. *Communications Chemistry* **2020**, *3.* IF=4.253

121. Cho, I.; Zhao, L.; Mapley, J. I.; Shahshahan, S.; Wagner, P.; Gordon, K. C.; Innis, P. C.; Kimura, M.; Mori, S.; Mozer, A. J., Significant Effect of Electronic Coupling on Electron Transfer between Surface-Bound Porphyrins and $Co^{2+/3+}$ Complex Electrolytes. *Journal of Physical Chemistry C* **2020**, *124,* 9178-9190. IF=4.189

122. Kavungathodi, M. F. M.; Cho, I.; Wagner, P.; Mozer, A. J., Synergistic Effect of Alkyl Chain Barriers on Heteroleptic Ruthenium Dyes and $Co^{2+/3+}$ Complex Mediators for Reduced Charge Recombination in Dye-Sensitized Solar Cells. *Journal of Physical Chemistry C* **2020**, *124,* 23013-23026. IF=4.189

123. Moia, D.; Abe, M.; Wagner, P.; Saguchi, H.; Koumura, N.; Nelson, J.; Barnes, P. R. F.; Mori, S., The Effect of the Dielectric Environment on Electron Transfer Reactions at the Interfaces of Molecular Sensitized Semiconductors in Electrolytes. *Journal of Physical Chemistry C* **2020**, *124,* 6979-6992. IF=4.189

124. Popov, I.; Biernacka, K.; Zhu, H.; Nti, F.; Porcarelli, L.; Wang, X.; Khamzin, A.; Gainaru, C.; Forsyth, M.; Sokolov, A. P., Strongly Correlated Ion Dynamics in Plastic Ionic Crystals and Polymerized Ionic Liquids. *Journal of Physical Chemistry C* **2020**, *124,* 17889-17896. IF=4.189

125. Sharma, A.; Li, J.; Guo, S. X.; Bond, A. M.; Zhang, J., Modeling the Influence of Low Concentrations of Water on the Thermodynamics, Electron Transfer Kinetics, and Diffusivity of the $[Ru(CN)_6]^{4-/3-}$ Process in Propylene Carbonate. *Journal of Physical Chemistry C* **2020**, *124,* 13726-13738. IF=4.189

126. Dawkins, M. J. C.; Simonov, A. N.; Jones, C., 2,6-Diiminopyridine Complexes of Group 2 Metals: Synthesis, Characterisation and Redox Behaviour. *Dalton Transactions* **2020**, *49,* 6627-6634. IF=4.174

127. Russo, M. J.; Quigley, A. F.; Kapsa, R. M. I.; Moulton, S. E.; Guijt, R.; Silva, S. M.; Greene, G. W., A Simple Electrochemical Swab Assay for the Rapid Quantification of Clonazepam in Unprocessed Saliva Enabled by Lubricin Antifouling Coatings. *ChemElectroChem* **2020**, *7,* 2851-2858. IF=4.154

128. Wagner, M.; Wagner, K.; Barnsley, J.E.; Veksha, A.; Wagner, P.; Gordon, K.C.; Bobacka, J.; Wallace, G.G.; Ivaska, A.; Officer, D.L.; Lisak, G., Polyterthiophenes Cross-Linked with Terpyridyl Metal Complexes for Molecular Architecture of Optically and Electrochemically Tunable Materials. *ChemElectroChem* **2020**, *7,* 4453-4459. IF=4.154

129. Zou, R.; Shan, S.; Huang, L.; Chen, Z.; Lawson, T.; Lin, M.; Yan, L.; Liu, Y., High-Performance Intraocular Biosensors from Chitosan-Functionalized Nitrogen-Containing Graphene for the Detection of Glucose. *ACS Biomaterials Science and Engineering* **2020**, *6,* 673-679. IF=4.152

130. Robinson, T. M.; Talebian, S.; Foroughi, J.; Yue, Z.; Fay, C. D.; Wallace, G. G., Fabrication of Aligned Biomimetic Gellan Gum-Chitosan Microstructures through 3D Printed Microfluidic Channels and Multiple *in situ* Cross-Linking Mechanisms. *ACS Biomaterials Science and Engineering* **2020**, *6,* 3638-3648. IF=4.152

131. Yuan, Q.; Yu, Y.; Sherrell, P. C.; Chen, J.; Bi, X., Fe/Co-Based Bimetallic MOF-Derived Co_3Fe_7@NCNTFs Bifunctional Electrocatalyst for High-Efficiency Overall Water Splitting. *Chemistry - An Asian Journal* **2020**, *15,* 1728-1735. IF=4.056

132. Lam, S. C.; Coates, L. J.; Gupta, V.; Wirth, H. J.; Gooley, A. A.; Haddad, P. R.; Paull, B., Ultraviolet Absorbance Detector Based on a High Output Power 235 nm Surface Mounted Device-Type Light-Emitting Diode. *Journal of Chromatography A* **2020**, *1631.* IF=4.049

133. Cabot, J. M.; Daikuara, L. Y.; Yue, Z.; Hayes, P.; Liu, X.; Wallace, G. G.; Paull, B., Electrofluidic Control of Bioactive Molecule Delivery into Soft Tissue Models Based on Gelatin Methacryloyl Hydrogels Using Threads and Surgical Sutures. *Scientific Reports* **2020**, *10.* IF=3.998

134. Ha, T. A.; Pozo-Gonzalo, C.; Nairn, K.; MacFarlane, D. R.; Forsyth, M.; Howlett, P. C., An Investigation of Commercial Carbon Air Cathode Structure in Ionic Liquid Based Sodium Oxygen Batteries. *Scientific Reports* **2020**, *10.* IF=3.998

135. Chen, L.; Cabot, J. M.; Sanz Rodriguez, E.; Ghiasvand, A.; Innis, P. C.; Paull, B., Thread-Based Isoelectric Focusing Coupled with Desorption Electrospray Ionization Mass Spectrometry. *Analyst* **2020**, *145,* 6928-6936. IF=3.978

136. Du, L.; Cao, S.; Zheng, X.; Jiang, L.; Ren, Z.; Chen, J.; Xu, Q., Superfast Self-Healing and Photothermal Active Hydrogel with Nondefective Graphene as Effective Additive. *Macromolecular Materials and Engineering* **2020**, *305.* IF=3.853

137. Du, H. L.; Hodgetts, R. Y.; Chatti, M.; Nguyen, C. K.; Macfarlane, D. R.; Simonov, A. N., Is Molybdenum Disulfide Modified with Molybdenum Metal Catalytically Active for the Nitrogen Reduction Reaction? *Journal of the Electrochemical Society* **2020**, *167.* IF=3.721

138. Guyomard, D.; Di Noto, V.; Forsyth, M.; Poizot, P.; Rojo, T.; Zaghib, K.; Lucht, B.; Aurbach, D., Preface - Jes Focus Issue on Challenges in Novel Electrolytes, Organic Materials, and Innovative Chemistries for Batteries in

Honor of Michel Armand. *Journal of the Electrochemical Society* **2020**, *167.* IF=3.721

139. Mendes, T. C.; Goujon, N.; Malic, N.; Postma, A.; Chiefari, J.; Zhu, H.; Howlett, P. C.; Forsyth, M., Polymerized Ionic Liquid Block Copolymer Electrolytes for All-Solid-State Lithium-Metal Batteries. *Journal of the Electrochemical Society* **2020**, *167.* IF=3.721

140. Mayer, R. M.; Garcia-Rosas, R.; Mohammadi, A.; Tan, Y.; Alici, G.; Choong, P.; Oetomo, D., Tactile Feedback in Closed-Loop Control of Myoelectric Hand Grasping: Conveying Information of Multiple Sensors Simultaneously via a Single Feedback Channel. *Frontiers in Neuroscience* **2020**, *14.* IF=3.707

141. Quigley, A. F.; Cornock, R.; Mysore, T.; Foroughi, J.; Kita, M.; Razal, J. M.; Crook, J.; Moulton, S. E.; Wallace, G. G.; Kapsa, R. M. I., Wet-Spun Trojan Horse Cell Constructs for Engineering Muscle. *Frontiers in Chemistry* **2020**, *8.* IF=3.693

142. Li, J.; Liu, X.; Crook, J. M.; Wallace, G. G., 3D Printing of Cytocompatible Graphene/Alginate Scaffolds for Mimetic Tissue Constructs. *Frontiers in Bioengineering and Biotechnology* **2020**, *8.* IF=3.644

143. Salahuddin, B.; Warren, H.; Spinks, G. M., Thermally Actuated Hydrogel Bead Based Braided Artificial Muscle. *Smart Materials and Structures* **2020**, *29.* IF=3.613

144. da Silva Freires, A.; Botelho, C. N.; Silva, S. M.; Goulart, M. O. F.; Damos, F. S.; Luz, R. D. C. S., Photoelectrochemical Biosensor for 1,4-Dihydroxybenzene Based on Copper Sulfide and Horseradish Peroxidase Enzyme: Application in Skin Cream Samples. *Microchemical Journal* **2020**, *159.* IF=3.594

145. Kretzmann, J. A.; Evans, C. W.; Feng, L.; Lawler, N. B.; Norret, M.; Higgins, M. J.; Iyer, K. S., Surface Diffusion of Dendronised Polymers Correlates with their Transfection Potential. *Langmuir* **2020**, *36,* 9074-9080. IF=3.557

146. Morlando, A.; McNamara, J.; Rehman, Y.; Sencadas, V.; Barker, P. J.; Konstantinov, K., Hydrothermal Synthesis of Rutile TiO_2 Nanorods and Their Decoration with CeO_2 Nanoparticles as Low-Photocatalytic Active Ingredients in Uv Filtering Applications. *Journal of Materials Science* **2020**, *55,* 8095-8108. IF = 3.553

147. Hill, N. S.; Coote, M. L., Rational Design of Photo-Cleavable Alkoxyamines for Polymerisation and Synthesis. *Physical Chemistry Chemical Physics* **2020**, *22,* 19680-19686. IF=3.430

148. Thomas, M.; Suarez-Martinez, I.; Yu, L. J.; Karton, A.; Chandler, G. S.; Robinson, M.; Cherchneff, I.; Talbi, D.; Spagnoli, D., Atomistic Simulations of the Aggregation of Small Aromatic Molecules in Homogenous and Heterogenous Mixtures. *Physical Chemistry Chemical Physics* **2020**, *22,* 21005-21014. IF=3.430

149. Zhang, J.; Su, C.; Rogers, F. J. M.; Darwish, N.; Coote, M. L.; Ciampi, S., Irreproducibility in the Triboelectric Charging of Insulators: Evidence of a Non-Monotonic Charge: versus Contact Time Relationship. *Physical Chemistry Chemical Physics* **2020**, *22,* 11671-11677. IF=3.430

150. Olmo, R. D.; Casado, N.; Olmedo-Martínez, J. L.; Wang, X.; Forsyth, M., Mixed Ionic-Electronic Conductors Based on PEDOT:polyDADMA and Organic Ionic Plastic Crystals. *Polymers* **2020**, *12,* 1-18. If=3.426

151. Rogers, F. J. M.; Norcott, P. L.; Coote, M. L., Recent Advances in the Chemistry of Benzo[E] [1,2,4]Triazinyl Radicals. *Organic and Biomolecular Chemistry* **2020**, *18,* 8255-8277. IF=3.412

152. Yang, Q.; Guo, X.; Ye, X.; Zhu, H.; Kong, L.; Hou, T., Functionalized Polyacrylonitrile Fibers with Durable Antibacterial Activity and Superior Cu(II)-Removal Performance. *Materials Chemistry and Physics* **2020**, *245.* IF=3.408

153. Sencadas, V.; Sadat, S.; Silva, D. M., Mechanical Performance of Elastomeric PGS Scaffolds under Dynamic Conditions. *Journal of the Mechanical Behavior of Biomedical Materials* **2020**, *102.* IF=3.372

154. Begić, S.; Chen, F.; Jónsson, E.; Forsyth, M., Water as a Catalyst for Ion Transport across the Electrical Double Layer in Ionic Liquids. *Physical Review Materials* **2020**, *4.* IF=3.337

155. Giraldo-Pedroza, A.; Lee, W. C. C.; Lam, W. K.; Coman, R.; Alici, G., Effects of Wearable Devices with Biofeedback on Biomechanical Performance of Running—a Systematic Review. *Sensors (Switzerland)* **2020**, *20*, 1-25. IF=3.275

156. Zhang, J.; Darwish, N.; Coote, M. L.; Ciampi, S., Static Electrification of Plastics under Friction: the Position of Engineering-Grade Polyethylene Terephthalate in the Triboelectric Series. *Advanced Engineering Materials* **2020**, *22.* IF=3.217

157. Cai, C.; Fu, J.; Zhang, C.; Wang, C.; Sun, R.; Guo, S.; Zhang, F.; Wang, M.; Liu, Y.; Chen, J., Highly Flexible Reduced Graphene Oxide@Polypyrrole-Polyethylene Glycol Foam for Supercapacitors. *RSC Advances* **2020**, *10,* 29090-29099. IF=3.119

158. Warren, H.; Shepherd, D. J.; in het Panhuis, M.; Officer, D. L.; Spinks, G. M., Porous PNIPAM Hydrogels: Overcoming Diffusion-Governed Hydrogel Actuation. *Sensors and Actuators, A- Physical* **2020**, *301.* IF=2.904

159. Mansour, F. R.; Waheed, S.; Paull, B.; Maya, F., Porogens and Porogen Selection in the Preparation of Porous Polymer Monoliths. *Journal of Separation Science* **2020**, *43,* 56-69. IF=2.878

160. Young, T.; Chen, F.; Burba, C. M., Quantitative Investigation of Ion Clusters in a Double Salt Ionic Liquid by both Vibrational Spectroscopy and Molecular Dynamics Simulation. *Journal of Physical Chemistry B* **2020**, *124,* 3984-3991. IF=2.857

161. Farajikhah, S.; Runge, A. F. J.; Boumelhem, B. B.; Rukhlenko, I. D.; Stefani, A.; Sayyar, S.; Innis, P. C.; Fraser, S. T.; Fleming, S.; Large, M. C. J., Thermally Drawn Biodegradable Fibers with Tailored Topography for Biomedical Applications. *Journal of Biomedical Materials Research - Part B Applied Biomaterials* **2020**. IF=2.831

162. Walker, M. J.; Goddard, E.; Stephens-Fripp, B.; Alici, G., Towards Including End-Users in the Design of Prosthetic Hands: Ethical Analysis of a Survey of Australians with Upper-Limb Difference. *Science and Engineering Ethics* **2020**, *26,* 981-1007. IF=2.787

163. Mohammadi, A.; Lavranos, J.; Zhou, H.; Mutlu, R.; Alici, G.; Tan, Y.; Choong, P.; Oetomo, D., A Practical 3D-Printed Soft Robotic Prosthetic Hand with Multi-Articulating Capabilities. *PLoS ONE* **2020**, *15.* IF=2.740

164. Mapley, J. I.; Hayes, P.; Officer, D. L.; Wagner, P.; Gordon, K. C., Investigation of Ferrocene Linkers in B-Substituted Porphyrins. *Journal of Physical Chemistry A* **2020**, *124,* 5513-5522. IF=2.600

165. Rogers, F. J. M.; Noble, B. B.; Coote, M. L., Computational Optimisation of Alkoxyamine-Based Electrochemical Methylation. *Journal of Physical Chemistry A* **2020**, *124,* 6104-6110. IF=2.600

166. Noble, B. B.; Coote, M. L., Isotactic Regulation in the Radical Polymerisation of Calcium Methacrylate: Is Multiple Chelation the Key to Stereocontrol? *Journal of Polymer Science* **2020**, *58,* 52-61.IF= 2.591

167. Jiang, S.; Cao, G.; Shao, H.; Luo, M.; Sheng, D.; Xu, W.; Li, J.; Wallace, G. G.; Wang, X.; Fang, J., Turning Cotton to Self-Supported Electrocatalytic Carbon Electrode for Highly Efficient Oxygen Reduction. *Electrocatalysis* **2020**, *11,* 317-328. IF=2.587

168. Fung, A. K. K.; Coote, M. L., A Mechanistic Perspective on Atom Transfer Radical Polymerisation. *Polymer International* **2020**. IF=2.574

169. Sparrow, R., Virtue and Vice in Our Relationships with Robots: Is There an Asymmetry and How Might It Be Explained? *International Journal of Social Robotics* **2020**. IF=2.516

170. Mahdi, R.; Alsultan, M.; Al-Keisy, A.; Swiegers, G. F., Photocatalytic Hydrogen Generation from pH-Neutral Water by a Flexible Tri-Component Composite. *Catalysis Letters* **2020**. IF=2.482

171. Liu, D.; Zhao, J.; Li, Y.; Zhu, W.; Lin, L., Effects of Boron Content on Microstructure and Wear Properties of $FeCoCrNiB_x$ High-Entropy Alloy Coating by Laser Cladding. *Applied Sciences-Basel (Switzerland)* **2020**, *10.* IF=2.474

172. Sparrow, R., Robotics Has a Race Problem. *Science Technology and Human Values* **2020**, *45,* 538-560. IF=2.333

173. Alosime, E. M.; Alshahrani, A. A.; Nghiem, L. D.; in het Panhuis, M., The Preparation and Characterisation of Buckypaper Made from Carbon Nanotubes Impregnated with Chitosan. *Polymer Composites* **2020**, *41,* 1393-1404. IF=2.265

174. Stephens-Fripp, B.; Jean Walker, M.; Goddard, E.; Alici, G., A Survey on What Australians with Upper Limb Difference Want in a Prosthesis: Justification for Using Soft Robotics and Additive Manufacturing for Customized Prosthetic Hands. *Disability and Rehabilitation: Assistive Technology* **2020**, *15,* 342-349. IF=2.222

175. Knowles, B. R.; Wagner, P.; MacLaughlin, S.; Higgins, M. J.; Molino, P. J., Modified Silica Nanoparticle Coatings: Dual Antifouling Effects of Self-Assembled Quaternary Ammonium and Zwitterionic Silanes. *Biointerphases* **2020**, *15.* IF=2.043

176. Knowles, B. R.; Wagner, P.; MacLaughlin, S.; Higgins, M. J.; Molino, P. J., Carboxybetaine Functionalized Nanosilicas as Protein Resistant Surface Coatings. *Biointerphases* **2020**, *15.* IF=2.043

177. Yang, D.; Molino, P. J.; Knowles, B. R.; Maclaughlin, S.; Higgins, M. J., Fungal Spore Adhesion on Glycidoxypropyltrimethoxy Silane Modified Silica Nanoparticle Surfaces as Revealed by Single Cell Force Spectroscopy. *Biointerphases* **2020**, *15.* IF=2.043

178. Yu, L. J.; Dale, S. G.; Chan, B.; Karton, A., Benchmark Study of DFT and Composite Methods for Bond Dissociation Energies in Argon Compounds. *Chemical Physics* **2020**, *531.* IF=1.771

179. Mukherjee, P.; Cheng, K.; Wallace, G.; Chiaravano, E.; MacDougall, H.; O'Leary, S.; Solomon, M., 20 Year Review of Three-Dimensional Tools in Otology: Challenges of Translation and Innovation. *Otology and Neurotology* **2020**, *41*, 589-595. IF=1.712

180. Kemp, S.; Coles-Black, J.; Walker, M. J.; Wallace, G.; Chuen, J.; Mukherjee, P., Ethical and Regulatory Considerations for Surgeons as Consumers and Creators of Three-Dimensional Printed Medical Devices. *ANZ Journal of Surgery* **2020**, *90,* 1477-1481. IF=1.355

181. Farajikhah, S.; Choi, J.; Esrafilzadeh, D.; Underwood, J.; Innis, P. C.; Paull, B.; Wallace, G. G., 3D Textile Structures with Integrated Electroactive Electrodes for Wearable Electrochemical Sensors. *Journal of the Textile Institute* **2020**. IF=1.239

182. Farajikhah, S.; Talebian, S.; Cabot, J. M.; Sayyar, S.; Innis, P. C.; Paull, B.; Wallace, G. G., Tunable Flow Rate in Textile-Based Materials Utilising Composite Fibres. *Journal of the Textile Institute* **2020**. IF=1.239

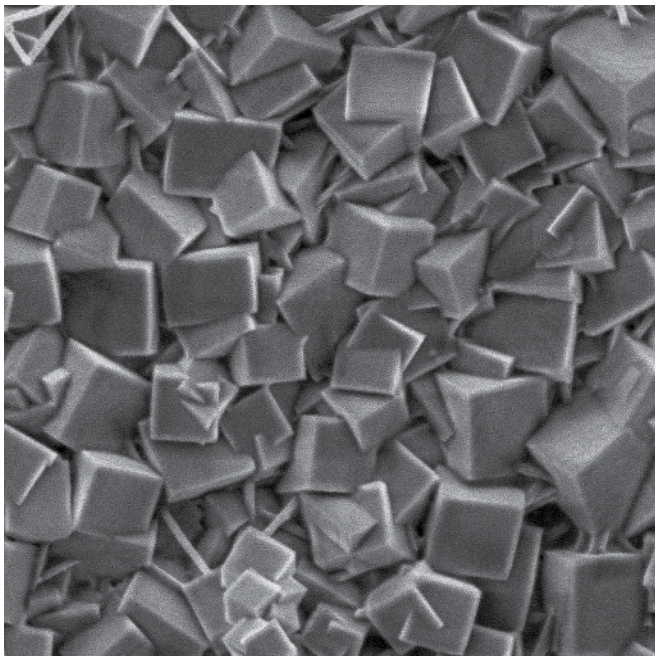
183. Chung, J. H. Y.; Kade, J. C.; Jeiranikhameneh, A.; Ruberu, K.; Mukherjee, P.; Yue, Z.; Wallace, G. G., 3D Hybrid Printing Platform for Auricular Cartilage Reconstruction. *Biomedical Physics and Engineering Express* **2020**, *6.* IF=1.10

184. Nikahd, M.; Mikusek, J.; Banwell, M. G.; Yu, L. J.; Coote, M. L.; Gardiner, M. G., Further, Small-Molecule Pyrolysis Products Derived from Chitin. *Australian Journal of Chemistry* **2020**, *73*, 1187-1196. IF=1.073

185. Goddard, E., Relational Agency and Neurotechnology: Developing and Deploying Competency through Intricate Partnerships. *International Journal of Feminist Approaches to Bioethics* **2020**, *13,* 162-166. IF=0.514

186. Desroches, P. E.; Silva, S. M.; Gietman, S. W.; Quigley, A. F.; Kapsa, R. M. I.; Moulton, S. E.; Greene, G. W., Lubricin (PRG4) Antiadhesive Coatings Mitigate Electrochemical Impedance Instabilities in Polypyrrole Bionic Electrodes Exposed to Fouling Fluids. *ACS Applied Bio Materials* **2020**, *3,* 8032-8039. IF= not yet available

187. Han, M.; Berry, J. D.; Silva, S. M.; Vidallon, M. L. P.; Lei, W.; Quigley, A. F.; Kapsa, R. M. I.; Moulton, S. E.; Tabor, R.; Greene, G. W., Self-Assembly of Lubricin (PRG4) Brushes on Graphene Oxide Affords Stable 2D-Nanosheets in Concentrated Electrolytes and Complex Fluids. *ACS Applied Nano Materials* **2020**, *3,* 11527-11542. IF= not yet available



Caption: Scanning electron microscope image of carbon nanofibres air cathode. Image courtesy of Laura Garcia-Quintana, Deakin University.

188. Harris, J.; Walsh, K.; Maxwell, H.; Dodds, S., Emotional Touchpoints; the Feelings Nurses Have About Explaining Multi-Resistant Organisms to Colonised Patients. *Infection, Disease and Health* **2020**, *25*, 113-123. IF= not yet available

189. Lin, Y. W., Tsou, K., Fay, C., Liu, X., Chung, J., Sharma, D., Jeiranikhameneh, M., Kuo, P., Tzeng, C., Wallace, G., Wu, C., Ker, M., Chao, J. & Cheng, Y., A Microvalve Cell Printing Technique Using Riboflavin Photosensitizer for Selective Cell Patterning onto a Retinal Chip. *Bioprinting* **2020**, *20.* IF= not yet available

190. Nik, A. E.; Faiz, J., Optimisation of Synchronous Reluctance Motor Based on Radial Basis Network. *Serbian Journal of Electrical Engineering* **2020**, *17,* 223-234. IF= not yet available

191. O'Connell, C. D., Konate, S., Onofrillo, C., Kapsa, R., Baker, C., Duchi, S., Eekel, T., Yue, Z., Beirne, S., Barnsley, G., Di Bella, C., Choong, P. F., Wallace, G. G., Free-Form Co-Axial Bioprinting of a Gelatin Methacryloyl Bio-Ink by Direct *in situ* Photo-Crosslinking During Extrusion. *Bioprinting* **2020**, *19.* IF= not yet available

192. Oveissi, F.; Spinks, G. M.; Naficy, S., Bond Reformation, Self-Recovery, and Toughness in Hydrogen- Bonded Hydrogels. *ACS Applied Polymer Materials* **2020**. IF= 8.097

193. Prathapan, R.; Ghosh, A. K.; Knapp, A.; Vijayakumar, A.; Bogari, N. N. J.; Abraham, B. D.; Al-Ghabkari, A.; Fery, A.; Hu, J., *in situ* Alignment of Bacterial Cellulose Using Wrinkling. *ACS Applied Bio Materials* **2020**, *3,* 7898-7907. IF= not yet available

194. Qin, C.; Yue, Z.; Chao, Y.; Forster, R. J.; Maolmhuaidh, F. Ó.; Huang, X. F.; Beirne, S.; Wallace, G. G.; Chen, J., Data on the Bipolar Electroactive Conducting Polymers for Wireless Cell Stimulation. *Data in Brief* **2020**, *33*, 106406. IF=not yet available.

195. Rehmen, J.; Pathirana, T.; Garcia-Quintana, L.; Kerr, R.; Howlett, P. C.; Zuber, K.; Pozo-Gonzalo, C.; Evans, D. R., Structuring Pedot Hollow Nanosphere Electrodes for High Specific Energy Li-Metal|Polymer Thin-Film Batteries. *ACS Applied Nano Materials* **2020**, *3,* 3820-3828. IF= not yet available

196. Talebian, S.; Conde, J., Why Go Nano on COVID-19 Pandemic? *Matter* **2020**, *3,* 598-601. IF= not yet available

197. Tawk, C.; Alici, G., Finite Element Modeling in the Design Process of 3D Printed Pneumatic Soft Actuators and Sensors. *Robotics* **2020**, *9.* IF= not yet available

198. Wright, C. J.; Molino, B. Z.; Chung, J. H. Y.; Pannell, J. T.; Kuester, M.; Molino, P. J.; Hanks, T. W., Synthesis and 3D Printing of Conducting Alginate–Polypyrrole Ionomers. *Gels* **2020**, *6,* 1-12. IF= not yet available

199. Wu, H.; Jia, F.; Li, Z.; Lin, F.; Huo, M.; Huang, S.; Sayyar, S.; Jiao, S.; Huang, H.; Jiang, Z., Novel Water-Based Nanolubricant with Superior Tribological Performance in Hot Steel Rolling. *International Journal of Extreme Manufacturing* **2020**, *2.* IF= not yet available

200. Zhang, X.; Guo, S. X.; Gandionco, K. A.; Bond, A. M.; Zhang, J., Electrocatalytic Carbon Dioxide Reduction: from Fundamental Principles to Catalyst Design. *Materials Today Advances* **2020**, *7.* IF= not yet available

201. Zhou, Y.; Kang, L.; Yue, Z.; Liu, X.; Wallace, G. G., Composite Tissue Adhesive Containing Catechol-Modified Hyaluronic Acid and Poly- L -Lysine. *ACS Applied Bio Materials* **2020**, *3,* 628-638. IF= not yet available

202. Crook, J. M., Preface. *Methods in Molecular Biology,* **2020**, *2140*, v. IF= not yet available

203. Crook, J. M., Cell Processing for 3D Bioprinting: Quality Requirements for Quality Assurance in Fundamental Research and Translation. *Methods in Molecular Biology,* **2020**, *2140,* 19-26. IF= not yet available

204. Duchi, S.; Onofrillo, C.; O'Connell, C.; Wallace, G. G.; Choong, P.; Di Bella, C., Bioprinting Stem Cells in Hydrogel for *in situ* Surgical Application: A Case for Articular Cartilage. *Methods in Molecular Biology,* **2020**, *2140,* 145-157. IF= not yet available

205. Ngan, C.; Quigley, A.; O'Connell, C.; Kita, M.; Bourke, J.; Wallace, G. G.; Choong, P.; Kapsa, R. M. I., 3D Bioprinting and Differentiation of Primary Skeletal Muscle Progenitor Cells. *Methods in Molecular Biology,* **2020**, *2140,* 229-242. IF= not yet available

206. Goddard, E.; Dodds, S., Ethics and Policy for Bioprinting. *Methods in Molecular Biology,* **2020**, *2140,* 43-64. IF= not yet available

207. Hancock, L., Commercialisation and Corporatisation: Academic Freedom and Autonomy under Constraints in Australian Universities. *Education in the Asia-Pacific Region,* **2020**, *54,* 219-246. IF= not yet available

208. Crook JM, Tomaskovic-Crook E., Bioprinting 3D Human Induced Pluripotent Stem Cell Constructs for Multilineage Tissue Engineering and Modelling. *Methods in Molecular Biology,* **2020**, *2140,* 251-258. IF= not yet available

209. Tomaskovic-Crook E, Crook JM, 3D Bioprinting Electrically Conductive Bioink with Human Neural Stem Cells for Human Neural Tissues, *Methods in Molecular Biology,* **2020**, *2140,* 159-170. IF= not yet available

Published Conference Articles

Captured by SCOPUS database with ACES in the address line (14.01.2021). This list contains the articles that were used to calculate the statistics in Table 7 in conjunction with the journal articles listed above.

210. Adan, F. H., Jusoh, M., Sabapathy, T., Osman, M. N., Alaydrus, M., Awal, M. R., Rahim, H. A., Yasin, M. N. M., Alomainy, A., Kamarudin, M. R., Majid, H.A., In Switchable Beam Antenna with Five Planar Element Using Pin Diode in Elevation Plane, 2020 2nd International Conference on Broadband Communications, Wireless Sensors and Powering, *BCWSP* **2020**, 2020; pp 152-156.

211. Cabot, J. M.; Breadmore, M. C.; Paull, B. In Fiber Based Electrofluidic Platforms for Direct Analysis of Metabolites in Complex Samples, 21st International Conference on Miniaturized Systems for Chemistry and Life Sciences, *MicroTAS 2017,* **2020***;* pp 1330-1331.

212. Fazilah, A. F. M., Jusoh, M., Sabapathy, T., Abbasi, Q., Rahim, H. A., Yasin, M. N. M., Kamarudin, R., Majid, H. A. and Soh, P. J. , In A Flexible and Compact Metamaterial UHF RID Tag for Remote Sensing in Human Health, 2020 International Conference on UK-China Emerging Technologies, *UCET 2020,* **2020***.*

213. Macdonald, N. P.; Currivan, S.; Paull, B.; Breadmore, M. C. In 3D Branching Structures for Fluidic Proportioning and Sample Handing, 21st International Conference on Miniaturized Systems for Chemistry and Life Sciences, *MicroTAS 2017,* **2020***;* pp 287-288.

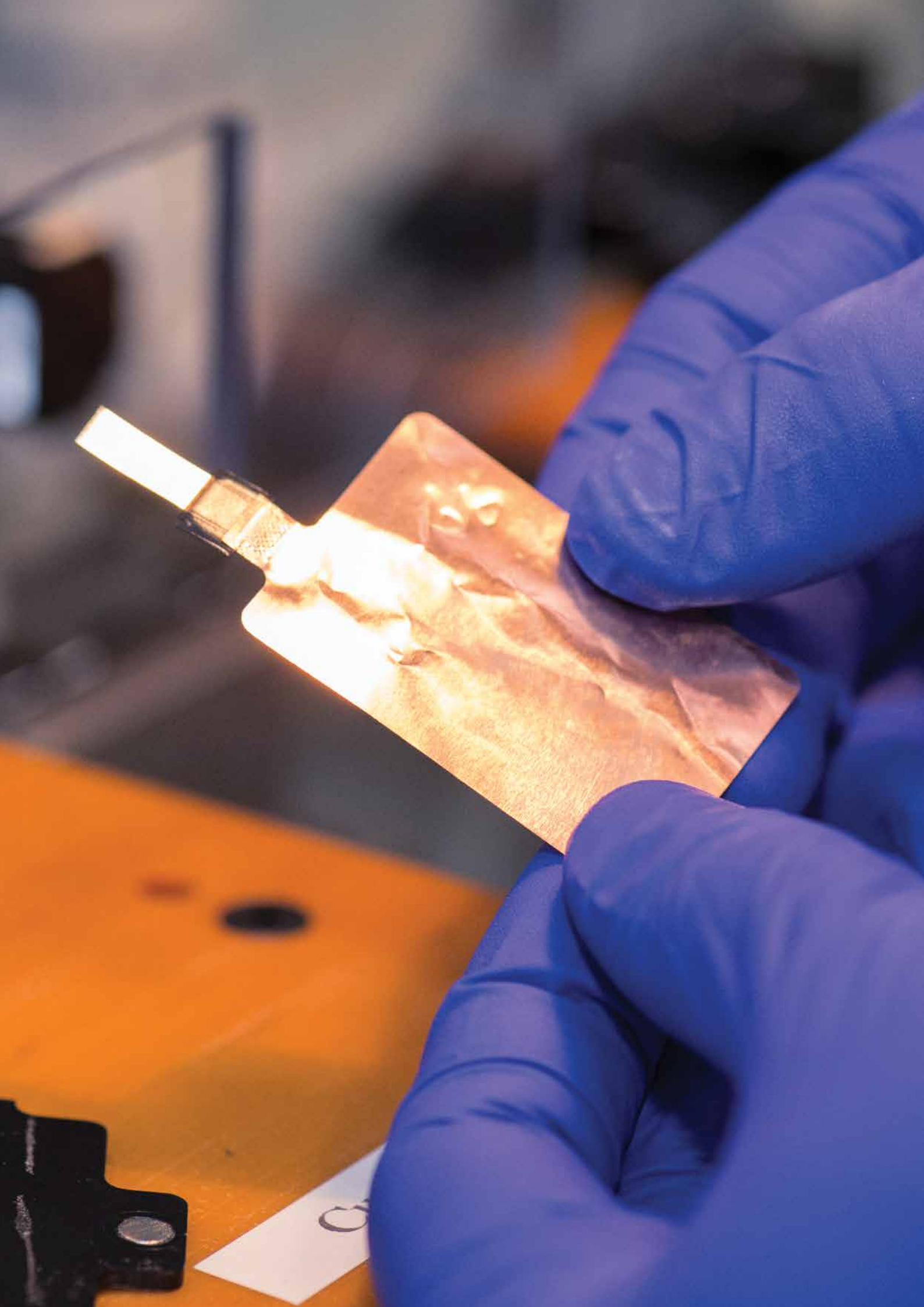
214. Mayer, R. M.; Mohammadi, A.; Tan, Y.; Alici, G.; Choong, P.; Oetomo, D. In Psychometric Evaluation of Multi-Point Bone-Conducted Tactile Stimulation on the Three Bony Landmarks of the Elbow, Proceedings of the IEEE RAS and EMBS International Conference on Biomedical Robotics and Biomechatronics, **2020**; pp 648-653.

215. Tawk, C.; Mutlu, R.; Alici, G. In a 3D Printed Modular Soft Gripper for Conformal Grasping, IEEE/ASME International Conference on Advanced Intelligent Mechatronics, *AIM,* **2020***;* pp 583-588.

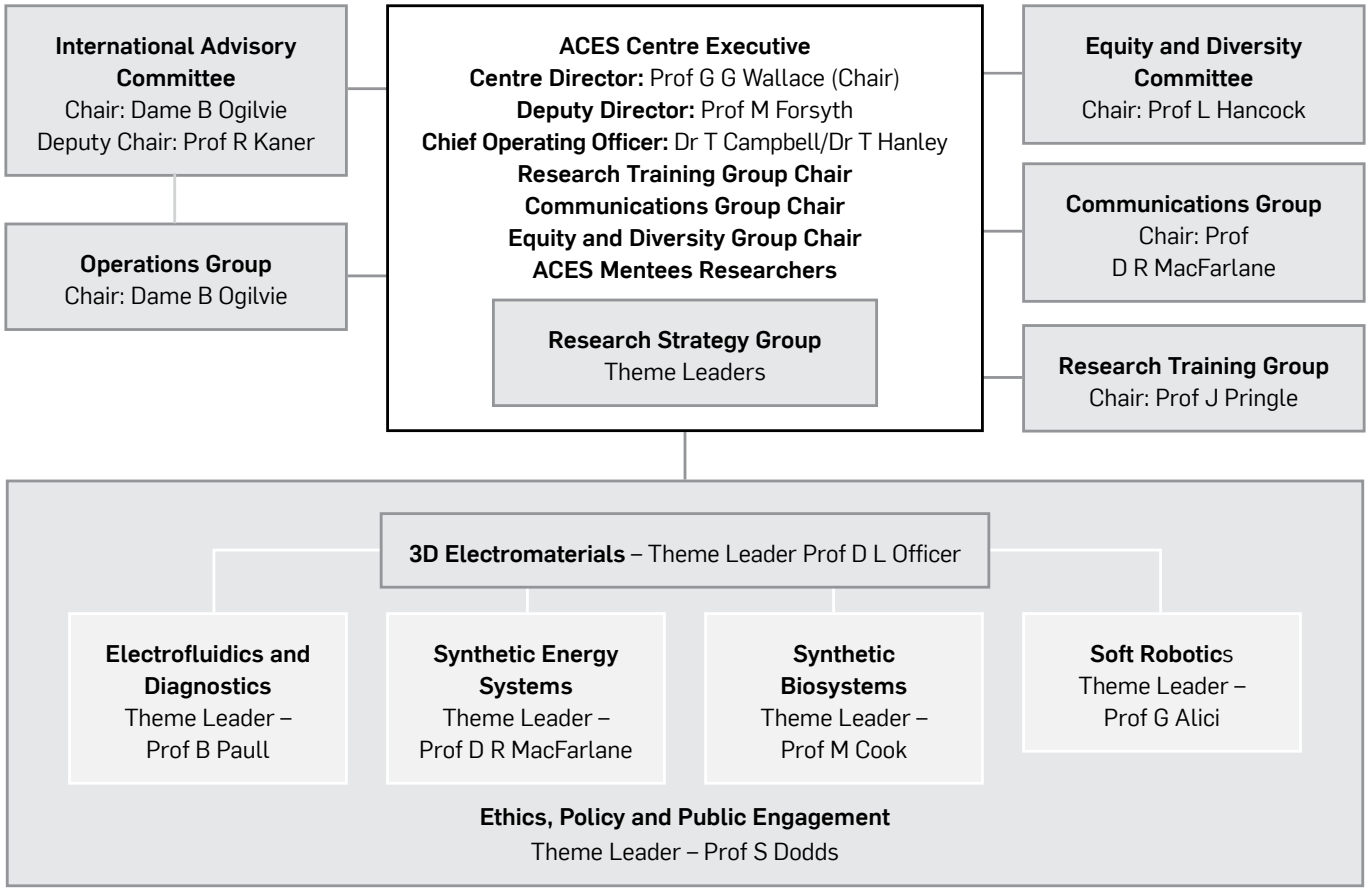
216. Tawk, C.; Panhuis, M. I. H.; Spinks, G. M.; Alici, G. In 3D Printed Soft Pneumatic Bending Sensing Chambers for Bilateral and Remote Control of Soft Robotic Systems, IEEE/ASME International Conference on Advanced Intelligent Mechatronics, *AIM,* **2020***;* pp 922-927.

217. Tawk, C.; Sariyildiz, E.; Zhou, H.; Panhuis, M. I. H.; Spinks, G. M.; Alici, G. In Position Control of a 3D Printed Soft Finger with Integrated Soft Pneumatic Sensing Chambers, 2020 3rd IEEE International Conference on Soft Robotics, *RoboSoft 2020,* **2020***;* pp 446-451.

218. Zhou, H.; Alici, G. In A Compact and Cost-Effective Pattern Recognition Based Myoelectric Control System for Robotic Prosthetic Hands, IEEE/ASME International Conference on Advanced Intelligent Mechatronics, *AIM,* **2020**; pp 270-275.



Governance



Schematic: ACES Governance Structure

The Centre's governance structure aims to ensure the efficient operation of the Centre across multiple locations and is focused on achievement of Centre objectives through specialist committees and advisory groups informing the Centre Executive. The Governance arrangements provide the appropriate mix of strategic planning and day to day management and ensure proper engagement with key stakeholders.

Highly effective engagement at many levels has underpinned the success of ACES in tackling the big multidisciplinary research challenges. None of this has been possible without the commitment of individuals within the ACES research, administration, communication, and governance teams.

ACES

Director Prof Gordon Wallace, supported by Prof Maria Forsyth, as Deputy Director, provide a strong research leadership team. Both are passionately committed to fundamental research that can be translated into real outcomes for our community.

During 2020 there was a change in the Chief Operating Officer from Dr Toni Campbell to Dr Tracey Hanley in June. Dr Toni Campbell decided to retire from the role after many years of dedicated service to the ACES team.

Senior CIs in their role as research theme leaders on the ACES research strategy group, mentor other CIs as deputy theme leaders who now lead many of the activities within the ACES themes.

- RF Crisitina Pozo-Gonzales, CI A/Prof Patrick Howlett and SRF Caiyun Wang co-ordinate the SES theme meetings, research group discussions and specialised workshops.
- Prof Robert Kapsa and A/Prof Jeremy Crook drive the SBS research activities. Crook also co-heads the Equity and Diversity Committee.
- Prof Jennifer Pringle assists in the co-ordination of the EM theme activities.

As we transit to focus our research onto strategic applications, the relevant theme leaders (and deputies) are assuming greater responsibility for communication of findings and dissemination of knowledge accumulated.

In March 2020, six ACES Associate Theme Leaders across four Nodes were introduced to support the Theme and Deputy Theme Leaders in capturing and reporting information for all Themes across the Nodes. The nominated Associate Theme Leaders presented monthly summaries of research activities at the ACES_All virtual meetings.

This role is important as the Centre is in its final stages to ensure that the enthusiasm in ACES remains high among the researchers and the reporting is excellent, which will be critical for the ongoing outcomes from ACES and future research developments. The Associate Theme Leaders include:

Associate Theme Leader	Theme	Node
Shaikh Faisal	Electromaterials	University of Wollongong
Eva Tomaskovic-Crook	Synthetic Biosystems	University of Wollongong
Hao Zhou	Soft Robotics	University of Wollongong
Vipul Gupta	Electrofluidics & Diagnostics	University of Tasmania
SiXuan Guo	Synthetic Energy Systems	Monash University
Natalie Ralph (Mar-Aug) Linda Wollershiem (Sep-Dec)	Ethics, Policy & Public Engagement (EPPE)	Deakin University

Where possible with the restrictions of COVID-19, the majority of the six ACES Themes across all Nodes, continued to meet regularly throughout the year as whole groups or sub themes. These meetings address the strategic direction of the themes and focused on current projects. A highlight of the theme meetings was the Electrofluidics and Diagnostics team's face to face micro-symposium held at UTAS in March 2020 prior to COVID-19 restrictions. All other meetings were conducted virtually for the remainder of the year.

Centre Executive Committee

The Centre's governance structure aims to ensure the efficient operation of the Centre across multiple locations and is focused on achievement of Centre objectives through specialist committees and advisory groups informing the Centre Executive. The Governance arrangements provide the appropriate mix of strategic planning and day to day management and ensure proper engagement with key stakeholders.

The Centre Executive Committee is responsible for reporting outcomes to the ARC and stakeholders for setting strategic directions and broad budget allocations.

The membership includes representatives from Chief Investigators, Early Career Researchers and Communications from across the Nodes.

The Executive met four times in 2020 (Feb, May, Aug, Dec) where it reviewed and endorsed the activities of sub-committees including Research Training Group, Research Strategy/Procurement Group, Communications and Equity and Diversity Group.

International Advisory Committee

The International Advisory Committee (IAC) reviews the Centre's research performance annually against

DR TONI CAMPBELL

ACES COO

Toni's time with ACES as Chief Operating Officer dates back to 2009, but her contribution goes even further back, joining as a post-doctoral research fellow in 2001 after completing her PhD at the University of Wollongong.

"I appreciate all the support and friendships formed throughout my journey with ACES and the IPRI team, as well as appreciating the opportunities being part of this amazing group of talented individuals has afforded me. I found it very easy to turn up to work on a daily basis.

"I am confident the ACES team will continue to deliver on their research and training initiatives, despite this being a very different world because of the pandemic, and achieve outcomes for the benefit of our communities. I wish the team and their collaborators well in their future endeavours as they continue their research journey together".

Good luck Toni, we wish you all the best for your future endeavours.

key performance indicators, provides strategic advice on research and training opportunities and facilitates connections with national and international research programs in industry, academia and non-academic research groups.

The IAC met at the 2020 International Electromaterials Science Symposium at the Australian National University in February and again virtually in October. Unfortunately, the scheduled Dublin, Ireland meeting in May was cancelled due to the COVID-19 international travel limitations and rescheduled as a virtual meeting in October.

In 2020 membership of the ACES Governance groups were reviewed by the IAC Chair and ACES Director. As a result, the IAC welcomed two new highly qualified individuals to join the IAC; Dr Amanda Caples (Lead Scientist, Department of Jobs, Precincts and Regions Victoria State Government) and Dr Pia Winberg (Director, CEO and Chief Scientist Venus Shell Systems Pty Ltd).

Operations Group

The Operations Group comprises of DVC (Research) or their appointed proxy from each of the collaborating organisations. The annual meeting is chaired by Dame Bridget Ogilvie (IAC Chair) addressing cross-institutional matters. The Operations group met on 19th February in 2020 to address cross-institutional matters and ensure proper alignment of the Centre's activities with the strategic directions of the participating Universities, as well as addressing any impediments to progress and to explore the most effective ways to provide support.

Research Strategy Group

The Terms of Reference for the Research Strategy Group (RSG) is to generate the most cohesive and constructive collaborative effort within the research teams. Strategic directions of all Theme areas are reviewed driving ACES interconnecting projects and activities to maximise the synergies that will arise from the diverse skill-sets of the researchers.

Chaired by the Centre Director Prof Gordon Wallace, the RSG met in February 2020 with Chief Investigators from all institutions participating.

In April 2020, the Research Strategy group was refocussed to Resource Procurement Group with a focus on future planning beyond 2020, chaired by Centre Director Gordon Wallace and comprised of invited Chief Investigators, Associate Investigators, Senior Researchers, ACES Professional/ Administrative staff including Chief Operating Officer and Communications Officer.

The mission of the ACES planning group was to identify opportunities for research endeavours that build on the ACES Platform and extend beyond the lifetime of the centre; identify skills portfolio needed to pursue these activities, present to the International Advisory Committee for endorsement and to present Impact Statement, Legacy Statement and Opportunity Audit Plan and Expression of Interest for the next Centre of Excellence.

The group also contained three subcommittees chaired by Chief Investigators. The subcommittees included Impact & Engagement (research impact pathway), Legacy (knowledge base, facilities, training, network and industry alliances/ partnerships) and the Opportunity Group. Eight meetings were held during the April - December period.

Research Training Group

The Research Training Group (RTG) is responsible for designing, establishing and implementing an innovative research training and career development program, including various industry and web-based programs designed to meet the Centre key performance indicators relating to training and career development for ACES staff and students. The volume of training increased in 2020 with 18 courses delivered including significant growth in webinar participation.

The two Masters courses in Biofabrication and Electromaterials continued in 2020 along with the Certificate in Entrepreneurship and Innovation targeting PhD students.

The RSG met four times in February, April, July and November in 2020 with representation from across the Nodes. The RSG had an increased membership including representation from all Nodes including Dr Vipul Gupta (UTAS) who replaced Dr Trevor Lewis in July, Sofia Georgiadis (Monash Admin), and Samuel Rathbone (UOW). ACES Chief Operating Officer, Dr Tracey Hanley attended the July meeting by way of introduction.

Communications Group

The Communications Group works with Chief Investigators to ensure effective and efficient communication of research progress to all levels of the community including media, industry, government departments and the public.

The Communications Group met in Feb, April, July, and November in 2020 and increasing its membership to include representation from all nodes including academic, student and administrative members. The group now has a membership of 15 including an increase of female participants from 37% to 50%.

2020 saw a greater increase in the use of technology with a rise in social media (Facebook, Twitter, LinkedIn, YouTube platforms) the distribution of a social media Fact Sheet on usage, virtual lab tours, and the launch of the new ACES website. In addition, the New Dimensions publication was finalised in both print and an online interactive version.

Bi-monthly internal newsletters and external circulation schedules were implemented with encouragement for participation from all Nodes to provide stories and ideas. External newsletters targeted end-user/industry, research and the community.

Equity And Diversity Committee

The Equity and Diversity Committee is responsible for ACES initiatives including a review of ACES Gender Equity Plan and ACES policies including a Code of Conduct, that embrace gender equity and diversity. The Committee initiate training activities on equity or diversity, collect gender and diversity related metrics, and monitor progress on KPIs on an annual basis; reporting to ACES Executive on progress against targets.

The Committee met five times in 2020 (Feb, May, Aug, Sept, Dec) and successfully implemented the ACES Code of Conduct Policy and the ACES Conference Policy which sits on the ACES website for public access.

In March, the Committee actively promoted International Women's Day week through regular social media quotes from ACES female scientists, stories on the website, circulation of Deakin blog article. In addition an email was circulated to all ACES members on thought and ideas relevant to the ACES Project team in terms of recognising the equality and gender-related issues in STEM research, work places and beyond.

The committee facilitated an Equity and Diversity guest panel at the ACES Full Centre (FCM) meeting in February. In addition, at the FCM, an online feedback survey was introduced to capture the membership breakup and feedback on family friendliness, cultural and diversity sensitivities at the event.

In November an EDC training webinar was presented by Laura Navarro Early- and Mid-Career Researcher Project Manager Diversity and Inclusion section, from the Academy of Science on the *effect of CV-19 on research and ECRs.*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Membership

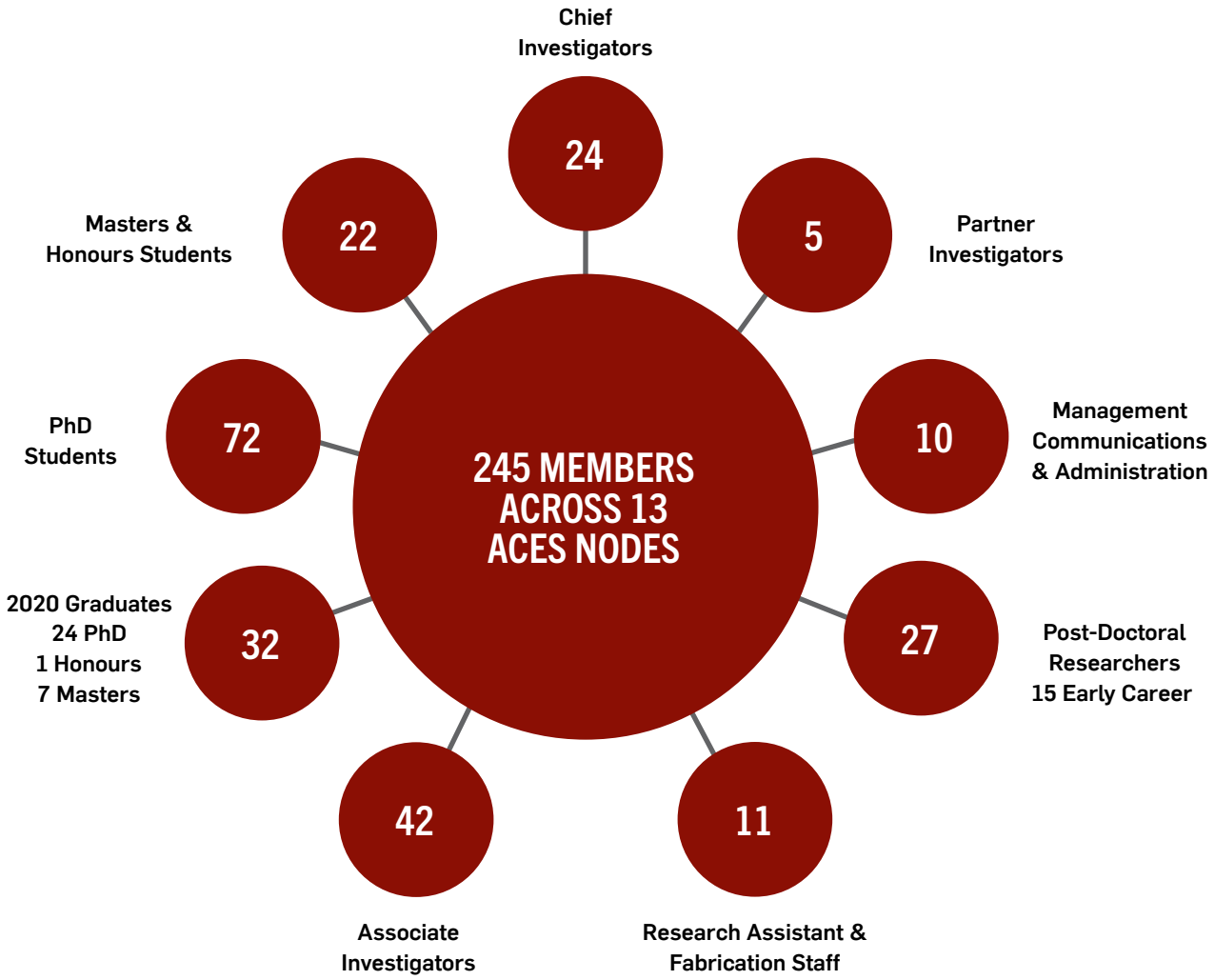


Table 8: A list of ACES Chief Investigators and Partner Investigators 2020

Name	Node	EM	SES	SBS	SR	EFD	EPPE
Chief Investigators							
Wallace, Gordon	University of Wollongong	✓	✓	✓	✓	✓	
Officer, David	University of Wollongong	✓	✓				
Alici, Gursel	University of Wollongong	✓			✓		
Chen, Jun	University of Wollongong	✓	✓				
Crook, Jeremy	University of Wollongong	✓		✓			
Higgins, Michael	University of Wollongong	✓		✓			
in het Panhuis, Marc	University of Wollongong	✓		✓	✓		
Innis, Peter	University of Wollongong	✓				✓	
Kapsa, Robert	University of Wollongong	✓		✓			
Mozer, Attila	University of Wollongong	✓	✓				

Spinks, Geoffrey	University of Wollongong	✓	✓		✓		
MacFarlane, Douglas	Monash University	✓	✓				
Zhang, Jie	Monash University	✓	✓				
Sparrow, Robert	Monash University						✓
Forsyth, Maria	Deakin University	✓	✓	✓			
Howlett, Patrick	Deakin University	✓	✓		✓		
Pringle, Jennifer	Deakin University	✓	✓				
Wang, Xungai	Deakin University	✓					
Hancock, Linda	Deakin University						✓
Paull, Brett	University of Tasmania	✓				✓	
Dodds, Susan	La Trobe University						✓
Cook, Mark	University of Melbourne	✓		✓			
Coote, Michelle	Australian National University	✓	✓	✓			
Moulton, Simon	Swinburne University of Technology	✓		✓		✓	
Partner Investigators							
Kim, Seon Jeong	Hanyang University, Korea	✓			✓		
Guldi, Dirk	Friedrich Alexander University, Germany	✓					
Watanabe, Masa	Yokohama University, Japan	✓	✓				
Diamond, Dermot	Dublin City University, Ireland	✓				✓	
Unwin, Patrick	Warwick University, UK	✓	✓				

Table 9: A list of ACES Research Fellows, Early Career Researchers, Engineers and Technicians 2020

Name	Node	EM	SES	SBS	SR	EFD	EPPE
Research Fellows							
Gilmore, Kerry (Jan – June 1.0FTE, July – Dec 0.8FTE)	University of Wollongong	✓		✓			
Harris, Alex (Jan-May UOW) (July – UOM)	University of Wollongong University of Melbourne	✓		✓			
Lee, Chong Yong	University of Wollongong		✓				
Molino, Paul	University of Wollongong			✓			
Nattestad, Andrew	University of Wollongong	✓	✓				

Name	Node	EM	SES	SBS	SR	EFD	EPPE
Tomaskovic-Crook, Eva	University of Wollongong	✓		✓			
Wagner, Klaudia	University of Wollongong	✓	✓				
Wagner, Pawel	University of Wollongong	✓					
Wang, Caiyun	University of Wollongong	✓	✓				
Yue, Zhilian	University of Wollongong	✓		✓			
Guo, Si-Xuan	Monash University	✓	✓				
Howard, Mark	Monash University						✓
Simonov, Alexandr (Sasha)	Monash University	✓	✓				
Simonova, Irina (0.8FTE)	Monash University	✓	✓				
Chen, FangFang	Deakin University	✓	✓				
Pozo-Gonzalo, Cristina (0.5 FTE)	Deakin University	✓	✓				
Ralph, Natalie (Jan-July)	Deakin University						✓
Tang, Bin (casual – 0.5 FTE) (Aug – Dec)	Deakin University	✓					
Wang, Jinfeng (0.6 FTE) (Aug - Dec)	Deakin University	✓					
Moraes Silva, Saimon (0.5 FTE, Jul-Dec)	Swinburne University of Technology	✓		✓			
Manchanda, Arushi (April - Dec)	University of Tasmania					✓	
Yu, Lijuan	Australian National University	✓					
Early Career Researchers							
Chen, Zhi (Casual Mar-Aug; 0.5 FTE Sep-Dec)	University of Wollongong	✓		✓			
Faisal, Shaikh Nayeem	University of Wollongong	✓	✓				
Hunt, Holly	University of Wollongong	✓		✓	✓		
Nagle, Alex (casual Mar-Dec)	University of Wollongong			✓			
Ruland, Andres	University of Wollongong	✓					

Name	Node	EM	SES	SBS	SR	EFD	EPPE
Zhou, Hao	University of Wollongong				✓		
Bakker, Jacinta	Monash University		✓				
Choi, Jaecheol	Monash University		✓				
Achchige, Mary Kalani Erangi Periyapperuma (0.6 FTE)	Deakin University		✓				
Liang, Yan	Deakin University	✓	✓				
Makhlooghiazad, Faezeh	Deakin University		✓				
Yunis, Ruhamah (Casual)	Deakin University	✓	✓				
Gupta, Vipul	University of Tasmania	✓				✓	
Wu, Liang	University of Tasmania	✓				✓	
Goddard, Eliza	La Trobe University						✓
Bourke, Justin (Jan-July 2020)	University of Melbourne			✓			
Professional Services Staff							
Canales, Ros (0.6FTE Feb-Dec)	Research Assistant University of Wollongong			✓			
Higginbottom, Sarah (0.6FTE) (Jan–June)	Bionics Research Assistant University of Wollongong			✓			
Jeiraini, Ali (Jan-Oct)	Fabrication Technician University of Wollongong	✓		✓			
Kita, Magda (0.4FTE April-Dec)	Senior Research Assistant Bionics University of Wollongong at St Vincent's Hospital Melbourne			✓			
Richards, Laura (0.6FTE) (Jan-Aug)	Bionics Research Assistant University of Wollongong			✓			
Talebian, Sepehr (Oct-Dec)	Fabrication Technician University of Wollongong	✓		✓			
Tangey, Bonnie (0.6FTE, Feb-Sept)	Bionics Research Assistant University of Wollongong			✓			
Newman, Peter (casual)	Monash University		✓				
Taylor, John (casual)	Monash University		✓				
Newbegin, Timothy (casual)	Research Assistant Deakin University		✓				

Table 10: A List Of Aces Non-Academic Positions 2020

Name	Node	EM
Campbell, Toni (Jan–Jun)	University of Wollongong	Chief Operations Officer
Cinnadaio, Carin (Jan-Nov - 0.6FTE)	University of Wollongong	Administration
Clark, Renae (Nov-Dec - 0.6FTE)	University of Wollongong	Administration
Findlay, Samuel	University of Wollongong	Communications & Media Officer
Hanley, Tracey (Jun–Dec)	University of Wollongong	Chief Operations Officer
Hood, Lauren	University of Wollongong	Communications & Media Coordinator
McKenzie, Delvene (0.6 FTE)	University of Wollongong	Administration
McKenzie, Shannon (casual Jan-May)	University of Wollongong	Administration
O'Brien, Vanessa (0.6 FTE)	University of Wollongong	Operations Officer
Georgiadis, Sofia (0.5 FTE)	Deakin University	Administration Support

Table 11: A list of ACES Postgraduate Students working on core Centre Research and Supervised by Centre Staff in 2020

Name (Start Year)	Funding Source	Project Description	Node	Country of Birth	Program Theme
Core Funded PhD					
Abeywardena, Sujani (2019)	ACES	Threads in Gels	University of Wollongong	Sri Lanka	EFD
Brooks, Joshua (2016)	APA	Development of high aspect ratio ordered thermoplastic nano-materials as print media for 3D additive fabrication	University of Wollongong	Australia	EFD/EM/SR
Cho, Inseong (2017)	ACES	Developing new asymmetric redox mediators with large difference in forward / backward electron transfer rates	University of Wollongong	Korea	EM/SES
Gayani, Buddihka (2019)	ACES	Cell-Cell adhesion on materials for biomedical applications	University of Wollongong	Sri Lanka	EM/SBS
James, Emma (2019)	ACES	Direct piezoelectricity for 3D human neural tissue engineering and remodelling	University of Wollongong	Australia	SBS
Kim, Kyuman (2019)	ACES	Redox Mediated "Wireless" Connections for Solar assisted CO_2 or N_2 Reduction	University of Wollongong	Korea	EM/SES
Le, Hong Quan (2019)	ACES	Control system for robotic hand	University of Wollongong	Vietnam	SR
Montoya Gurrola, Gerardo (2018)	ACES	Integration of sensing technology into soft robotic hand	University of Wollongong	Mexico	SR
Rathbone, Sam (2019)	Aus Gov't RTP ACES core project	Modelling ultrasound mediated neuromodulation: towards targeted therapeutic brain stimulation	University of Wollongong	Australia	SBS

Name (Start Year)	Funding Source	Project Description	Node	Country of Birth	Program Theme
Shekibi, Bijan (2017)	ACES	Design of an integrated multi-well cell culture system for functional tissue constructs	University of Wollongong St Vincent's Hospital Melbourne	Australia	SBS
Zhang, Shuai (2018)	ACES	Flexible thermoelectrochemical cells	University of Wollongong	China	SES
Blesch, Thomas (2018)	ACES	Non aqueous flow batteries	Monash University	Germany	SES
Dong, Shuo (2017)	ACES	Redox couples for flow batteries	Monash University	China	SES
Gandionco, Karl Adrian (2020)	ACES	Electrocatalytic reduction of CO_2	Monash University	Philippines	SES
Hodgetts, Rebecca (2017)	APA	Understanding the mechanism of electrocatalytic nitrogen reduction	Monash University	Australia	SES
Johnston, Sam (2019)	APA- ACES topup	Electrochemical oxidation of ammonia for the sustainable production of nitrates	Monash University	Australia	SES
Li, Linbo (2019)	ACES	2D Catalysts for high performance electrochemical CO_2 reduction	Monash University		SES
Long Du, Hoang (2017)	ACES	Nanostructured catalysts for electrochemical ammonia synthesis	Monash University	Malaysia	EM/SES
Nguyen, Cuong Ky (2018)	ACES	Photoelectrocatalytic production of ammonia	Monash University	Vietnam	SES
Biernacka, Karolina (2019)	ACES	An investigation of novel solid state membranes for sodium batteries	Deakin University	Poland	SES
Cherian, Mathew (2015- from 2018 part time)	ACES	Global development, community development and energy	Deakin University	India	EPPE
Panhwar, Ghulam Murtaza (2019)	ACES	Development of new thermal energy harvesting devices	Deakin University	Pakistan	SES
Quintana, Laura Garcia (2017)	ACES	Enhancement of oxygen reduction mechanism in sodium air batteries	Deakin University	Spain	SES
Rakov, Dmitrii (2018)	ACES	Characterisation and modelling electrolytes and interface for Na-Oxygen batteries	Deakin University	Russia	SES
Wollersheim, Linda (2018)	ACES	Assessing policy and supply chain aspects of renewable energy	Deakin University	Germany	EPPE
Blum, Anna (2016)	ACES	Ethical challenges for electromaterials and neuroscience: the benchtop brain	University of NSW	USA	EPPE
Duc, Daniela (2015)	ACES	Materials design and fabrication of effective optical and electrical co-stimulation of cells	Swinburne University of Technology	Mauritius	SBS
Gietman, Shaun (2015)	ACES	Synthesis of optically active drug delivery systems	Swinburne University of Technology	Australia	EFD/ SBS

Name (Start Year)	Funding Source	Project Description	Node	Country of Birth	Program Theme
Mendes, Alexandre Xavier (2019)	ACES	Functional hydrogels for 3D Neural Systems	Swinburne University of Technology	Brazil	SBS
Nascimento, Adriana Teixeira Do (2020)	ACES	The development of electrical and optical 3D materials for neuronal stimulation.	Swinburne University	Brazil	EM
Simpson, Catherine (2016-Part time from 2017)	ACES	Nitroxides for energy	Australian National University	Australia	EM/SES
Masters Students					
Mehmood, Irfan (2018)	IPTA	MPhil Electromaterials - Photocatalytic water splitting using novel electromaterials	University of Wollongong	Pakistan	EM/SES
Narangerel, Gantumur (2018)		Master - Encapsulation of VEGF for islet transplantation	University of Wollongong		SBS
Osama Altakhayney (2019)		Master - 3D printing of spinal implants	University of Wollongong	Jordan	EM/SBS
Shahshahan, Sayedmohsen (2018)	IPTA	MPhil Electromaterials- Development of 2D Metal Organic Frame (MOF) for Photocatalytic CO_2 Reduction	University of Wollongong	Iran	EM/SES
Affiliated PhD					
Al-Ghazzawi, Fatimah (2016)	Iraqi Govt	New metal-organic interfaces- new photo-active interfaces for catalytical chemistry and/ or energy harvesting/conversion applications	University of Wollongong	Iraq	EM
Baker, Carly (2020)	AGRTP Scholarship	The development of conducting polymers for bioelectronics interfaces	University of Wollongong	Australia	EM
Daikuara, Luciana Yumiko (2016)	University Of Wollongong-IPRI-IHMRI matching	Fabricating delivery system for wound healing- thread based electrofluidics	University of Wollongong	Brazil	EM/SBS
Dhanushka, nuwan hegoda arachchi (2018)	University of Wollongong	Plasma protein adsorption on blood contacting device coatings	University of Wollongong		EM
Fan, Yuchao (2017)	University Of Wollongong-IPRI matching	Hybrid bioprinted cartilage scaffold based on cellulose nanocrystals reinforced GelMA/ HAMA hydrogel	University of Wollongong	China	SBS
Hai, Abdul Moqeet (2018)	HEC scholarship with ACES topup	Fabrication of silk-based structures for corneal application	University of Wollongong	Iraq	SBS
Higginbottom, Sarah (2020)	Aust Govt RT scholarship	Investigating the therapeutic effects of electrical stimulation (e-stim) on a 3D human cerebral-organoic glioblastoma (GB) model	University of Wollongong	Australia	SBS

Name (Start Year)	Funding Source	Project Description	Node	Country of Birth	Program Theme
Kavungathodi, Munavvar Fairoos Mele (2019)	IPTA & UPA University Of Wollongong	Inventive approaches to fabricate highly efficient sensitized solar cell: change the way to dye-sensitise and to regenerate	University of Wollongong	India	EM
Khan, Jawairia (2017)	Pakistan HEC & IPTA	Fibre electrofluidics for ambient ionisation mass spectrometry	University of Wollongong	Pakistan	EFD
Kulaga, Anna (2019)	AGRTP Scholarship	Development of methods to improve vascularisation with islet-laden constructs with 3D beioprinting	University of Wollongong		SBS
Kuppanacharry, Praneshwar Sethupathy (2017)	UPA	Developing new architectures for redox-based energy processes	University of Wollongong	India	EM
Lisha, Jia (2019)	ARC DP – affiliated PhD	Fabrication of nanoporous metallic alloys/graphene as high-performance electrocatalysts	University of Wollongong	China	EM/SES
Maher, Malachy (2018)	University Of Wollongong-CSIRO scholarship	Development and evaluation of new biologically based materials for bioprinting cells	University of Wollongong	Australia	SBS
Posniak, Stephen (2018)	Australian Govt Research Training Program (AGRTP)	Development of 3D printed hybrid structures for cartilage reconstruction	University of Wollongong	Australia	SBS
Potts, Michael (2020)	University of Wollongong	Printing and modification of metal-organic framework films	University of Wollongong	Australia	EM/E&D
Qin, Chunyan (2017)	University Of Wollongong-IPRI-IHMRI matching	Injectable electrodes - bipolar electrochemical chips for wireless cell stimulation driven by electric field	University of Wollongong	China	EM/SBS
Rajbhandari, Grishmi (2018)	BIOFAB Training Hub affiliate	Antennas and coils for cochlear devices	University of Wollongong	Nepal	EM
St Clair-Glover, Mitchell (2020)	RTP & Rotary Club School	3D printing of innervated skin tissue for burn treatment	University of Wollongong	Australia	SB
Vijayakumar, Amruthalakshmi (2016)	IPTA	N-doped graphene for electrocatalytic reduction of CO_2	University of Wollongong	India	EM/SES
Wang, Kezhong (2018)	University Of Wollongong-IPRI matching	Graphene-based soft electrodes	University of Wollongong	China	EM
Zhou, Ying (2017)	UPA	Development of multifunctional bioinks for 3D printing cellular constructs	University of Wollongong	China	SBS
Zhou, Yuetong (2018)	ARC DP affiliate PhD	The design and development of flexible redox-gel integrated electrode	University of Wollongong	China	EM/SES

Name (Start Year)	Funding Source	Project Description	Node	Country of Birth	Program Theme
Zou, Jinshuo (2017)	University Of Wollongong-IPRI matching	Electrocatalytic nitrogen reduction at ambient temperature and pressure	University of Wollongong	China	SES
Castillo, Yady Garcia (2019)	IFM Deakin	Probing interface regions in novel composite energy materials using advanced magnetic resonance techniques	Deakin University		EM
Desroches, Pauline (2018)	ARC DP affiliate	Ultra-low fouling active surface for bionic implants	Deakin University	France	EM
Ha, The An (2017)	AISRF Deakin Affiliate	Na-Air cells	Deakin University	Vietnam	SES
Hasanpoor, Meisam (Sam) – 01.FTE (2018)	UPA affiliate	Investigation of degradation mechanisms in advanced lithium metal batteries	Deakin University	Iran	SES
Malunavar, Sneha Subhas (2018)	Deakin Scholarship	Ionic liquid based solid electrolyte for sodium batteries	Deakin University		SES EM
Mudiyanselage, Isuru Eranda Gunathilaka Adikari (2018)	Deakin affiliate	Studying novel redox systems for electrochemical devices by magnetic resonance spectroscopy and imaging	Deakin University	Sri Lanka	SES
Sirigiri, Nanditha (2019)	Deakin international scholarship	Computational investigation of organic ionic plastic crystals	Deakin University		EM
Mladenovska, Tajanka (2016, part-time)	UOM	Innovation, commercialisation and regulation of 3D-bioprinted surgically implantable orthopaedic medical devices	University of Melbourne	Macedonia	SBS/EPE
Adesanya, Olumayowa (2017)	UTAS	The legal and ethical aspects of bioprinting	University of Tasmania	Nigeria	EPPE
Chen, Liang (2018)	ARC LP affiliate	Fibre based electrofluidics with ambient mass spectrometry based detection.	University of Tasmania	China	EFD
Affiliated Masters					
Asua, Ane Urigoitia	EU-Biofab project	MPhil Biofabrication - Collagen Printing	Utrecht University / University of Wollongong		SBS
Bani, Jacopo	EU-Biofab project	MPhil Biofabrication - 3D coaxial bioprinting for cartilage repair and regeneration	Utrecht University / University of Wollongong		SBS
Chan, Kuan Phang	IPTA	MPhil Biofabrication - 3D printing for bone regeneration	University of Wollongong	Malaysia	SBS
Ebert, Markus	EU-Biofab project	MPhil Biofabrication - 3D printed graphene-flexible electrodes	Wurzburg University/ University of Wollongong	Germany	EM/SBS
Gantumur, Narangerel	IPTA	MPhil Biofabrication- Encapsulation of VEGF for islet transplantation	University of Wollongong	Mongolia	SBS

Name (Start Year)	Funding Source	Project Description	Node	Country of Birth	Program Theme
Kulaga, Anna	AGRTP Scholarship	Development of methods to improve vascularisation with islet-laden constructs with 3D bioprinting	University of Wollongong		SBS
Castillo, Gabriel Comeron	MESC – 6 month project	Harvesting waste heat using thermoelectrochemical cells	Deakin University	Spain	SES
Affiliated Honours					
Jay, Sky	Honours	Electrifying 3D human neural tissues	University of Wollongong	Australia	SBS

Table 12: ACES Work Submitted for Examination 2020

Name	Project Description	Node	Country of Origin	Program Theme
PhD Students				
Chao, Yunfeng (2016)	Fabrication of graphene-based composites for energy storage application	University of Wollongong	China	EM
Chen, Xifang (2016)	Ulvan fabrication for wound healing	University of Wollongong	China	SBS
Kang, Lingzhi (2016)	Biofabricated platforms (based on collagen) for skin repair and regeneration	University of Wollongong	China	SBS
Khakbaz, Hadis (2016)	Development of high nanofilled (aspect ratio ordered) bio-thermoplastics as print media for 3D additive fabrication.	University of Wollongong	Iran	EM/EFD
Chatti, Manjunath (2015)	Photo-processes-MoS_2 nanosheets integrated into graphene matrix for enhanced hydrogen evolution	Monash University	India	EM/SES
Hill, Nicholas (2017)	Modelling 3D spatial effects on radical orbital switching and associated properties, and indeed electric field effects on chemical reactions in general	Australian National University	Australia	EM/SES
Masters Students				
Berthel, Marius	MPhil Biofabrication- Dual drug-eluting collagen matrix for epilepsy treatment	Wurzburg University/ University of Wollongong	Germany	SBS
Brodmerkel, Maxim	MPhil Biofabrication- 3D printed degradable stents with controlled drug delivery capabilities	Wurzburg University/ University of Wollongong	Germany	SBS

Name	Project Description	Node	Country of Origin	Program Theme
Gray, Diego Castaneda	MPhil Biofabrication - 3D printed degradable stents with controlled drug delivery capabilities	Utrecht University/ University of Wollongong	Mexico	SBS
Gruska, Anne	EU-Biofab project MPhil Biofabrication- Parameter optimisation of co-axial melt extrusion writing.	Wurzburg University/ University of Wollongong	Germany	SBS
Gutierrez, Borja Sanz	EU-Biofab project MPhil Biofabrication- Evaluation of marine collagen for 3D bioprinting	Utrecht University/ University of Wollongong		SBS
Haag, Hannah	EU-Biofab project. MPhil Biofabrication- 3D printed structures for cartilage growth in predestined shape with high resolution.	Wurzburg University/ University of Wollongong	Germany	SBS
Marks, Sulokshana	IPTA MPhil Biofabrication- Development of nanostructured cellulosic inks for wound healing application	University of Wollongong	Sri Lanka	SBS
Renes, Max	EU-Biofab project MPhil Biofabrication- Towards the fabrication of pancreatic islet tissue constructs through co-axial bio-printing	Utrecht University/ University of Wollongong	Netherlands	SBS
Sanchez, Ane Albillos	EU-Biofab project MPhil Biofabrication-Nerve/ muscle cell simulation	Utrecht University/ University of Wollongong	Spain	SBS
Van Tienderen, Gilles	MPhil Biofabrication- Towards an innervated *in vitro* 3D corneal tissue model	Utrecht University / University of Wollongong	Netherlands	SBS
Buttar, Karmjeet Kaur	MPhil Electromaterials	Deakin University		SES

Table 13: Successful Completions ACES 2014-2020

Name	Degree	Project Description	Node	Program Theme	What was next?
Completed 2015					
Grierson, Keira	Honours International Bachelor of Science		University of Wollongong	SBS	
Completed 2016					
Lee, Richmond	Affiliate PhD	Studying reactive oxygen chemistry and its role in oxidative degradation in materials and biology	ANU	EM	Research Singapore Employed overseas

Name	Degree	Project Description	Node	Program Theme	What was next?
Noble, Benjamin	Affiliate PhD	Study stereoregulation in radical polymerisation	ANU	EM	ECR ACES
Completed 2017					
Gately, Reece	Affiliate PhD	3D printed robotic hand	University of Wollongong	SR	
Gu, Qi	Affiliate PhD *awarded 2017 outstanding self financed student abroad.	3D Bioprinting for neural tissue engineering	University of Wollongong	EM/SBS	Head, Intelligent Biomaterials and Biomedical Engineering lab, Chinese Academy of Sciences
Jia, Xiaoteng	Affiliate PhD *awarded 2017 outstanding self financed student abroad.	Biodegradable electrodes for energy storage applications in medical bionics	University of Wollongong	EM/SES	Department of Chemical & Biomolecular Engineering, University of California, Irvine
Maksour, Simon	Awarded First Class Honours	Establishing a novel human neural stem cell model for DISC1 loss-of-function: a valuable tool in molecular studies of neurogenesis and psychiatric disorders	University of Wollongong	SBS	
Sangian, Danial	Affiliate PhD	Developing a new type of McKibben artificial muscles	University of Wollongong	SR	Alexander von Humboldt Postdoctoral Fellow, Technical University of Berlin, Germany
Bonke, Shannon	Affiliate PhD	APA- Co-, Mn- and Ni-oxides from various preparation methods will be examined electrochemically for conversion of solar energy to drive the synthesis of solar fuels	Monash University	SES	Post doctoral Hermholtz Zentrum Berlin
Chun, Ken	Core PhD	Develop novel nanoporous metals for electrochemical applications	Monash University	SES	
Al-Masri, Danah	Core PhD	New redox couples and ionic liquid electrolytes for thermal energy harvesting	Deakin University	SES	ECR Deakin University
Completed 2018					
Aziz, Shazed Md	Affiliate PhD	Polymer fibre artificial muscle	University of Wollongong	EM/SR	

Name	Degree	Project Description	Node	Program Theme	What was next?
Carter, Sarah-Sophia	MPhil Biofabrication masters	Development of bioprinting platforms for bioartifical pancreas constructs	Utretch University / University of Wollongong	SBS	Uppsala University, Sweden
Farajikhah, Syamak	Core PhD	Sensor systems for fluidics	University of Wollongong	EM/EFD	ECR University of Sydney
Ge, Yu	UPA –ACES Core funded project PhD	Graphene and its inorganic analogues based materials for energy storage device	University of Wollongong	EM SES	Postdoctoral China
Hamilton, Charles	ACES Masters Cored funded	Printable tough, thermally-active hydrogel actuators	University of Wollongong	SR	Doing medical degree US
Lu, Zan	CSC Scholarship – Affiliate PhD	Carbon nanotube fiber and its application in garment and wearable sensors	University of Wollongong	EM SES	
Liu, Yuqing	Affiliate PhD	Flexible 3D electrodes via extrusion-printing for flexible and wearable device	University of Wollongong	EM	ECR ACES University Of Wollongong
Rathbone, Sam	Honours Bachelor of Science	The stimulating application of nanoparticles in neural stem cells	University of Wollongong	SBS	PhD affiliated to ACES
Van Kogelenberg, Sylvia	MPhil Biofabrication masters	Fabrication of ulvan based structures for cell culture in wound healing	Utretch University / University of Wollongong	SBS	ING Netherlands, Amsterdam
Zheng, Tian	University Of Wollongong matching scholarship - Affiliate PhD	Development of magnetoelectric polymer composites	University of Wollongong	EM SBS	ECR Melbourne University
Zong, Yan	Self funded - Affiliate PhD	Development of biocompatible and biodegradable magnetoelectric electrodes for remote and contactless electrical stimulation of neural tissue	University of Wollongong	EM SBS	Lecturer at College of Chemistry and Chemical Engineering, Shaanxi University of Science and Technology, China
Cabral, Diogo	Core PhD	Novel redox couples for redox flow batteries	Monash University	SES	Employed overseas
Halima, Ahmed	Monash Scholarship – Affiliate PhD	Novel Si-based photocathode assemblies.	Monash University	SES	

Name	Degree	Project Description	Node	Program Theme	What was next?
Hoogeveen, Dijon	Core PhD	Dye-Sensitized photocathodes catalysing light driven reduction	Monash University	EM SES	Research Fellow Monash
Li, Fengwang	Core PhD *Mollie Holman award best thesis	Photoelectrocatalytic and electrocatalytic reduction of CO_2 using novel 2D materials	Monash University	SES	Post Doc University of Toronto, Canada
Li, Haitao	Affiliate PhD	Develop several different kinds of photocatalysts with excellent properties to convert the CO_2 into fuel or other useful chemicals.	Monash University	SES	
Rao, Jun (Rossie)	Core PhD	3D nanostructured electrolytes	Deakin University	EM	
Russo, Mathew	ACES MPhil Electromaterials	Development of quasi-solid state electrolytes for thermal energy harvesting	Deakin University	SES	
Gupta, Vipul	Affiliate PhD	New composite and micro/nanostructured materials for chemical analysis	University of Tasmania	EFD	ECR ACES
Li, Feng	Affiliate PhD	Microfluidic devices with integrated nanochannels for sample-in/ answer-out analysis of pharmaceuticals from body fluids.	University of Tasmania	EFD	
Completed 2019					
Al-Graiti, Wed	Iraqi Govt Affiliate PhD	Development of functionalised nanoporous carbon fibre electrodes for probe-sensing technology	University of Wollongong	EM	Employed overseas
Barsby, Tom	ACES core PhD	Electrical stimulation 3D structures – stem cell effects	University of Wollongong St Vincent's Hospital Melbourne	SBS	Postdoctoral research position University of Helsinki Finland
Blanco Peña, Laura	MPhil Biofabrication	3D printing flexible electrodes	Utrecht University / University of Wollongong	EM/SBS	Business Analyst at McKinsey & Company
Chen, Zhi	ACES core PhD	Bio inks for stem cells	University of Wollongong	EM/SBS	ECR ACES University of Wollongong

Name	Degree	Project Description	Node	Program Theme	What was next?
Choi, Jaecheol	ACES core PhD	Electrocatalytic reduction of CO_2	University of Wollongong	EM SES	ECR Monash University
James, Daniel Reynolds	Grad Cert Biofabrication		University of Wollongong	SBS	
Javadi, Seyed Mohammad	Affiliate PhD	Developing graphene oxide based composite materials capable of acting as a temperature sensor	University of Wollongong	EM	Aussie Bee
Kade, Juliane	EU- MPhil Biofabrication	3D hybrid printed structures for auricular cartilage regeneration	Wurzburg University/ University of Wollongong	SBS	Functional Materials in Medicine & Dentistry University Hospital, Wurzburg
Li, Jianfeng	ACES core PhD	Electrical stimulation cell effects-molecular markers.	University of Wollongong	SBS	Post Doc Max Plank Institute Germany
Maher, Declan	Grad Cert Biofabrication		University of Wollongong	SBS	Employed overseas
Mehropouya, Fahimeh	ACES core PhD	Polymeric nanodispersion and growth factors	University of Wollongong	EM SBS	Postdoctoral Research Associate, School of Physics, University of Sydney
Puckert, Christina	ACES core PhD	Cell-material interactions using Bio-AFM	University of Wollongong	EM SBS	Employed overseas
Robinson, Thomas	MPhil Biofabrication	Corneal tissue engineering with methacrylated gellan gum	University of Wollongong	EM/SBS	Employed by other Institution
Shahangi, Farzad	MPhil Biofabrication	3D printing polycaprolactone structures and modelling and finite element analysis of the internal structure to predict properties of auricular structures	University of Wollongong	EM	Bucher Municipal, Sydney
Siti Naquia, Abdul Rahim	PhD Malaysian Gov't - ACES extension	Studying schizophrenia using induced pluripotent stem cells and conductive biomaterials	University of Wollongong	SBS	Lab Technician at Macquarie Stem Cells
Tawk, Charbel	ACES core PhD	3D printed pneumatic soft actuators and sensors: their modeling, performance quantification, control and applications in soft robotic systems	University of Wollongong	SR	Soft Robotics Engineer, Employed by University of Wollongong

Name	Degree	Project Description	Node	Program Theme	What was next?
Weisgrab, Gregor	EU- MPhil Biofabrication	Novel fabrication methods for collagen-based implantables for the cornea	Utrecht University/ University of Wollongong	EM SBS	Vienna University of Technology, Vienna
Williams, Joanne	MPhil Biofabrication	3D printing controlled drug delivery systems	University of Wollongong	EM SBS	Systems Manager Peoplecare Health Fund
Wright, Cody	ACES core PhD	Electro-printing	University of Wollongong	EM	Compliance Specialist Waters Corporation
Xiao, Yang	Affiliate PhD	The synthesis and characterisation of photoactive materials and their use in the chemopropulsion-based fluidic transport systems.	University of Wollongong	EM	
Yu, Changchun	PhD CSC with an ACES extension	Functional batteries for cellular communications	University of Wollongong	SBS	Postdoctoral research position Wenzhou Medical University China
Zhang, Long	ACES affiliate PhD	Electrostatic control over radical reactions at solid/liquid interfaces	University of Wollongong	EM	Employed by other University
Zhao, Yong	ACES affiliate PhD – CSC with ACES extension	CO_2 reduction on copper metal or copper oxide electrodes	University of Wollongong	EM SES	Postdoctoral research with Prof Chuan Zhao at UNSW, Sydney
Muataz, Ali	PhD	Photo and photoelectrochemical reduction reaction on black silicon membrane	Monash	SES	High School Teacher
Xiao, Changlong	ACES core PhD	3D structural control of ionic conduction	Monash University	EM SES	PostDoc researcher UQ
Zhang, Ying (Sherry)	ACES core PhD	Utilisation of CO_2 as C1 building block for electroorganic synthesis in ionic liquids	Monash University	SES	Associate Professor Jiangnan University, China
Begic, Srdjan	ACES core PhD	Characterisation and modelling of 3D electrolytes & active metal interphases	Deakin University	EM SES	Entrepreneur
Biernacka, Karolina	European Masters (MESC)	Materials for Energy Storage and Conversion	Deakin University	SES	PhD ACES
Erangi Periyapperuma Achchige, Mary Kalani	ACES core PhD	Energy storage for soft robotics	Deakin University	SES SR	Associate research fellow, Deakin
Grzelak, Aleksandra	European Masters (MESC)	Materials for Energy Storage and Conversion	Deakin University	SES	PhD Universite de Liège Belgium

Name	Degree	Project Description	Node	Program Theme	What was next?
Taheri, Abuzar	ACES core PhD	Integrating 3D materials in thermoelectrics- new solid and liquid electrolytes and 3D electrocatalysts for thermal energy harvesting	Deakin University	SES	Research and Development Chemist, Palla Pharma Melbourne
Caballero Aguilar, Lilith	ACES core PhD	3D printing of drug delivery structures	Swinburne University of Technology	SBS	Univeristy of Melbourne at St Vincent's Hospital Melbourne
Ngan, Catherine	ACES affiliate PhD	3D muscle constructs for ablated muscle injury and robotics tissue-electrode interfaces	University of Melbourne	SBS	Medical Dr, St Vincent's Hospital Melbourne
Viana, John	ACES affiliate PhD	Ethical issues involved in recruiting people with dementia for clinical trials	University of Tasmania	EPPE	PostDoc Research ANU
Waheed, Sidra	ACES Core PhD	3D fabricated micro-fluidic manifolds – design and characterisation	University of Tasmania	EFD	Postdoctoral Researcher Beijing University
Completed 2020					
Berthel, Marius	MPhil Biofabrication	Dual drug-eluting collagen matrix for epilepsy treatment	Wurzburg University/ University Of Wollongong	SBS	Employed overseas
Chan, Kuan Phang	Masters	HDPE bone graft fabrication: establishing proprietary HDPE fabrication protocol by selective laser sintering	University of Wollongong	EM SBS	Employed by Health/ Medical Industry - Lyka Smith
Feng, Lei	PhD	Direct visualisation of single molecule amyloid beta peptides in action by high-speed atomic force microscopy	University of Wollongong	EM SBS	
Hamzawy, Sameh	PhD	Intermediate band solar cells	University of Wollongong	SES	
Marks, Sulokshana	Masters	3D printing of chitosan-based scaffolds for wound healing	University of Wollongong	EM SBS	PhD at University of Wollongong
Mokhtari, Fatemeh	PhD	Self-powered smart fabrics for wearable technologies	University of Wollongong		Academic Assistant employed by University Of Wollongong

Name	Degree	Project Description	Node	Program Theme	What was next?
Nagle, Alex	ACES Core PhD	Nanofabrication of polymer nanoarray architectures for tissue engineering	University of Wollongong	EM	Employed by Industry
Salahuddin, Bidita Binte	Affiliate PhD	Hydrogel based braided artificial muscle	University of Wollongong	SR	Postdoctoral Researcher, University of Queensland
Shahshahan, Sayadmohsen	Masters	Development of 2D metal organic frame (MOF) for photocatalytic CO_2 reduction	University of Wollongong	SES	Employed by Industry
Stephens-Fripp, Benajmin	Affiliate PhD	Providing non-invasive sensory feedback for transradial prosthetic hand users	University of Wollongong	SR	Mechatronic Engineer, Facebook Reality Labs
Talebian, Sepehr	PhD	Development of novel fiber for smart drug delivery application	University of Wollongong	EM SES	Post-Doctoral Researcher University Of Wollongong
Van Tienderen, Gilles	MPhil Biofabrication	Towards an innervated *in vitro* 3D corneal tissue model	Utrecht University / University of Wollongong	SBS	
Wu, Liang	ACES Core PhD	Detection systems for diagnostics	University of Wollongong	EFD	Employed by University of Tasmania
Yang, Dan	PhD	Development of nanomaterial based antimicrobial coatings	University of Wollongong		R & D position at GPS Pharmaceuticals in Sydney
Yungfeng, Chao	ACES Core PhD	Fabrication of graphene structures for energy storage using roll-to-roll printing	University of Wollongong	SES	Employed by University of Wollongong
Zarghami, Sara	Affiliate PhD	Chemopropulsion	University of Wollongong	EM	Employed by other University. Researcher Macquarie University
Chatti, Manjunath	ACES Core PhD	Photo-processes-MoS_2 nanosheets integrated into graphene matrix for enhanced hydrogen evolution	Monash University	EM SES	Research Fellow School of Chemistry Monash
Kang, Colin	Affiliate PhD	Fluorinated ionic liquid-based electrolytes with high nitrogen gas solubility for electrochemical ammonia synthesis	Monash University	SES	Assoc. Research Fellow Deakin

Name	Degree	Project Description	Node	Program Theme	What was next?
Kaur Buttar, Karmjeet	MPhil Electromaterials	Organic ionic plastic crystal/carbon composites for solid-state battery electrodes and supercapacitors	Deakin University	SES	Further study
Affiliated Honours					
Jay, Sky	Honours	Electrifying 3D human neural tissues	University of Wollongong	Australia	SBS

Table 14: Associate Investigators 2020 with ACES Acknowledgement or Deeds in Place

Name	ACES Node	AI affiliation	Program Theme	AI RF or AI
Beirne, Stephen	University of Wollongong	University of Wollongong, Australia	EM- fabrication	AI RF
Chung, Johnson	University of Wollongong	University of Wollongong, Australia	EM/SBS	AI RF
Dittori, Mirella	University of Wollongong	University of Wollongong, Australia	SBS	AI
Esrafilzadeh, Dorna	University of Wollongong	RMIT, Australia	EM/SBS	AI RF
Forster, Robert	University of Wollongong	Dublin City University, Ireland	EM/SBS	AI
Gambhir, Sanjeev	University of Wollongong	University of Wollongong, Australia	EM	AI RF
Huang, Xu-Feng	University of Wollongong	University of Wollongong, Australia	SBS	AI
Jalili, Rouhollah (Ali)	University of Wollongong	UNSW, Australia	EM	AI RF
Liu, Xiao	University of Wollongong	University of Wollongong, Australia	EM/SBS	AI RF
McCaul, Margaret	University of Wollongong	Dublin City University, Ireland	EM/SBS	AI RF
Morin, Aoife	University of Wollongong	Dublin City University, Ireland	EM/SBS/EFD	AI
Mutlu, Rahim	University of Wollongong	University of Wollongong, Australia	SR	AI RF
Oetomo, Denny	University of Wollongong	University of Melbourne, Australia	SR	AI
Richardson, Chris	University of Wollongong	University of Wollongong, Australia	EM/ SES	AI
Sayyar, Sepidar	University of Wollongong	University of Wollongong, Australia	EM	AI RF
Sencadas, Vitor	University of Wollongong	University of Wollongong, Australia	SR	AI RF
Sutton, Gerard	University of Wollongong	University of Sydney, Australia	EM/SBS	AI
Zhang, Binbin	University of Wollongong	Yokohama National University, Japan	EM/SBS	AI RF

Name	ACES Node	AI affiliation	Program Theme	AI RF or AI
Bond, Alan	Monash University	Monash, Australia	SES	AI
Choi, Jaecheol	Monash University	Monash, Australia	SES	AI
Fukuda, Junji	Monash University	Yokohama National University, Japan	SES	AI
Hutchison, Katrina	Monash University	Adjunct Monash & Macquarie University, Australia	EPPE	AI
Ali, Saleem	Center for Energy and Environmental Policy, Deakin	Newark, USA	EPPE	AI
Greene, Wren (George)	Deakin University	Deakin, Australia	SBS/EFD	AI
Kerr, Robert	Deakin University	Deakin, Australia	SES	AI RF
Khoo, Timothy	Deakin University	Deakin, Australia	EM/SES	AI
Mecerreyes, David	Deakin University	Polymat-University of the Basque Country, Spain	EM/SES	AI
O'Dell, Luke	Deakin University	Deakin, Australia	EM	AI RF
Porcarelli, Luca	Honorary Fellow at Deakin University	Deakin, Australia	SES	AI RF
Zhu, Haijin	Deakin University	Deakin, Australia	EM	AI
Choong, Peter	University of Melbourne	University of Melbourne, Australia	SBS	AI
DiBella, Claudia	University of Melbourne	University of Melbourne, Australia	SBS	AI
Duchi, Serena	University of Melbourne	University of Melbourne, Australia	SBS	AI
Li, Dan	University of Melbourne	University of Melbourne, Australia	SBS	AI
O'Connell, Cathal	University of Melbourne	University of Melbourne, Australia	SBS	AI RF
Onofrillo, Carmine	University of Melbourne	St Vincents Hospital, Melbourne, Australia	SBS	AI RF
Quigley, Anita	University of Melbourne	RMIT University	SBS	AI
Breadmore, Michael	University of Tasmania	UTAS, Australia	EFD	AI
Gilbert, Frederic	University of Tasmania	UTAS, Australia	EPPE	AI RF
Lewis, Trevor	University of Tasmania	UTAS, Australia	EFD	AI
McArthur, Sally	Swinburne University of Technology	Swinburne University of Technology, Australia	EM/SBS	AI
Stoddart, Paul	Swinburne University of Technology	Swinburne University of Technology, Australia	EM/SBS	AI

2021 Activity Plan

Translation and commercialisation

The established translational facilities BatTRI-Hub, TRICEP and Biofab@ACMD will continue to facilitate the move from research bench to technology readiness levels fit for commercialisation. The foci for 2021 will be to leverage the translation of the research to realise outcomes, the platforms are in place and will deliver over the coming years.

- Soft robotics
- Energy
- 3D printing
- Edge Functionalised Graphene

Research

ACES will continue to utilise the knowledge gained within the themes to deliver impact in:

- developing high performance electromaterials and fabrication protocols to enable integration into devices for applications in energy, robotics, bionics and diagnostics;
- Electrocatalytic N_2, H_2O and CO_2 Reduction, H_2O oxidation;
- Metal batteries including metal based flow batteries;
- Thermocells;
- Modelling research to provide advanced in-depth knowledge for making safer, more efficient and long storage capacity batteries;
- Handheld bioprinting hardware including iFix Pen and Axcelda Biopen;
- 3D REDI, a bioprinting platform;
- Investigation of the fundamentals of thread-based electrofluidic systems;
- Development of thread-based analytical systems;
- Use the mechanical actuation and sensing properties of selected electromaterials to develop new robotic systems such as a multi-digit, fluid and highly dexterous 3D robotic hand;
- Wireless technology for clinically-specific tissue modelling, including 3D neural and other tissue building, and electroceuticals for therapeutics;
- Formation of brain-like tissue on the bench to understand neural function and disease;
- Conduct conceptual research related to the ethics of emerging technologies, climate and energy justice, the impact of neural implants and robotics on health care ethics and society.

Research Training

Key research skills training will continue including research methodology, material synthesis and characterisation planning for impact from the beginning. The integration of ethics and public engagement is essential to all areas of research at ACES. Apart from the traditional research training that has been integral to ACES from the beginning, with a large number of the cohort looking at life beyond ACES, the training will be focused on career development and job readiness. Entrepreneurship and innovation courses will again be offered in 2021.

Other plans include offering:

- Careers and research translation panels as part of the February ACES Symposium;
- Webinars;
- Interview skills;
- Planning for future careers outside academia;
- Impedance spectroscopy/battery electrochemistry workshop;
- AFM workshop/Webinar;
- Raman workshop and showcase of different experimental techniques available at different nodes.

Global Engagement

We will continue to develop both existing and recently established research opportunities and continue to seek engagement with new opportunities.

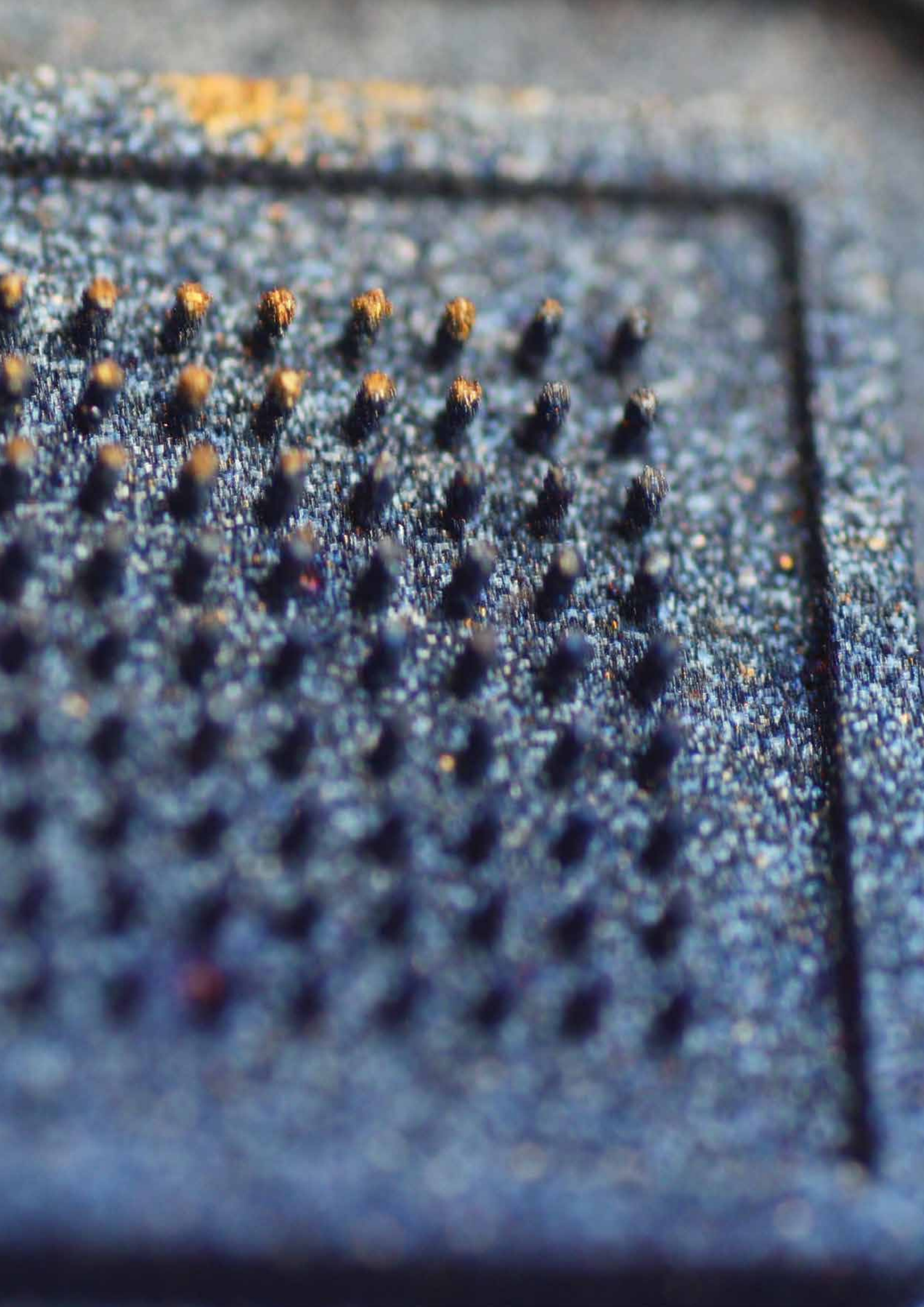
Communications

ACES will communicate the outcomes, achievements and impact of the Centre through website, social and mainstream media, and through planned events which will be held through a combination of on-site and virtual methods (COVID restrictions dependent). The ACES webinar program, YouTube channel and podcasts will remain a strength of communications throughout 2021.

Planned hosted events:

- Annual Bill Wheeler lecture and student award;
- Science week events;
- Annual Leon-Kane Maguire public lecture;
- Biofabrication 2021 public lecture (postponed from 2020).

The ACES website is planned to contain details of ACES legacy and impact and will continue to promote the ACES experience beyond the Centre's lifetime.



Other Research Developments

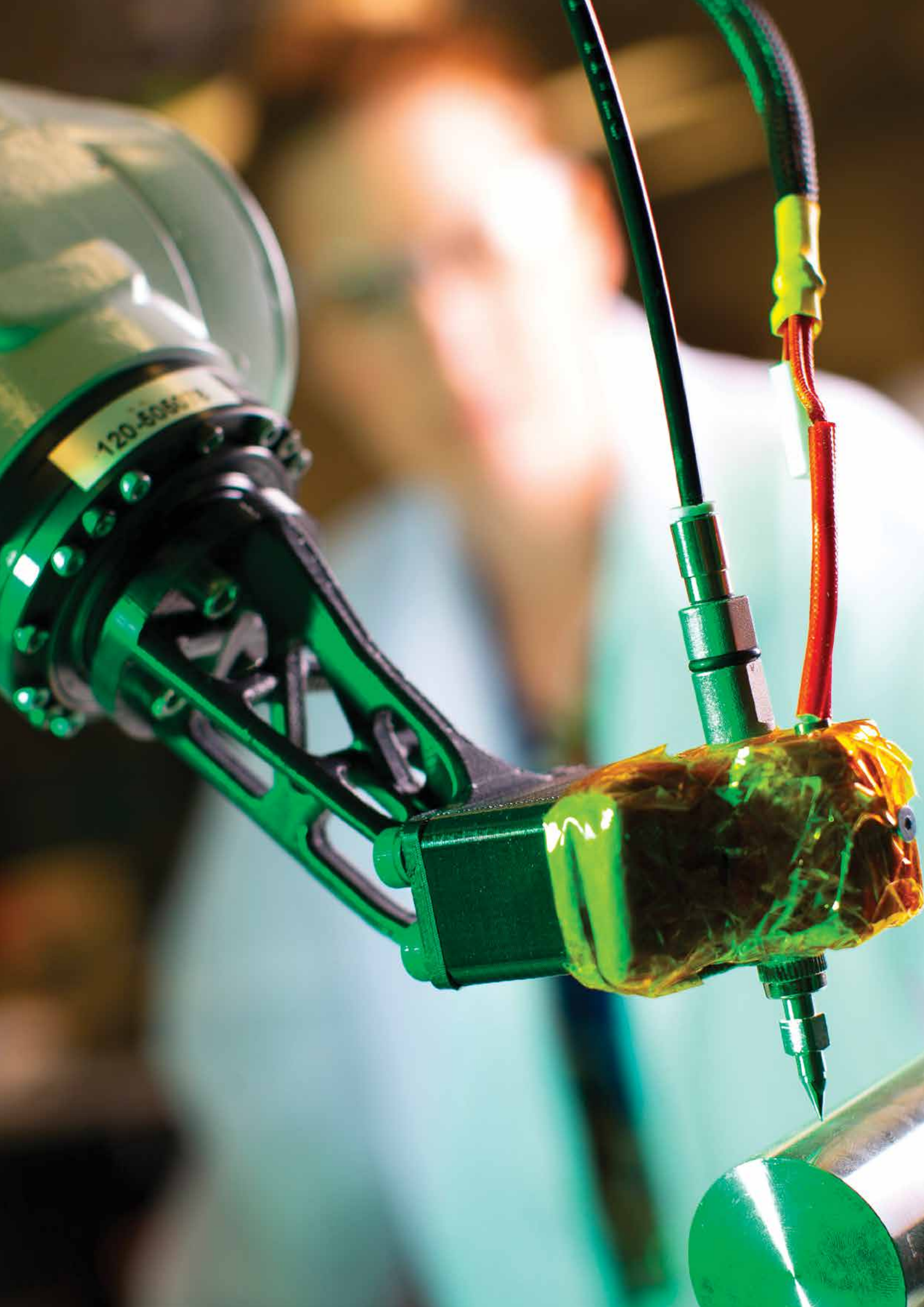
ACES members are involved in other research initiatives. In some cases the ACES entity (facilities, personnel and market presence) has enabled the development of these research initiatives that could not be funded by the Centre of Excellence core funding. A list of some of the other research initiatives is shown in Table 15.

Table 15: Examples of other Fundamental research initiatives where ACES members are involved

ACES Research Area	Project	Researcher	Funding Body
Biomaterials	2021-2023: A wireless electric nerve-guide for peripheral nerve repair.	A/Prof Jeremy Crook	NHMRC Ideas Grant 2002761
Biology	2021-2023: Autologous Constructs for Muscle Engineering and Repair.	Prof Robert Kapsa	NHMRC Ideas Grant 2002723
Fluidics	2021-2023: 3D printed microchemical devices and systems.	Prof Michael Breadmore; Dr Vipul Gupta (ACES)	ARC Discovery Grant DP210102928
Bionics	2021-2023: Non-invasive and safe human-machine interface (HMI) systems.	Prof Gursel Alici	ARC Discovery Grant DP210102911
Materials/ Energy	2021-2023: Designing disorder into ionic materials for clean energy applications.	Prof Jennifer Pringle (ACES); Prof Douglas MacFarlane (ACES); Dr Mega Kar	ARC Discovery Grant DP210101269
Energy	2021-2023: Parameterisation of voltammetry in a machine learning environment.	A Prof Jie Zhang (ACES); Prof Alan Bond (ACES); Prof David Gavaghan; Dr Alison Parkin	ARC Discovery Grant DP210100606
Energy	2021-2023: Sustainable high energy sodium batteries with enhanced safety & cycle life.	Prof Maria Forsyth (ACES); Dr Luke O'Dell; Prof Patrick Howlett (ACES); Dr Fangfang Chen (ACES); Prof Agilio Padua; Prof Michel Armand	ARC Discovery Grant DP210101172
Materials	2021-2023: Switchable and stereocontrolled photoredox catalysis.	Dr Alexander Bissember; Prof Michelle Coote (ACES); Prof Jianwei Sun	ARC Discovery Grant DP210100025
Materials/ Energy	2021-2023: Flexible flame aerosol synthesis technology.	Prof Antonio Tricoli; Prof Douglas MacFarlane (ACES); Prof Huanting Wang; Prof Lan Fu; Prof David Nisbet; Associate Prof Jason Scott; Dr Alexandr Simonov (ACES); Dr Zongyou Yin; Dr Enrico Della Gaspera; Dr Samuel Ippolito; Dr Emma Lovell; Dr Alexey Glushenkov	ARC LIEF LE210100084
Materials/ Energy	2021-2025: New dimensions of electrocatalyst design for sustainable energy future.	Dr Alexandr Simonov	Future Fellowship FT200100317
Materials/ Fluidics	2020-2023: 3D printing of multi-level porosity glass.	Dr Vipul Gupta	DECRA DE200101733

ACES Research Area	Project	Researcher	Funding Body
Energy	2020-2023: Developing sustainable liquid fuels from carbon dioxide conversion.	Dr Fengwang Li	DECRA DE200100477
Energy	2020-2023: Sustainable nitrogen chemistry.	Prof Douglas MacFarlane; Dr Alexandr Simonov	ARC Discovery Grant DP200101491
Bionics	2020-2023: Protein structural-dynamics at solid surfaces.	Prof Michael Higgins	Future Fellowship FT190100451
Energy	2020-2022: Change materials for wind and solar energy storage.	Prof Jenny Pringle, Prof Douglas MacFarlane	ARC Linkage Project
Biosystems	2020-2022: Changes in brain resilience underlie seizure susceptibility in epilepsy.	Prof Mark Cook	NHMRC Ideas Grant
Materials	2020-2022: Rapid molecular (bio) material imaging by Infrared and Raman microscopies.	Prof Peter Lay; Prof Ewan Blanch; Prof Michael Kassiou; A/Prof Elizabeth New; Prof Ewa Goldys; Prof John Gooding; Prof Emma Johnston; Prof Gordon Wallace (ACES); Dr Thomas Rodemann; Dr Tamim Darwish; Dr Julio Ribeiro; Prof Georges Grau	ARC LIEF grant LE200100043
Energy	2019-2021: Next-generation solid-state batteries to drive an automotive revolution.	Prof Patrick Howlett, Prof Maria Forsyth and Dr Robert Kerr	ARC Linkage Project
Energy	2019-2021: Faster interfacial electron transfer: the effect of molecule shape and size.	A/Prof Attila Mozer (ACES); Dr Pawel Wagner (ACES); Dr Andrew Nattestad (ACES AI); A/Prof Shogo Mori; Prof Keith Gordon	ARC Discovery grant DP190100687
Bionics	2019-2021: Bioelectronics: addressing the biointerface challenge.	Dr Damia Mawad; Prof David Officer (ACES); Dr Antonio Lauto; Prof George Malliaras	ARC Discovery grant DP190102560
Energy	2018: ARC Training Centre for Future Energy Storage Technologies (StorEnergy).	Prof Maria Forsyth (ACES); Prof Dan Li; Prof Douglas MacFarlane (ACES); Prof Abbas Kouzani; Prof Peter Talbot; A/Prof Jennifer Pringle (ACES); A/Prof Patrick Howlett (ACES); Dr Robert Kerr (ACES AI); Prof Saeid Nahavandi; Dr Michael Fielding; et al	ARC Industrial Transformation Training Centre IC180100049
Materials/Energy	2018-2020: Self-powered active noise control via a nanofibre acoustoelectric converter.	Tong Lin, Xu Wang (ACES), Jian Fang (ACES)	ARC Linkage
Medical Bionics	2018-2020: Control of prosthetic limbs from decoded brain signals.	D Freestone; D Grayden, S John; T Oxley; M Cook (ACES); D Ackland; Y Wong	NHMRC Project 1148005
Chemistry	2018-2020: A Universal chiral auxiliary for controlled radical polymerisation.	Prof Michelle Coote (ACES)	ARC Discovery grant DP 180100139

ACES Research Area	Project	Researcher	Funding Body
Materials/ Bionics	2018-2020: Ultra-low fouling active surfaces.	Prof Simon Moulton (ACES) Prof Robert Kapsa (ACES) Prof Wren Greene (ACES AI) Dr Anita Quigley (ACES)	ARC Discovery grant DP 180102287
Materials	2018-2020: Multifunctional and environmentally friendly corrosion inhibitor systems.	Prof Maria Forsyth (ACES) Dr Anthony Somers Prof Margaret Ackland Dr Laura Machuca Suarez Prof Herman Terryn	ARC Discovery grant DP180101465
Medical Bionics	2018: ARC Training Centre in Cognitive Computing for Medical Technologies.	T Baldwin; D Freestone; D Grayden; C Masters; K Verspoor; M Cook (ACES); A Burkitt; T Cohn; J Bailey; I Mareels; T Kalincik; A van Schaik; M McDonnell; L Cavedon; J Batstone; S Harrer; N Faux; A Jimeno Yepes; C Butler; B Goudey; U Asif ; J Tang; JH Lau; B Mashford; P Maruff	ARC Industrial Transformation Training Centre IC170100030
Fluidics	2017-2020: A high speed, high fidelity 3D printer for fabricating microfluidic devices.	Prof Michael Breadmore; Dr Rosanne Guijt; Dr Stuart Thickett; Prof Brett Paull; Mrs Celia Lin	ARC Linkage Project LP160101247
Materials	2017-2020: Increasing solid electrolyte conductivity through defect design.	Prof Jennifer Pringle; Prof Peter Bruce; Dr Anthony Hollenkamp	ARC Discovery grant DP170101087
Materials	2017-2020: Redox-gel integrated electrode for thermocells – body heat to electricity.	Prof Jun Chen; Dr Leigh Aldous	ARC Discovery grant DP170102320
Energy	2017-2020: Ionic liquid-based electrochemical reduction of nitrogen to ammonia.	Prof Douglas MacFarlane; Dr Xinyi Zhang; Prof Jun Chen; Prof Dr Suojiang Zhang	ARC Discovery grant DP 170102267
Chemistry	2017-2021: Controlling chemical reactions via pH-switchable electrostatic catalysis.	Prof Michelle Coote (ACES)	ARC Laureate Fellowship FL170100041



Financial Statement

Statement of Operating Income and Expenditure for year ended 31 December 2020.

Income	2020 $
ARC Centre Grant Funding	4,070,579
Institutional Cash Support	1,796,073
Total income	5,866,652

In-Kind	2020 $
Total Institutional In-Kind Support	2,827,544

Expenditure-ARC and Institutional cash	2020 $
Personnel (salaries & stipends)	5,789,489
Equipment	103,630
Travel	159,221
Research maintenance & consumables	447,319
Other (3rd party expert services, administration, dissemination)	114,803
Total Expenditure	6,614,462

Supplementary Information

Appendix 1: Stakeholder Engagement Activities of the Ethics, Policyand Public Engagement Team in 2020

	Description of Engagement Activities ACES EPPE Group
1.	Earth Unbound: Climate Change, Activism And Ecological Justice, Deakin University, 31 January.
2.	Virtual presentation by Alan Finkel, Chief Scientist, Press Club Canberra, 12 February.
3.	'War on Waste: Building a Circular Economy', Committee for Economic Development of Australia, with The Hon, Lily D'Ambrosio MP, Minister for Energy, Environment and Climate Change, in Melbourne, a public talk, 26 February.
4.	Invited webinar on 'Governing Carbon Dioxide Removal in EU's Multi-Level System', Australian- German Climate & Energy College, Melbourne University, 4 March.
5.	Webinar 'Renewable PPAs', Smart Energy Council, Melbourne University, 11 March.
6.	United Nations Principles for Responsible Management Education (UN/PRME), Business for Peace seminar on Entrepreneurship and Peacebuilding, The American University, United States, 24 March.
7.	Webinar 'Australia's Energy Future and Branch Annual Meeting'. Renew: Alternative Energy (Alternative Technology Association), 25 March.
8.	Hydrogen demonstration projects, German Climate & Energy College, 8 April.
9.	Bündnis Bürgerenergie (Citizen Energy Organisation Germany), 10 April.
10.	Webinar, 'Integrating Energy Efficiency into Demand Response and Distributed Energy Systems', University of Melbourne, 29 April.
11.	Australian Energy Market Operator (AEMO Q1 2020) Quarterly Dynamics Seminar, 13 May.
12.	Webinar 'Wind Power and RE Policies: Best Practices', Energy Watch Group/ World Wind Energy Association, 14 May.
13.	Webinar 'Community-scale batteries', Energy Security Board/ Australian National University/ The Total Environment Centre, 21 May.
14.	9th International Workshop on Advances in Cleaner Production (IWACP), International Conference in collaboration with Universidade Paulista (UNIP Brazil), Melbourne, 26 May.
15.	Hepburn Wind Board including the Future Generation Working Group, Board meetings and the Finance and Risk Committee.
16.	United Nations Principles for Responsible Management Education (UN/PRME), Business for Peace working group monthly online meeting, 9 June.
17.	Webinar 'Community-scale batteries: Regulatory Reform Options', organised by the Energy Security Board, Australian National University, TTEC, 18 June.
18.	Webinar 'Community-Scale Batteries – Regulatory Reform Options', Canberra Total Environment Centre, ANU Battery Storage and Grid Integration Program and Ausgrid, 18 June.
19.	Webinar 'Unpacking resilience in times of crisis', Centre for Resilient and Inclusive Societies (CRIS), Alfred Deakin's Institute, 23 June .
20.	Webinar 'Clean Energy in Australia', Melbourne University, Clean Energy College, 25 June.
21.	Webinar 'Energy Ministerial Forum', Clean Energy Council, 8 July.
22.	Virtual Town Hall meeting on Australia's National Environmental Law, Australian Conservation Foundation (ACF), 22 July.
23.	Webinar Sustainable Development Goal 15: Life on Land, EU Centre, Royal Melbourne Institute of Technology (RMIT), 28 July.
24.	Australian Energy Market Operator (AEMO Q2 2020) Quarterly Dynamics Seminar, 29 July.

	Description of Engagement Activities ACES EPPE Group
25.	Joined virtual Coalition for Community Energy (C4CE) Research Committee and Committee meeting as C4CE Research Collaboration Coordinator, 29 July.
26.	'Earth Unbound', Deakin University, 31 July.
27.	Town Hall Meeting at The Victorian Heart Institute to discuss the new institute in the area of the ethics of emerging technology, July.
28.	Energy Ministerial Forum organised by the Clean Energy Council, July.
29.	Brooke's Oration John Denton AO and Chair International Chamber of Commerce, COVID-19: International trade and its ramifications for Australia in a post- COVID global economy, Deakin University, 12 August.
30.	'Communities Leading Climate Action' workshop, Beyond Zero Emissions, 12 August.
31.	Webinar, International Consultation United Nations Environment Assembly (UNEA) Resolution 4/19 on Mineral Resource Governance, on the United Nations Environment Assembly of the United Nations Environment Program, 19 August.
32.	Webinar, '2020 Integrated System Plan Insights', Australian Energy Market Operator (AEMO), 24 August.
33.	Research Committee meeting, Coalition for Community Energy (C4CE), 26 August, 23 September.
34.	Webinar 'health economics agendas', Department of Health Economics Deakin University
35.	University of Wollongong research group: "The Algorithm Will See You Now" (NHMRC Ideas Grant) to discuss research on machine learning, global health, emerging technology (diagnostics) and global health policy (World Health Organisation).
36.	'Smart Energy Conference', Smart Energy Council (online conference), 9 – 10 September.
37.	Webinar "The global renewable energy pathfinder", Australian National University, 22 September
38.	Webinar 'The 1.5°C Role of Digital Platforms breaking down the success Factors' Rocky Mountain Institute, Browning Environmental Communications and the United Nations Development Program (UNDP), 23 September.
39.	'Community Energy Local Power Plan', Policy Launch, 23 September.
40.	'Post-2025 Market Design', Briefing Session, Energy Security Board, 30 September.
41.	Opportunities for Stand-alone power systems (SAPS)/Microgrids to Enhance Network Resilience - Presentation on the Final Report, Canberra, Sydney, Melbourne 14 October.
42.	'Assessing India and Australia's strategic partnership' Australia India Institute, Dr Rajeswari Pillai Rajagopalan (Distinguished Fellow and Head of the Nuclear and Space Policy Initiative, Observer Research Foundation, New Delhi) 14 October.
43.	US Washington Arana Stage Mead Centre for American Theatre Amitai Etzioni, The First Hundred Days: Under Biden, Trump, or Biden and a GOP-controlled Senate, 19 October.
44.	Webinar 'Trade for Peace: Pathways from aid to trade and employment', part of "Harnessing the economy for peace" series, by Geneva Peacebuilding Platform, 27 October.
45.	Webinar 'Debating the Future of Hydrogen Energy', Professor Michael Bradshaw (University of Warwick), Professor Benjamin Sovacool (University of Sussex), Prof Indra Øverland (Norwegian Institute of International Affairs), Newcastle University, 28 October.
46.	'Renew: Burning Issues – Design and Building for Bushfire Protection' ATA, Renew Julie de Jong (H+H Architects), Maria Kornakova (Fire Protection Association Australia), Rob McLeod (Renew), 28 October.
47	'The Political Economy of Corruption', UK University of Loughborough, Birkbeck University, World Interdisciplinary Network for Institutional Research Dorottya Sallai, London School of Economics Jozsef Martin, Corvinus University Budapest, 6 November.
48.	Webinar: Prof Mark Howden (ANU), Framing cascading, compound and complex risk; Mr Andrew Gissing (Risk Frontiers), Compound Disasters in Exploring Complex Risk, Disasters and Vulnerability Compound, Cascading and Lingering Disasters Australia: historical analysis and implications; Dr Nicky Grigg (CSIRO), What have we learned about Australia's vulnerability?; Em Prof John Handmer (IIASA), Identifying and governing systemic risk, 6 November.
49.	Webinar, 'Testing innovative social impact measurement by businesses in complex contexts', by Business for Peace - PRME (Principles for Management Education) Working Group, 12 November.

Description of Engagement Activities ACES EPPE Group	
50.	World Interdisciplinary Network for Institutional Research, Japan Informal Practices, Corruption, and Institutional Change Leviathan for Sale: Maritime police privatisation, bureaucratic corruption and the Sewol disaster, 14 November.
51.	International Energy Association (IEA) National, The outlook for electricity: transformation of the electricity sector is pivotal to the prospects for economic development, energy security and energy transitions, 17 November.
52.	International Energy Association (IEA) National, The outlook for Fuels post COVID, 18 November.
53.	Webinar Get-Up, Malcolm Turnbull and Tim Flannery, 18 November.
54.	IEA Getting to Net Zero: Speakers Christophe McGlade, IEA Daniel Crow; IEA Panellists Sarah Ladislaw, Senior Vice President, Centre for International and Strategic Studies, United States Glen Peters, Research Director, Centre for International Climate Research Ed Webber, Deputy Director, International Climate Action, UK BEIS Professor Ji Zou, CEO & President of Energy Foundation China, 19 November.
55.	IEA Speakers: Mike Waldron, IEA Climate change and equity; Lucila Arboleya; IEA Panellists: Deirdre Cooper, Co-Head, Thematic Equity, Ninety-One; Nigel Jollands, Associate Director, EBRD; Gu Yoon Chung, Head of Business Development Asia Pacific, Enel Green Power Asia, 20 November.
56.	Webinar Centre for Policy Development Climate & Recovery Initiative, the Centre for Policy Development and ClimateWorks Australia APRA Executive Board Member Geoff Summerhayes, ClimateWorks Australia CEO Climate & Recovery Initiative Forum Australia at COP26 Anna Skarbek, and AustralianSuper Chair Don Russell, 23 November,
57.	ANU Canberra British High Commission, Climate Change Institute Dr John Murton, Special Envoy for COP 26 from the Government of the United Kingdom; Tosca Barucco, Special Envoy for 26th Conference of the Parties (COP 26) from the Italian Ministry of Foreign Affairs and International Cooperation; and Prof Frank Jotzo, Director of the Centre for Climate Economics and Policy at Australian National University. Webinar: UN Climate Change Conference UK 2021, 23 November.
58.	Transparency International EU Debugging Democracy: open data for political integrity in Europe, 26 November.
59.	Transparency International Transparency International Chief Political Correspondent Expert panel discussion Launch Of Australia's National Integrity System: The Blueprint For Action 30 November.
60.	Climate Council Minister Matt Kean, NSW Minister for Energy and Environment Amanda McKenzie, Climate Council CEO Greg Bourne, Climate Councillor and former head of ARENA Andrew Charlton, Economist and Director of Alpha Beta - co-author of our Clean Jobs Plan, 10 December.

Appendix 2: Research Training & Mentoring Events

The ACES program targets the professional development of research staff and postgraduate students, as well as key areas of continuing technical and scientific education. The workshops in 2020 were undertaken in the form of events, podcasts, technology showcases, and webinars.

Research Training and Mentoring Events/Meetings 2020		Date	Venue	Attendees Registered
Events				
1.	**Clinical Connections** Experts in their fields including Professor Fiona Wood (burns), Professor Peter Choong (orthopaedics), Professor Mori Adhmesheh (oncology), and Professor Toby Coates (kidney and pancreatic islet cell transplantation) joined with ACES researchers to discuss how advances in materials and additive manufacturing techniques, including 3D printing and bioprinting can overcome challenges faced in the operating theatre to improve the care of patients.	3 February	iCampus Wollongong UOW	71

	Research Training and Mentoring Events/Meetings 2020	Date	Venue	Attendees Registered
2.	**14th Annual International Electromaterials Science Symposium.** The annual International Electromaterials Science Symposium brings together leaders in electromaterials science research across a broad range of disciplines in electromaterials science research across a broad range of disciplines. Plenary speakers for the Symposium included Prof Richard Kaner from the University of California, Prof Jadranka Travas-Sejdic from the University of Auckland and Prof Justin Gooding from UNSW, each delivering on their area of expertise whilst offer some interesting takeaways for all guests.	5-6 February	ANU Canberra	120
3.	**Annual ACES Translational Showcase** This was a fantastic opportunity to get an insight into the translational aspects of the work we do across Australia as part of ACES and opportunities for engagement between researchers, industry and end-users. Attendees had the chance to chat with our researchers on electrofluidics and diagnostics, synthetic energy systems, synthetic biosystems, soft robotics, and 3D electromaterials, as well as ethics, policy and public engagement issues associated with these new technologies.	7 Feb	ANU Canberra	108
4.	**9th International Workshop Advances in Cleaner Production (IWACP) Towards Sustainable Energy-Water-Food Nexus - The Contribution of Cleaner Production** Organised by ACES team members. IWACP is a multi/interdisciplinary forum for the exchange of information and research results on technologies, concepts and policies based on Cleaner Production and conceived to assist the desired transition to a sustainable society.	26 May	Virtual	600
5.	**Sutrode Workshop** This workshop was held with ACES collaborator Mario Romero-Ortega University Texas Houston USA investigating the uses of the functional Sutrode (combines the electrical properties of an electrode with the mechanical properties of a suture) in research activities within the Centre. Exploring lessons learnt to date and what the future may hold for this ground breaking technology.	9 Feb	University of Melbourne & RMIT	12
6.	**Joint UOW/Hanyang University Workshop** This event provided an opportunity to advance a number of on-going research projects and joint research publications in biomedical engineering.	11 Feb	iCampus Wollongong UOW	24
7.	**3D Printed Prosthetic Ears Workshop** The workshop discussed how advances in 3D printing could be used to further develop new technologies to tackle significant medical challenges that included 3D printing of prosthetic ears as low cost as possible.	14 Feb	iCampus Wollongong UOW	19
8.	**Meet the Media Forum** A discussion with journalists: Samantha Brett (Channel 7), Melissa Cunningham (The Age) and Donna Demaio (3AW Radio). Find out what makes science news and how to ensure your research is reported accurately.	23 June	Virtual	67

	Research Training and Mentoring Events/Meetings 2020	Date	Venue	Attendees Registered
9.	**Australia-India MedTech 3D Printed Ears** ACES hosted a workshop with AMTZ (Andhra Pradesh MedTech Zone Ltd based in Vizag) and leading Australian clinicians to explore how these organisations can work together to ensure effective translation of innovative 3D bioprinting initiatives in Australia and India. Attendees heard about the exciting collaborations to utilise 3D bioprinting and additive manufacturing to tackle clinical challenges, international education opportunities to inspire the next generation of researchers, and the engagement of policy makers to achieve global impact.	26 June	Virtual (UOW/ RPA Sydney)	45
10.	**3D Bioprinting Short Course 10 weeks –** 1. Intro to Bioprinting: Building Collaborations 2. Intro to Biomaterials and Ink Formulations 3. Intro to 3D Printer Hardware 4. Characterising Bioinks and Testing Printability 5. Printing with Cells 6. Cartilage Regeneration in the Knee 7. 3D Printed Ears 8. Islet Cell Transplantation 9. Wound Healing 10. Printers in Action: Virtual Tour of TRICEP	28 Aug - 30 Oct	Virtual	11
11.	**Making a PhD Work for You: An ACES Discussion Panel** Gordon Wallace CI UOW, Cameron Ferris, Cathal O'Connell, Eva Tomaskovic-Crook RF UOW, Danielle Warren PhD UOW, conducted a presentation covering: the skills you can acquire through postgraduate research training; the opportunities those skills can open up for you; what to look for in a postgraduate research environment.	28 September	Virtual	99
12.	**Entrepreneur and Innovation Certificate** A one-year non-academic program provided to ACES students and early career researchers. The course is comprised of presentations by a variety of professional businessmen, educators and scientists that have commercialised their own products. This provides them with a thorough overview of the potential opportunities available to them that is not purely limited to academia.	2019 until October 2020	Sydney Business School	11
13.	**Entrepreneur and Innovation Certificate Pitches** Tillmann Boehme (UOW) and ACES Researchers across Nodes deliver their pitch session based on their latest work. Presenting teams showcase novel, innovative and viable ideas ready for market testing, followed by constructive feedback from the online audience to help develop these ideas further.	14 October	Virtual	51
14.	**Making an Animated Video Using PowerPoint** Shou Dong and Thomas Blesch, Monash PhD students shared their knowledge and experience to other ACES members on how to create high quality animated videos for presenting science.	21 October	Virtual Monash	60

	Research Training and Mentoring Events/Meetings 2020	Date	Venue	Attendees Registered
15.	**New Technologies and Dynamic Ageing** Ageing presents all kinds of challenges and opportunities. Being aware of existing and emerging technologies that can assist in providing a dynamic lifestyle is critical if we are to confront those challenges and maximise opportunities. This online workshop brings together clinicians and technologists to discuss this important area. It will also be an opportunity to explore how proposed developments at UOW's Innovation Campus can assist.	24 November	Virtual UOW	62
16.	**Podcasts** A variety of podcasts were recorded over the year and covered among other topics research progression and variety of career paths.	April-December	Virtual	Appendix 3
17.	**Webinars** There were a significant number and variety of webinars this year, covering career development, research development and working ethically.	April - December	Virtual	Appendix 4
18.	**Technology Showcases** ACES technology showcases demonstrated the culmination of years of dedicated research and paths beyond academia to inspire next generation researchers.	October - December	Virtual	Appendix 5

Appendix 3: ACES Podcast Series

A new initiative by ACES in 2021. The number of plays as recorded on 6.1.2021.

	Podcasts	Date	Speaker Affiliation	Number of Plays
1.	**Dr Leo Stevens** **Being a scientist and an entrepreneur** Former ACES student Dr Leo Stevens discusses his PhD experience, his journey since graduating in 2017, founding a company, how he spends his downtime and more. Dr Stevens is the founder of Eon Labs and the Co-founder of Upward Manufacturing. He is a scientist and entrepreneur who was born in raised on the coast of Australia in Wollongong. He completed both his undergraduate degree and PhD at the University of Wollongong (UOW).	15 April	Founder of Eon Labs and the Co-founder of Upward Manufacturing	90 plays
2.	**Dr Matthew Griffith** **Science and where it takes you around the world** Dr Matthew Griffith talks about his PhD experience, moving to Japan, returning to Australia, his various research positions and projects, running marathons and more. Dr Griffith is a researcher now based at the University of Sydney. He is a University of Wollongong graduate, completing a PhD in Physical Chemistry and Device Physics.	22 April	University of Sydney	69 plays

Podcasts		Date	Speaker Affiliation	Number of Plays
3.	**Sidra Waheed** **PhD in Chemistry with ACES** Sidra Waheed discusses her PhD experience, her background, life in Tasmania, what's next for her and more. Sidra recently completed her PhD in chemistry with ACES and the Australian Centre for Research on Separation Science (ACROSS) at the University of Tasmania (UTAS).	29 April	Australian Centre for Research on Separation Science (ACROSS) UTAS	105 plays
4.	**Dr Brianna Thompson** **Science around the world** Dr Brianna Thompson discusses her PhD, teaching science in Japan, working in research around Australian and overseas, her change of career to study medicine and more. Brianna completed her PhD at the University of Wollongong (UOW) within the Intelligent Polymer Institute (IPRI). She is now studying medicine at the University of Otago in New Zealand.	6 May	University of Otago, NZ	112 plays
5.	**Dr Cameron Ferris** **PhD to ACES and now own startup company** Cameron completed his PhD at the University of Wollongong (UOW) and ACES in 2013 and is now the Chief Operations Officer at Inventia Life Science.	14 May	Inventia Life Science	121 plays
6.	**A/Prof Payal Mukherjee** **ACES Collaborator and Ear, Nose and Throat (ENT) surgeon** Throughout the conversation, we hear about her career path and background, being introduced to 3D printing, working with ACES and much more. Payal is also a Clinical A/Prof at the University of Sydney, Royal Prince Alfred Institute of Academic Surgery and is the founder of ENT, Hearing and Balance Centre.	20 May	University of Sydney/RPA	65 plays
7.	**Dr Cristina Pozo-Gonzalo** **From Spain to ACES Australia** ACES Research Fellow Dr Cristina Pozo-Gonzalo talks about her background, moving from Spain to Manchester and then eventually Australia, her career in research and much more.	27 May	Deakin University	89 plays
8.	**Dr Cathal O'Connell** **PhD, Postdoctoral Fellow and his time with ACES** We chat with VC Postdoctoral Fellow at RMIT University Dr Cathal O'Connell about his PhD and time with ACES, science writing and his passion for reading.	4 June	RMIT	90 plays
9.	**Dr Lilith Caballero Aguilar** **PhD to Post-Doctoral Research Fellow and Women in STEM.** Postdoctoral Research Fellow at Swinburne University of Technology. Lilith talks about her PhD project and experience with ACES, how she became interested in science, Women in STEM, life outside of research.	10 June	Swinburne University	151 plays

Podcasts		Date	Speaker Affiliation	Number of Plays
10.	**Prof Simon Moulton** **Research story in ACES.** Prof Moulton talks about his role within ACES, his unique journey to study science and become a professor after spending a number of years in the Navy, his interests outside of work including a love for cycling.	17 June	Swinburne University	61 plays
11.	**Prof Fiona Wood** **World-renowned burns surgeon and 2005 Australian of the Year** Clinical professor, world-renowned burns surgeon and 2005 Australian of the Year, Prof Fiona Wood. Throughout the conversation, we hear about her career in medicine and plastic surgery, pioneering the 'spray-on skin' technique, treating Bali bombing survivors in 2002, future collaborations and much more.	1 July	Clinical Professor	68 plays
12.	**A/Prof Claudia Di Bella** **ACES collaborator and Orthopaedic surgeon** Throughout the conversation, we hear about A/Prof Claudia Di Bella's career in medicine and how she got to where she is today, moving to Australia from Italy, her work with ACES, playing professional water polo and more.	16 July	University of Melbourne	85 plays
13.	**Prof Douglas MacFarlane** **Journey from Belfast to Australia and leading the Energy Program** Prof Macfarlane talks about his role within ACES as head of the Energy Program, his journey to become a professor in science, how he came to Australia after being born in Belfast, his interests outside of work including hiking and carpentry.	29 July	Monash University	79 plays
14.	**Molly Patton** **Science and arts merging together to communicate science** Founder and Creative in Chief of Patton'd Studios. Molly talks about her background in studying both science and arts, merging the two together to start her business, communicating science through visual design, contributing to the journal cover artwork in the Royal Society of Chemistry on Next-Gen Nanomaterials and more.	13 August	Patton'd Studios	73 plays
15.	**Prof Susan Dodds** **ACES Journey including a background in Philosophy** Prof Dodds talks about her role within ACES, her journey as a researcher and background in philosophy.	28 August	La Trobe University	77 plays
16.	**Prof Maria Forsyth** **Career, collaborations and ACES journey** Prof Forsyth talks about her career in science, her work and collaborations, the ACES journey and its legacy.	9 September	Deakin University	124 plays
17.	**Dr Syamak Farajikhah** **Career in science and PhD at UOW** Dr Farajikhah talks about his career in science, his PhD in chemistry at the University of Wollongong, his latest work.	15 October	University of Sydney	68 plays

Podcasts		Date	Speaker Affiliation	Number of Plays
18.	**Dr Peter Sherrell** **Science career and research in Sweden and London** Dr Sherrell talks about his career in science, including his PhD in materials science at the University of Wollongong, working in research in Sweden and London.	28 October	University of Melbourne	37 plays
19.	**Prof Alan Bond** **Chemistry, career and research** Prof Bond chats about his interest in chemistry, how it all started, and his distinguished career in research.	27 November	Monash University	47 plays
20.	**Dr Amy Gelmi** **PhD and postdoctoral career** Dr Gelmi talks about her PhD at the University of Wollongong (UOW) and her postdoctoral career, including working in research in Sweden and London before moving back to Australia.	11 December	RMIT	35 plays

Appendix 4: ACES Technology Showcases

Technology Showcases		Date	Venue	Registered Participants
1.	**Soft Robotic Hand** ACES is one of the first research teams to combine cutting-edge technologies of additive manufacturing, smart materials and soft robotics to bring effective and low cost solutions for myoelectric prosthetic hands. This showcase included: • Insights into the technology; • A live demonstration of current models; • Interactive Q&A session with ACES Director Prof Gordon Wallace, Project Leader Prof Gursel Alici and Project Research Fellow Dr Hao Zhou.	26 October	Virtual	36
2.	**Quantitative Ultrasound Imaging** ACES researchers are developing ultrasound technology as a non-destructive technique for biomaterial evaluation. This system offers a number of advantages, including quantitative technique and simple set-up, spatial visualisation of cell domains in the three dimensions, and larger penetration depth compared to microscopy, and is ideal for soft tissues. This technology can be used for a range of applications including bioprinting, pharmacology and tissue engineering. This showcase included: • Insights into the technology; • A live demonstration of the current system; • Interactive Q&A session with ACES Director Prof Gordon Wallace and Project Leader Dr Andres Ruland.	2 November	Virtual	32

	Technology Showcases	Date	Venue	Registered Participants
3.	**CO_2 Reduction** Electrochemical reduction is a promising clean energy technology, by using electricity from renewables to convert CO_2 to achieve a carbon neutral energy cycle. ACES has made a significant contribution to the field of CO_2 electroreduction that covers nearly all aspects impacting the carbon electroreduction performance, including: • Catalysts allowing targeted reduction reaction with high selectivity and activity; • Gas diffusion electrodes overcoming the mass transport limitation of CO_2 to enable electrolysis at high current densities; • Sea water as an electrolyte for the concurrent electroreduction of CO_2 and storage via mineralisation; and • Prototype scalable reactors for industrial application. This showcase includes: • Insights into the technology from Prof Doug MacFarlane; • A live demonstration of the current systems being developed at the University of Wollongong and Monash University; • Interactive Q&A session with ACES Director Prof Gordon Wallace, Project Leaders Prof Jie Zhang and A/Prof Caiyun Wang.	16 November	Virtual	24
4.	**Edge Functionalised Graphene** ACES has made a globally recognised contribution to the field of graphene research, and in our latest significant breakthrough we have developed a patented process that allows us to selectively oxidise the edges of graphene sheets in graphite in large scale (edge functionalised graphene). This EFG material allows the creation of a variety of conductive, binder-free graphene doughs that have the potential for mouldable electrodes, polymer composite development, graphene-supported catalytic systems, battery/supercapacitor anodes and many other applications. This showcase provided: • Insights into the technology; • A live demonstration of the EFG material; • Interactive Q&A session with ACES Director Prof Gordon Wallace and ACES Electromaterials Theme Leader Prof David Officer.	30 November	Virtual	32
5.	**Building Electric Tissue Using Ultrasound** ACES researchers have developed a proprietary and clinically-amenable technology for wireless electrical stimulation of 3D cell cultures and tissues. The system offers a bold and new solution for 'next generation' tissue engineering and augmented 'within-body' tissue regeneration and function. Our technology draws from our earlier 'electric neural tissue engineering', which was awarded the inaugural Research Australia 2019 Health and Medical Research Frontiers Research Award. The technology includes a bioprintable and injectable 'Electrogel' that can be used for a range of applications including neural and other tissue engineering, and to wirelessly electrically stimulate damaged body tissues for their regeneration and restoration of function, for augmented pharmacotherapeutics. This showcase provided: • Insights into the technology; • A live demonstration of the current system; • Interactive Q&A session with inventors ACES Chief Investigator A/Prof Jeremy Micah Crook, ACES Research Fellow Dr Eva Tomaskovic-Crook and PhD candidate Samuel Rathbone.	14 December	Virtual	41

Appendix 5: ACES Webinar Series

Webinars		Date	Venue	Registered participants
1.	Building Collaborative Research Teams	8 April	Virtual	42
2.	iFix System: The Journey Thus Far with Prof Gerard Sutton	15 April	Virtual	63
3.	Job Seeker Skills with Prof Maria Forsyth https://youtu.be/K5C4o1jnGQI	22 April	Virtual	71
4.	Managing Intellectual Property: Part 1 with Prof Doug MacFarlane https://youtu.be/ziVKxcscle8	29 April	Virtual	79
5.	Modelling with Dr Fangfang Chen	6 May	Virtual	83
6.	Are Conducting Polymer Electrodes Capacitive or Faradaic? with Prof George Malliaras https://youtu.be/HfPzHe8eRro	12 May	Virtual	112
7.	Clinical Collaboration in Research With Dr P Mukherjee, S Fleming & Prof G Wallace	13 May	Virtual	67
8.	Bipolar, Wireless Electrochemistry from Cells to Waste Water with Prof Robert Forster https://youtu.be/yjogr8D0064	19 May	Virtual	76
9.	3D Printing, Presented by ACES/ANFF With Prof G Wallace, Dr J Chung, A/Prof S Beirne	20 May	Virtual	87
10.	Managing Intellectual Property: Part 2 with Prof Doug MacFarlane https://youtu.be/21OagClQkak	27 May	Virtual	107
11.	Crafting the Perfect LinkedIn Profile with Samuel Findlay https://youtu.be/h_A2mrXboVA	3 June	Virtual	138
12.	Application of Ionic Liquids as Solvents in Electrochemical Sensors with A/Prof Debbie Silvester https://youtu.be/ErBtHVg2fFo	4 June	Virtual	51
13.	Publishing from an Industry Project, Presented by ACES/storEnergy	11 June	Virtual	73
14.	Polymeric Materials for Neuroregeneration with A/Prof Jeremy Crook https://youtu.be/XfrHExiTies	17 June	Virtual	50
15.	Meet the Media Forum (Science in Public)	23 June	Virtual	
16.	Skin-healing Powers of Seaweed: A Conversation with Dr Pia Winberg https://youtu.be/Xkezi4gocil	30 June	Virtual	28
17.	Nanostructure of ionic liquids at electrodes and in the bulk, and for (truly) spontaneous graphene exfoliation	7 July	Virtual	32
18.	Polymer nanoparticles for drug delivery: The myth of the Trojan Horse with Prof Martina Stenzel https://youtu.be/S4Rcn6ceAZk	14 July	Virtual	38
19.	Scientific Writing for the Public with Dr Cathal O'Connell https://youtu.be/Q3GjJNC292o	21 July	Virtual	76

Webinars		Date	Venue	Registered participants
20.	Future Ionic Systems: Where are the Research Questions?	28 July	Virtual	52
21.	Writing A Great Paper: Part 1 with Prof Doug MacFarlane https://youtu.be/38zPckdPsc0	4 August	Virtual	120
22.	Getting Ideas Into Industry - A Road Map for Researchers	11 August	Virtual	56
23.	What kind of medical device innovator are you? And does it matter for ethics?	18 August	Virtual	35
24.	The good, the bad and the ugly: watching interfacial water molecules, surface groups and proteins in action	25 August	Virtual	43
25.	Writing A Great Paper: Part 2 with Prof Doug MacFarlane https://youtu.be/QabQtt4E22o	1 September	Virtual	50
26.	Harnessing Solar Energy through Catalysis: Closing the Carbon Loop	8 September	Virtual	40
27.	Single Molecule and Single Cells Biosensors	15 September	Virtual	59
28.	Plasma synthesis of tunable bio-functional surfaces and interfaces within internal porosity to enable robust solid-hydrogel hybrid material	22 September	Virtual	76
29.	Prototyping of Electrochemical Devices: Getting your ideas out of the lab - Session 1: 'WHY'	23 September	Virtual	21
30.	Prototyping of Electrochemical Devices: Getting your ideas out of the lab - Session 1: 'HOW'	25 September	Virtual	21
31.	Simulating non-equilibrium systems at the atomic scale	29 September	Virtual	66
32.	Machine Learning in Medicine with Prof Svetha Venkatesh, Prof Susan Dodds and Prof Mark Cook https://youtu.be/YU3F_9wqX90	1 October	Virtual	92
33.	Neutron Diffraction and Energy Research - It is not just Li ion batteries	6 October	Virtual	70
34.	Researchers Reaching Out: A conversation with Prof Richard John and his Science on the Go! outreach team	13 October	Virtual	78
35.	Imaging Biometals in the Human Brain Using High Field MRI with A/Prof Leigh Johnston https://www.youtube.com/watch?v=BElcHhrJlJA&list	20 October	Virtual	33
36.	Ethical Collaboration with Synthetic Biosystems Researchers	27 October	Virtual	91
37.	Latest Advances in Bioinks: An ACES/ANFF Webinar https://youtu.be/VpBjD8TMi8I	9 November	Virtual	42
38.	STEM, COVID-19 & Future Prospects for Researchers https://youtu.be/GfgLmn88Fm0	10 November	Virtual	35
39.	Applying Machine Learning to Experimental Results from Analytical Chemistry	17 November	Virtual	47
40.	The Evolution of Electrochemistry with Prof Alan Bond https://youtu.be/YUeMHfYa2pg	1 December	Virtual	194

Appendix 6: ACES Cross Nodal Interactions 2020

X-Nodal visits/interactions (this year including virtual) are reported for when members travel between ACES nodes to undertake multidisciplinary research, which includes brainstorming, project meetings, or access to laboratories to undertake research tasks. These visits are additional to ACES support provided to attend targeted workshops or ACES events/conferences. Due to COVID-19 in 2020 the usual face to face interactions could not occur and meetings were moved to smaller, informal online interactions.

ACES Cross Nodal Interactions 2020	
1.	Director Gordon Wallace, CI UOW, visited ACES Deakin node in Geelong, 31 January.
2.	Shaikh Faisal, ECR UOW, visited Prof Mainak Majumdar at ACES Monash node for characterising EFG, 2- 5 March.
3.	A total of ten monthly cross nodal virtual meetings were held for all Themes and Nodes of ACES during the year, with presentations and reports from each Theme as a standing agenda item.
4.	Ethics, Policy and Public Engagement Theme held cross nodal Theme meetings in March, May and June, October and December.
5.	Electrofluidics Theme held cross nodal Microfluidics workshop Micro-symposia both face to face (UTas, Tasmania, 5-7 March) and virtually 24 August.
6.	Mark Howard, EPPE RF Monash, attended University of Wollongong research group: "The Algorithm Will See You Now" (NHMRC Ideas Grant) to discuss research on machine learning, global health, emerging technology (diagnostics) and global health policy (World Health Organisation).
7.	Cristina Pozo-Gonzalo, RF Deakin, had a video conference with Yvonne Hora and James Griffith of Monash University to discuss XPS characterisation of rare earth metals deposits, 21 May.
8.	Andres Ruland, RF UOW, met with Serena Duchi and Carmine Onofrillo from Biofab3D, St. Vincent's Hospital Melbourne, to discuss results with collaborators for project ultrasound monitoring of cartilage, 7 and 27 July.
9.	ACES Full Centre Meeting 2020. The meeting was an opportunity for our end-users to gain insights in developments in electromaterials research, how ACES work has real world applications to build new innovations and industries, and engagement opportunities between researchers, industry and end-users, 20-21 August.
10.	To ensure that everyone stayed positively engaged throughout the shutdowns, online social events were held across all Nodes to keep up morale. Online trivia events were held on 1 & 29 May 2020.

Appendix 7: End-User Visits To Aces 2020

End-User and Industry Visits to ACES in 2020	
1.	Michael Chen, QUT PhD student with Mia Wodruff took a tour of TRICEP, 3 January
2.	Janet Hou, Dean Nan Tien Institute, took a tour of TRICEP, 3 January
3.	Greg D'Arcy and Ben Naylor from A W Edwards met to discuss collaboration and to view the facilities in TRICEP/ANFF and ACES UOW, 8 January
4.	Ben Naylor, Manager - Rintoul Pty Ltd, met for research discussions on the development of composite/3D printing, 8 January
5.	Dr Kathryn Lomas, CSO Hemideina Pty Ltd, met to discuss 3D printing opportunities and view the in TRICEP/ANFF, 14 January
6.	Raj Paramanathan, Genesis Care Pty Ltd, met with Gordon Wallace and Stephen Beirne, to discuss potential collaborative materials research project, 21 January
7.	Tom Kulaga, Electronics Engineer (Optical Stimulation), Nuera, met with Gordon Wallace and Ali Jeiriani to discuss 3D modelling, 28 January
8.	Stuart Creal, Director Science Centre Wollongong, visited ACES UOW to discuss outreach activities and displays, 29 January
9.	Pia Winberg, Venus Shells Systems Shoalhaven, visited ACES UOW to progress collaborative projects, 20 February
10.	Natasha Mitchell, Presenter & Science Journalist, Australian Broadcast Corporation, visited ACES UOW media team to tour the facilities and organise interviews with researchers on 3D bioprinting and attend the International Electromaterials Symposium at ANU, 3 February
11.	Neil Wilson, ROMAR Engineering, visited ACES UOW and TRICEP to talk 3D printing, 24 February

End-User and Industry Visits to ACES in 2020	
12.	Ian Quin, Clinical Operations Specialist, Genesis Care, visited ACES/TRICEP/ANFF to tour the facilities and discuss potential projects 21 January, 10 February, 2 & 17 March.
13.	Jitendra Joshi of Woodside met with Douglas MacFarlane, CI Monash, to discuss project planning, 13 March
14.	Fletcher Thompson, Me3D, had a virtual meeting with TRICEP to progress PPE equipment design and production, 16 April
15.	David Officer, UOW, met with Product Manager, Nicola Stanistreet of Pacific Resin, for research discussions about graphene composites, 19 May
16.	Shaikh Faisal, ECR UOW, met with Sicona battery technology regarding research projects, 20 July.
17.	Jason Hinds, Research Manager, Enware met with Paul Molino, RF UOW, to discuss collaborative projects and equipment, 31 July.
18.	Inventia Life Science visited TRICEP to discuss partnership opportunities regarding 3D bioprinting hardware and bioinks for skin regeneration as part of the BioMedTech Horizons program, 25 August.
19.	Christiaan Jordaan and Andrew Minett, from Sicona Battery Technologies, met with David Officer, CI UOW, to discuss use of graphene, 2 August & 14 September.
20.	David Allen, Podiatris from ISLHD, met with Gordon Wallace and Stephen Beirne UOW, to look at 3D printing and scanning capabilities for patients with diabetic foot problems, 25 August.
21.	Gerard Sutton, Chief Medical Officer iFix, Vision Eye Institute, met with Gordon Wallace, CI UOW, to discuss iFix and corneal bioengineering, 27 August.
22.	Vaultra and David Officer, CI UOW, had a virtual meeting with to discuss uses of graphene.

Appendix 8: Government and Non-Government Organisation Interactions 2020

Government and Non-Government Organisation Interactions 2020	
1.	Sangeetha Krishnamoorthy - Austrade, Santhosh Kumar AMTZ, India, met to progress collaborative research activities, 30 January.
2.	Duncan Macinnis, Director of Stakeholder Engagement NSW & ACT, MTPConnect to review progress on projects with TRICEP, 4 March.
3.	MacFarlane, Douglas, CI Monash, presented a seminar on Sustainable Ammonia to the Victorian Government, 24 March.
4.	Cherian, Matthew, PhD Deakin, included Energy start-ups into CSR policy of Government of India.
5.	Danielle Fisher, General Manager from NSW Organ and Tissue donation services participated in a lab visit with Dr Johnson Chung on 27 August.
6.	Michael John Ward, British Consul General and Jonathan Cook, British Deputy Consul General, UK Government, met with AIIM & TRICEP staff for a tour of facilities, 15 September.
7.	Prof Susan Dodds, CI La Trobe University, International Advisory role: Member of the World Health Organisation (WHO) COVID Think Tank on Ethics. Part of a future-scoping project on how WHO's West Pacific Regional Office can support its member countries' health systems after the initial challenge of COVID has passed, June.
8.	Prof Susan Dodds, CI La Trobe University, Go8 COVID-19 Roadmap 2020. An Ethical Framework for the recovery, Group of Eight, COVID-19 Roadmap to Recovery: A report for the nation, pp 23-25. (Contribution to the writing of the framework).
9.	Prof Susan Dodds, CI La Trobe University, COVID Contributions To Government Reports/ Advice • Bell, Genevieve *et al.* 2020. What motivates people to download and continue to use the COVIDSafe app? RRIF Q11 Rapid Research Information Forum, Office of the Chief Scientist (Independent reviewer). • Larkins, F *et al.*, 2020. Impact of COVID-19 pandemic on Australia's research workforce RRIF Q6 Rapid Research Information Forum, Office of the Chief Scientist (Independent reviewer). • Ahmed, W *et al.* 2020. Monitoring Wastewater to Detect COVID-19, RRIG Q 3, Rapid Research Information Forum, Office of the Chief Scientist (Independent reviewer). • Duncan Ivison, Marc Steers, Susan Dodds. 2020. An Ethical Framework for the recovery, Group of Eight, COVID-19 Roadmap to Recovery: A report for the nation, pp 23-25. (Contribution to the writing of the framework).

Government and Non-Government Organisation Interactions 2020	
10.	Natalie Ralph, AI Deakin, was a steering committee member of PRME (Principles for Responsible Management Education) Business for Peace working group, an initiative of the United Nations Global Compact, Jan – Sept.

Appendix 9: ACES Out and About with Stakeholders 2020

ACES Out and About Interacting with Stakeholders in 2020	
1.	Quintana, Laura Garcia, PhD Deakin, Visited CIC EnergiGune, Vitoria, Spain, for research collaboration, 7 January – 7 February.
2.	Robert Forster, AI DCU/UOW, presented an Open Day Talk "Collaborative work with ACES on electromaterials" at Portmarnock Community Secondary School, Dublin, Ireland, 16 January.
3.	Robert Forster, AI DCU/UOW, presented an Open Day Talk "Electromaterials Going Wireless: From Health to the Environment" at Cabra Community College, Secondary School, Dublin, Ireland, 17 January.
4.	David Officer, CI UOW, visited Composites Australia in Melbourne, Victoria, to discuss graphene publication/workshop, 20 January.
5.	David Officer, CI UOW and Faisal Shaikh ECR, visited Dr Andrew Cornejo and Dr Nikan Noorbehesht, of Hazer Group, to discuss graphene synthesis and manufacturing, 31 January.
6.	3D Printing Collaborative Workshop at GenesisCare, Alexandria with ACES/TRICEP, 10 February.
7.	Michelle Coote, CI ANU, was organiser, Chair and presenter for RACI 20th Australasian Polymer Summer School of 50 graduate students from around Australia, 11-12 February.
8.	Professor Maria Forsyth, CI Deakin, shared her research group motto for 2020 'Work hard, work happy' at IUPAC Global Women's Breakfast event, CSIRO, Clayton, 12 February.
9.	Cristina Pozo-Gonzalo, RF Deakin, visited A.Prof Aleks Nikoloski at the Future Battery Industries CRC Summit, Perth to discuss the circular economy for energy storage materials, 10-11 March.
10.	David Officer, CI UOW, and Shaikh Faisal, ECR UOW, visited the Research and Development of Ionic Industries and the laboratory of Prof Mainak at Monash University to explore the electrochemical performance of edge-functionalised graphene, 2-4 March.
11.	Shaikh, F, RF UOW, had a virtual meeting with Hazer Group Limited and presented the results and data from the graphene prepared from Hazer graphite samples and discussed future collaboration opportunities, 21 March.
12.	MacFarlane, Douglas, CI Monash, presented a seminar on Sustainable Ammonia to the Woodside on 16 April.
13.	David Officer, CI UOW, had a virtual meeting with Hazer Group to discuss energy materials collaboration, 22 April.
14.	Yan Liang, Cristina Pozo-Gonzalo, Rob Kerr, Faezeh Makhlooghiazad, Natalie Ralph, Yady Senayda Garcia Castillo, Deakin node, presented seminars for Secondary Science Teachers to develop online resources related to ACES research, 4 May.
15.	Dmitrii Rakov, PhD Deakin, established a new collaboration in preparation for his pending internship (subject to COVID-19) with National Aeronautics and Space Administration (NASA, Washington DC, USA).
16.	Saimon Moraes Silva, Swinburne PhD, presented to 25 high school students and teachers involved in the BrainSTEM innovation challenge "Creativity in scientific research" in the ASK BrainSTEM Innovation Challenge, 15 May.
17.	David Officer, CI UOW, visited Pacific Resins in Wollongong to discuss collaboration on graphene polymer composites, 19 May.
18.	Prof. David Officer, CI UOW and Dr. Shaikh Faisal, ECR UOW, engaged in initial collaboration of material transfer to Imagine Intelligent Materials Pty Ltd and Sicona Battery Technology, May.
19.	MacFarlane, Douglas, CI Monash, presented a seminar on Roadmap to the Ammonia Economy to the Clean Energy Council, 17 June.
20.	Paul Molino, RF UOW, met with Defence, Science and Technology Group (DSTG) to discuss next round of funding for Sensing systems, June.

ACES Out and About Interacting with Stakeholders in 2020	
21.	Andres Ruland, RF UOW, attended a video conference with Jan Weber (IAC Member) and Corporate Technology Scout from Boston Scientific, Clonmel, Ireland, for initial talks and presentation on ultrasound imaging capabilities to consider collaboration opportunities, June.
22.	Paul Molino, RF UOW, met with Jason Hinds (Enware Pty Ltd) to discuss work on the optical flow sensor project, June.
23.	Officer, David, CI UOW and Faisal, Shaikh, ECR UOW, had initial discussions with Imagine Intelligent Materials Pty Ltd and Sicona Battery Technology, June.
24.	Alexandr Simonov, RF Deakin, was invited by Petroleum Economist to comment on the recent fuels project by Repsol involving generation of H_2 by water electrolysis and CO_2 capture and valorisation, June.
25.	Zhilian Yue, UOW, participated in monthly virtual meeting on Corneal Bioengineering, with Professor Gerald Sutton in Sydney eye bank, 30 July.
26.	Mark Cook, CI UOM, Katina Michael and ACES Gordon Wallace, CI UOW, presented a virtual public lecture “Brain on a Bench”, 19 August.
27.	Jie Zhang, CI Monash, met with Dr. Weiguang Lan from Sinomem Technology Ltd to discuss collaboration opportunities, 7 and 29 September.
28.	Alici, Gursel, CI UOW and Dr Hoa Zhou UOW, met with Mr John Davey (recent amputee) to discuss the ACES robotic hand, 30 September.
29.	Robert Forster, AI DCU/UOW, presented “Improving Health Through Rapid, Early Disease Detection: From COVID-19 to Epilepsy” to the Royal College of Surgeons in Ireland, 20 October.
30.	Eva Tomaskovic-Crook, RF UOW, Jeremy Crook CI UOW – Discussions with Stemcell Technologies (Canada/Australia), 13 November.
31.	Meisam Hasanpoor, PhD Deakin, started a 3 month traineeship with Calix Limited in Victoria, working on 3 research projects and also collaborating with Monash and QUT.
32.	Deakin students have been working on 2 research projects with Boron Molecular in Melbourne using their labs.
33.	Greg Rollo-Walker, Deakin, has worked on a project in CSIRO labs in Clayton, Victoria
34.	2 Deakin students working on 2 projects with DST Group, Port Melbourne, Victoria.
35.	Deakin University has an ongoing project with M Brodribb, of Glen Iris, Victoria
36.	Deakin University, through collaboration with Monash University, has an ongoing project with Ionic Industries, South Melbourne, Victoria.
37.	Deakin University have started a collaborative project with SEBE (electrical engineering), Revo Group, Darra, Queensland.
38.	Deakin University student is working on an ongoing project with Sensoplex, Rowville, Victoria
39.	Deakin University is working on a collaboration project with shared student at University of South Australia, Sentex.
40.	Deakin University is working on a collaboration project with University of Melbourne and SupraG Energy, Port Melbourne, Victoria
41.	Deakin University is preparing a new project collaboration which has expedited due to COVID-19, with Cidetec, Donostia-San Sebastián, Spain.
42.	Deakin University completed a project of a literature survey into the physical degradation mechanisms of battery electrodes, CISIRO, Clayton Victoria.
43.	Deakin University completed a project, building a prototype using Sicona anode material with Sicona, Paddington NSW. A Second project agreement is being developed.
44.	Tim Khoo, Deakin AI, met with Casey Technical School to use storEnergy in the development of an energy module.
45.	Gordon Wallace and the TRICEP team met with Dr. Brendan Tonson of Wollongong Hospital to discuss potential collaboration on artificial retina idea and visit TRICEP, 6 November.

Appendix 10: ACES End-User Events 2020

A list of events where in 2020 members raised awareness of the facilities and research activities amongst end-users.

	End-User Event Description	Date	Venue
1.	**Clinical Connections** Experts in their fields including Professor Fiona Wood (burns), Professor Peter Choong (orthopaedics), Professor Mori Adhmesheh (oncology), and Professor Toby Coates (kidney and pancreatic islet cell transplantation) joined with ACES researchers to discuss how advances in materials and additive manufacturing techniques, including 3D printing and bioprinting can overcome challenges faced in the operating theatre to improve the care of patients.	3 Feb	iCampus Wollongong UOW
2.	**14th Annual International Electromaterials Science Symposium.** The annual International Electromaterials Science Symposium brings together leaders in electromaterials science research across a broad range of disciplines in electromaterials science research across a broad range of disciplines. Plenary speakers for the Symposium included Prof Richard Kaner from the University of California, Prof Jadranka Travas-Sejdic from the University of Auckland and Prof Justin Gooding from UNSW, each delivering on their area of expertise whilst offer some interesting takeaways for all guests.	5-6 Feb	ANU Canberra
3.	**Annual ACES Translational Showcase** This was a fantastic opportunity to get an insight into the translational aspects of the work we do across Australia as part of ACES and opportunities for engagement between researchers, industry and end-users. Attendees had the chance to chat with our researchers on electrofluidics and diagnostics, synthetic energy systems, synthetic biosystems, soft robotics, and 3D electromaterials, as well as ethics, policy and public engagement issues associated with these new technologies.	7 Feb	ANU Canberra
4.	**3D Printed Prosthetic Ears Workshop** The workshop discussed how advances in 3D printing could be used to further develop new technologies to tackle significant medical challenges that included 3D printing of prosthetic ears as low cost as possible.	14 Feb	iCampus Wollongong UOW
5.	**Australia-India MedTech 3D Printed Ears** ACES hosted a workshop with AMTZ (Andhra Pradesh MedTech Zone Ltd based in Vizag) and leading Australian clinicians to explore how these organisations can work together to ensure effective translation of innovative 3D bioprinting initiatives in Australia and India. Attendees heard about the exciting collaborations to utilise 3D bioprinting and additive manufacturing to tackle clinical challenges, international education opportunities to inspire the next generation of researchers, and the engagement of policy makers to achieve global impact.	26 June	Virtual (UOW/ RPA Sydney)
6.	**ACES Full Centre Meeting 2020** The meeting was an opportunity for our end-users to gain insights in developments in electromaterials research, how ACES work has real world applications to build new innovations and industries, and engagement opportunities between researchers, industry and end-users.	24 August	Virtual
7.	**New Technologies and Dynamic Ageing** Ageing presents all kinds of challenges and opportunities. Being aware of existing and emerging technologies that can assist in providing a dynamic lifestyle is critical if we are to confront those challenges and maximise opportunities. This online workshop brings together clinicians and technologists to discuss this important area. It will also be an opportunity to explore how proposed developments at UOW's Innovation Campus can assist.	24 Nov	Virtual UOW

End-User Event Description		Date	Venue
8.	**Podcasts** A variety of podcasts were recorded over the year and covered among other topics research progression and variety of career paths (Appendix 3).	April- December	Virtual
9.	**Webinars** There were a significant number and variety of webinars this year (Appendix 5).	April - December	Virtual
10.	**Technology Showcases** ACES technology showcases demonstrated the culmination of years of dedicated research (Appendix 4).	October - December	Virtual
11.	**3D REDI Launch** 3D REDI is a 3D bioprinting system designed for use in research and training. The intuitive 3DREDI platform, combined with practical training modules, will equip users with the essential hardware and skills to embark on projects in the rapidly emerging bioprinting industry. 3DREDI features ADAPTABLE, TRICEP's custom bioprinter user interface and toolpath generator, tailored to allow you to define functionally graded structures like never before. The launch introduced the 3DREDI system and demonstrated its capabilities, with the first 3DREDI available for purchase in the first quarter of 2021.	26 Nov	TRICEP and virtual

Appendix 11: ACES Plenary and Keynote Addresses 2020

Plenary and Keynote Addresses given by ACES members in 2020	
1.	Plenary talk: Maria Forsyth, CI Deakin, "Novel ionomer membranes for next generation solid state batteries" IMSTEC2020 Sydney, 2-6 February.
2.	Plenary talk: Maria Forsyth, CI Deakin, "Electrochemical Energy Storage – beyond 2020": 9th International workshop in advances in cleaner production, 26 May.
3.	Plenary lecture: Gursel Alici, CI UOW - 3rd International Conference on Magnetic Surgery, Xi'an, China, "Actively controlled medical robotic capsules: their actuation, localisation and drug delivery capabilities" 12-13 June.
4.	Plenary talk: Maria Forsyth, CI Deakin, "Environmentally Friendly Multifunctional Corrosion Inhibitor Systems" EUROCORR2020, 6-11 September.
5.	Keynote address: Xungai Wang, CI Monash, "Recent Developments in Addressing the Sustainability Challenges for Textiles & Fashion", Functional Textiles and Clothing Conference, IIT Delhi, 8 February.
6.	Keynote talk: Jenny Pringle, CI Deakin, "Development of organic ionic plastic crystals as solid-state electrolytes", International Conference on Nanoscience and Nanotechnology (ICONN) and International Conference on BioNano Innovation (ICBNI), Brisbane 9-13 February.
7.	Keynote talk: Maria Forsyth, CI Deakin, "Alkali electrodes and interphases in super concentrated Ionic Liquid electrolytes and the role of interfacial structure", International Battery Association (IBA) Conference, Bled, Slovenia, 8-13 March.
8.	Keynote Lecture: Gerard Sutton, AI UOW, Eye Bank Association of America, "A Bioengineered Cornea: Just around the corner", May.
9.	Forsyth, M, CI Deakin, Keynote 'Electrochemical Energy Storage - Beyond 2020' at 9th International workshop in advances in cleaner production online 26 May.
10.	MacFarlane, Doug, CI Monash Keynote 'Towards the "Ammonia-Economy" at 9th International workshop in advances in cleaner production online 26 May.
11.	Invited Keynote: Robert Sparrow, CI Monash, "What robots represent... and why it matters", Robophilosophy 2020, Aarhus Denmark, 19 August.
12.	Keynote address: Jeremy Crook, CI UOW, "Innovations in soft tissue building". Soft Tissue Bioengineering Virtual Symposium. Swinburne University of Technology, 17 September.

Plenary and Keynote Addresses given by ACES members in 2020	
13.	Keynote: Michelle Coote, CI ANU, workshop on big-data and machine learning for material design, "Machine Learning for Materials Design: An Overview" University of Science and Technology of China, Hefei, Anhui 230026, P. R. China, 12 September.
14.	Invited Keynote: Robert Sparrow, CI Monash, 'Robots and Care: Connection or Alienation?' E-Tonomy 2020, Paris, 30 September.
15.	Keynote address: Xungai Wang, CI Deakin, New ways of recycling and reusing coloured textile waste, the 3rd International Forum on Textiles for Graduate Students (virtual), November 29.

Appendix 12: ACES Invited Talks 2020

ACES Invited talks or Panels by ACES members in 2020	
1.	Invited lecture: Sparrow, R, CI Monash, U3A Hawthorn Summer School January 2020, "Resisting the Rise of the Machines: AI and Ethics.", Melbourne, 6 January.
2.	Invited lecture: Sparrow, R, CI Monash U3A Deepdene "In the hands of machines: the future of aged care", Melbourne, 6 January.
3.	Invited speaker: Alici, G, CI UOW, University of Toronto, Canada, "Soft robotics for prosthetic devices; can soft robotics help "restore normality" for people with limb difference?" 16 January.
4.	Invited speaker: Gilbert, F, AI UTAS, "Deep Brain Stimulation targeting dementia: Ethical shifts in clinical research practices" University of Oxford, 15-16 January.
5.	Pozo-Gonzalo, Christina, RF Deakin, was invited to contribute to "Women at the Forefront of Energy Research," based on recent contribution to ACS Energy Letters released in January.
6.	Invited Talk: Lee, C, RF UOW, 'CO_2 electrolysis in seawater' at the International Conference on Nanoscience and Nanotechnology (ICONN 2020), Brisbane, 9-13 February.
7.	Zhang, J. CI Monash, Electrochemical reduction of carbon dioxide, ICONN, Brisbane. Also chaired the section "Nano Energy and environment" at ICONN, 9-13 February.
8.	Invited Talk: Onofrillo, C, AI UOM, "A Biophysical beacon to decipher cartilage neogenesis in hydrogel scaffolds" Joint Australian-Korean Workshop, Bioengineered Materials for Medicine, St. Vincent's Hospital Melbourne, 10-11 February.
9.	Invited talk: Maria, F. CI Deakin, 'Work hard, work happy' IUPAC Global, Empowering Women in Chemistry, Women's Breakfast, CSIRO, 12 February.
10.	Invited Talk: Duchi, S, AI UOM, "Mesenchymal stem cells as multimodality therapy for osteo-chondral disease treatment", Joint Australian-Korean Workshop, Bioengineered Materials for Medicine, St. Vincent's Hospital Melbourne, 10-11 February.
11.	Invited Talk: Pozo-Gonzalo, C, RF Deakin, 'Clean electrochemical route for neodymium recovery in an ionic liquid mixture' at the 3rd International coalition for Energy Storage and Innovation Conference (ICESI 2020), Sydney, 1-4 March.
12.	Invited talk: Forster, R. AI UOW/DCU, "Wireless Advanced Oxidation Processes for Waste Water Treatment", Environmental Protection Agency, Dublin, 2 March.
13.	Invited talk: Forster R. AI UOW/DCU, "Ultrasensitive Detection of Pathogens and Pathogenic DNA, Breaking Biofilms Conference", Oviedo, Spain, 9-13 March.
14.	Invited Lecture: Coote, M, CI ANU, visited BASF Chemical Company, Ludwigshafen, Germany, for industry visit and invited lecture, 12 March.
15.	Invited talk: Pozo-Gonzalo, C, RF Deakin, "Clean electrochemical route for neodymium recovery in an ionic liquid mixture", ICESI 2020, Sydney, 1-4 March.
16.	Invited talk: Pringle, J, CI Deakin, "Development of new ionic electrolytes", ICESI, 1-4 March.
17.	Invited talk: Ralph, N, AI Deakin, 'training chemistry teachers' event titled, 'Energy Research and the Circular Economy' organised by Stor Energy (ARC Training Centre for Future Energy Storage Technologies), Institute for Frontier Materials (IFM), Peta White, School of Education at Deakin University. Presentations will form part of a new 'Circular Economy' website prepared by Deakin University for chemistry teachers and students, 4 May.
18.	Invited talk: Pozo-Gonzalo, C, RF Deakin, ASIL 2020, Melbourne, 5-7 May.

ACES Invited talks or Panels by ACES members in 2020	
19.	Invited Lecture: Crook J, CI UOW, Polymers for Neural Regeneration. Biomedical Engineering, University of Technology Sydney, Australia, 27 May.
20.	Invited virtual seminar: Coote, M, CI ANU, University of Science and Technology of China, Hefei, Anhui 230026, P. R. China, "Electrochemical and Electrostatic Catalysis of Chemical Reactions", 29 May.
21.	Invited paper: Pozo-Gonzalo C, RF Deakin, submitted a piece of the Conversation on recycling of rare earth metals, July.
22.	Invited speaker: Simonov A, RF Monash, Petroleum Economist to comment on the recent fuels project by Repsol involving generation of H_2 by water electrolysis and CO_2 capture and valorisation, July.
23.	Invited talk: Pringle, J, CI Deakin, "Development of Ionic Liquid and Plastic Crystal families with novel cation structures, Molten Salts and Ionic Liquids Discussion Group" Virtual Summer Meeting, 22 July.
24.	Invited talk: Wang, C, RF UOW, 'Surface Engineering of Metal-Based Catalysts for Efficient CO_2 Electroreduction' 2020 Wiley Conference - International Conference on Materials in Information Technology, 1 August.
25.	Invited talk: Pozo Gonzalo, C, RF Deakin, 'sustainable batteries: design and recovery' in a joint workshop between Spain and South America organised by Real Sociedad Espanola de Quimica RSEQUIMICA, 2 August.
26.	Invited Speaker: Paull, B, CI UTAS, "Ion-chromatography coupled with (QQQ) mass spectrometry: A powerful solution for trace analysis and speciation in environmental and industrial samples", ACS Fall 2020 Virtual Meeting and Expo, 14-19 August.
27.	Invited lecture: Coote, M, CI ANU, RSC Australasian Lecture, "Electrochemical and Electrostatic Catalysis of Chemical Reactions", Deakin University, 10 September.
28.	Invited Talk: Duchi, S, AI UOM, "Mesenchymal stem cells as oncological therapy for osteosarcoma treatment "Next Generation GISM-Italian mesenchymal Stem Cell Group, virtual meeting, Italy, 22 October.
29.	Invited presentation: Sparrow, R, CI Monash, Synthetic Biology Australasia October meetup, "How design makes a difference: ethics, power, and the nature/culture divide", virtual presentation Perth, 9 October.
30.	Invited speaker: Maria, F, CI Deakin, "Future electrolyte systems for safer, high energy density batteries" PRiME special LIVE event for Prof. Whittingham, 8 October.
31.	Invited speaker: Crook, JM "Bioprinting neuronal models". 2nd (Virtual) Australian Workshop on 3D Bioprinting for Tissue Engineering and Regenerative Medicine, 8 October.
32.	Invited talk: Pozo-Gonzalo, C, RF Deakin, "Aplicaciones Medioambientales y Energéticas de la Tecnología Electroquímica, I Workshop Iberoamericano" Online, 29 October.
33.	Invited panellist: Sparrow, R, CI Monash, Convergence Science Network, "Trust me, I'm a scientist. COVID-19 and public attitudes to science", virtual presentation Perth, 4 November.
34.	Invited presentation: Sparrow, R, CI Monash, "What robots represent...and why it matters", Melbourne Robotics Meetup, Melbourne, 25 November.
35.	Invited speaker: Crook J, CI UOW, "*In vitro* nerve-cell stimulation. Nanomaterials & Electronics for Wearable, Implantable Devices & Applications" (NEWIDEA 2020), Online conference, Queensland Micro and Nanotechnology Centre, Griffith University, https://www.newidea20.com/, 8 December.

Appendix 13: ACES Conference Presentations

A list of ACES conference presentations not listed in appendices above. Please note that the lists included in these appendices do not contain presentations by ACES members at ACES run events.

Conference Presentations by ACES members in 2020	
1.	Gayani, Buddhika, PhD UOW, oral 'Single-cell analysis of cell-material interactions for the discovery of phenotypic disease biomarkers' at the 32nd Australian colloid and surface science student conference, Gippsland, Victoria, 28-31 January.
2.	Arachchi, Nuwan Hegoda, Affiliate PhD UOW, oral 'High speed Atomic Force Microscopy for visualising plasma protein adsorption on silica nanoparticle-based coatings' at the 32nd Australian colloid and surface science student conference, Gippsland, Victoria, 28-31 January.

Conference Presentations by ACES members in 2020	
3.	Dodds, Susan, CI La Trobe, Presentation on 'Analytics and machine learning in medicine. Increasing data sharing to advance the future of healthcare as 'thought leader' for mix of government, industry and University leaders', Australia-America Leadership Dialogue, Stanford University, Palo Alto Cal, 22 January.
4.	Yue, Zhilian, AI UOW, 'Bioprinting and Bioinks', 20th Australian Polymer Summer School, Canberra, 11-13 February.
5.	Faisal, Shaikh Nayeem, ECR UOW, oral 'Edge-Functionalised Graphene Formulations as Moldable Electrode Materials' at the International Conference on Nanoscience & Nanotechnology (ICONN), 2020, Australia. (Awarded ANN Bursary as Early Career Researcher).
6.	Forsyth, Maria, and Pringle, Jenny CIs Deakin, and Pozo-Gonzalo, C ECR Deakin, presented at International Membrane Science and Technology Conference, IMSTEC2020 in Sydney, 2-6 February.
7.	Pozo-Gonzalo, Cristina, RF Deakin, was included in the Women in Renewables speakers guide organised by the Clean Energy Council.
8.	Arachchi, Nuwan Hegoda, Affiliate PhD UOW, oral 'High speed Atomic Force Microscopy for visualising plasma protein adsorption on silica nanoparticle-based coatings' at the International Conference on Nanoscience & Nanotechnology (ICONN), Brisbane, 9-13 February.
9.	Khan, Jawairia, Affiliate PhD UOW, poster 'Textile Structures as electrophoresis platforms for selective delivery and separation of complex matrices' at the International Conference on Nanoscience & Nanotechnology (ICONN), *Winner BEST POSTER AWARD, Brisbane, 9-13 February.
10.	Duc, Daniela, PhD UOW, volunteered and presented at Material Innovations in Surface Engineering (MISE) International Conference, Swinburne University of Technology, Hawthorn. D. Duc, R. M. I. Kapsa, S. McArthur, P. R. Stoddart, Hart W. and S. E. Moulton. 'Electrode Interface for Electrical and Near-Infrared co-stimulation of neurons.' 10-12 February.
11.	Bourke, Justin, RF UOM oral 'A comparison of neural network function in 2D culture, 3D hydrogels, and organoids' at the CSIRO Cutting Edge Symposium: Challenges and opportunities for "*ex-vivo*" model systems, Geelong, 26-28 February.
12.	Officer D. L., CI UOW, presented 'Porphyrin 2D and 3D Graphene Assemblies as Electrocatalysts for CO_2 reduction', ICONN2020, Brisbane, 9-13 February.
13.	Pringle, J, CI Deakin, presented 'Development of organic ionic plastic crystals as solid-state electrolytes' at International Conference on Nanoscience and Nanotechnology (ICONN) and International Conference on BioNano Innovation (ICBNI), Brisbane, Queensland, 9-13 February.
14.	Hodgetts, Rebecca, PhD Monash, poster 'Refining Universal Procedures for Ammonium Quantification via Rapid 1H NMR Analysis for Dinitrogen Reduction Studies' in the 2020 #RSC twitter competition, 3 March.
15.	Blesch, Thomas, PhD Monash, poster 'Symmetric, Non-aqueous Redox Flow Battery based on Iron Complexes' in the 2020 #RSC twitter competition, 3 March.
16.	Khoo, Timothy AI Deakin, Pozo-Gonzalo, Cristina ECR Deakin and Kerr, Robert ECR Deakin, presented at the FBI-CRC Summit in Perth, Western Australia, 9-11 March.
17.	Pozo-Gonzalo, Cristina, RF Deakin, Presentation at the on-line Energy and Circular economy Symposium, - in collaboration with the School of Education on 'Circular Economy and E-Waste', 4 May.
18.	Faezeh Makhlooghiazad, ECR Deakin, Presentation at the on-line Energy and Circular economy Symposium, - in collaboration with the School of Education on 'Beyond Li-ion batteries; Cheaper and Safe Sodium Batteries' 4 May.
19.	Hancock, L. CI Deakin, Cherian, M. Deakin, 'Indian Energy Transitions – A Framework to Address The Energy Divide' at 9th International Workshop on Advances in Cleaner Production (IWACP), Melbourne, Australia, and Sao Paulo, Brazil. (Conference – extract of paper) 26 May.
20.	Cristina Pozo-Gonzalo, RF Deakin, presented at the on-line Energy and Circular economy Symposium, in collaboration with the School of Education on 'Circular Economy and E-Waste', 4 May.
21.	Blesch, Thomas, PhD Monash, attended the 4th UK Redox Flow Battery Network (UKRFBN) annual online meeting and presented poster 'Symmetric, Non-aqueous Redox Flow Battery based on Iron Complexes', 6 July.
22.	Gursel Alici CI UOW and Hao Zhou RF UOW, 'A compact and cost-effective pattern recognition based myoelectric control system for robotic prosthetic hands' accepted manuscript AIM2020 virtual Conference in Boston, Massachusetts, USA, 6-10 July.

Conference Presentations by ACES members in 2020	
23.	Gursel Alici, CI UOW, Charbel Tawk, and Rahim Mutlu, 'A 3D printed modular soft gripper for conformal grasping', accepted manuscript AIM2020 virtual Conference in Boston, Massachusetts, USA, 6-10 July.
24.	Marc in het Panhuis CI UOW, Geoffrey M. Spinks CI UOW, Gursel Alici CI UOW and Charbel Tawk, '3D-printed soft pneumatic bending sensing chambers for bilateral and remote control of soft robotic systems', accepted manuscript AIM2020 virtual Conference in Boston, Massachusetts, USA, 6-10 July.
25.	Saimon Silva, RF Swinburne, 'Electrochemical Sensors Compatible with the Point-of-Care Enabled by Lubricin Antifouling Coatings', 71st Meeting of the International Society of Electrochemistry (Virtual Symposium). Oral presentation. Presentation resulted in an invitation to submit an article in a special issue of Electrochimica Acta. August.
26.	Alexandre Xavier Mendes, PhD Swinburne, Saimon Silva, RF Swinburne, Rob Kapsa CI RMIT, Simon Moulton CI Swinburne, oral presentation '3D Printing of Electroactive Hydrogels', Soft Tissue Bioengineering Virtual Symposium, August.
27.	Wollersheim, L, PhD Deakin, presentation 'What does the future of community energy hold in Victoria?' POLIS HDR Conference, 18 September.
28.	Alexandre, X. Mendes.; Saimon, M. Silva.; Cathal, O'Connell.; Robert, Kapsa.; Simon, E. Moulton, oral presentation, '3D Printing of Electroactive Hydrogels', Soft Tissue Bioengineering virtual symposium, 17 September.
29.	Forster, R, AI DCU/UOW presentation 'Electrochemical Sensors for miRNA in Epilepsy', FutureNeuro Clinical Conference, 13 September.
30.	Brett Paul, CI UTAS, Global ion chromatography virtual symposium: Advancing IC science for future impact, "Ion-chromatography coupled with (QQQ) mass spectrometry: A powerful solution for trace analysis and speciation in environmental and industrial matrices", 20-21 and 27 October.
31.	Md Habibullah Dalal, Chong-Yong Lee, Gordon Wallace, poster 'Electrochemical Cathodic Exfoliation of Graphite into Graphene in Aqueous Solutions of Alkali Metal Salts', 2020 MRS Virtual Spring/Fall Meeting & Exhibit, 27 Nov – 4 Dec.
32.	Makhlooghiazad, F, PhD presented a poster at the virtual 9th Australasian Symposium on Ionic Liquids (ASIL), 1- 2 December.
33.	Laura Garcia-Quintana, PhD Deakin, oral presentation 'Highly Homogeneous Sodium Superoxide Growth in NaO_2 Batteries Enabled by a Hybrid Electrolyte' at the virtual 9th Australasian Symposium on Ionic Liquids (ASIL), 1- 2 December.
34.	Chunyan Qin, PhD, UOW, oral presentation, 'Bipolar Electrical Stimulation with Cells', 11th World Biomaterials Congress 11-15 December.

Appendix 14: ACES Invited Seminars/Collaborative Research Visits

ACES Invited Seminars/Collaborative visits showcasing research activities in 2020	
Collaboration Visits	
1.	Garcia-Quintana, Laura, PhD Deakin, visited Dr Nagore Ortiz-Vitoriano, CIC Energigune, Spain, to continue the collaborative work on hybrid electrolytes, 7 January – 7 February.
2.	Robert Forster, AI DCU/UOW visited Abbott Diabetes Care, Donegal, Ireland, to discuss collaboration on biocompatible screen printed electrodes, January.
3.	Robert Forster, AI DCU/UOW visited Theradep Ltd, Clonmel, Ireland, to discuss collaboration on low temperature plasma coating of biomolecules, January.
4.	Zhilian Yue, AI UOW and affiliated PhD students, spent a week at the Burn Injury Research Unit, University of Western Australia, Perth, working with researchers to undertake a pilot *in vivo* study of ACES materials, 13-17 January.
5.	Faisal, Shaikh Nayeem, ECR UOW, visited Prof Chun Huang at UNSW to discuss use to graphene materials for their aerospace research projects, 17 January.
6.	Prof David Officer, CI UOW, met with Prof Chun Hui Wang, School of Mechanical and Manufacturing Engineering, UNSW to discuss collaborative research opportunities, 17 January.
7.	Prof David Officer, CI UOW, met with Dr Robert Kerr, BatriHub, Deakin University, to discuss collaborative research opportunities, 20 January.

ACES Invited Seminars/Collaborative visits showcasing research activities in 2020	
8.	Prof David Officer, CI UOW, met with Prof Mainak Majumder, Department of Mechanical and Aerospace Engineering, Monash University, to discuss collaborative research opportunities, 21 January.
9.	Ying, Zhou, PhD UOW, visited Professor Fiona Wood and Dr Mark Fear from The University of Western Australia, to discuss the effect of tissue adhesive on wound healing, 12-16 January.
10.	Chen, Xifeng, PhD UOW visited The University of Western Australia for a Pilot animal study to test ulvan scaffold for wound healing, 13-17 January.
11.	Jie Zhang, CI Monash, visited Thang Vu Dinh, Dr. Sebastian Thomas, Prof Christopher Hutchinson, School of Materials Science and Engineering, Monash University to discuss collaboration in using metal alloys for the eCO2RR, 28 January, 11 February, 4 March, 25 June
12.	Clinical collaborator Payal Mukherjee and Santosh Kumar AMTZ India, had a virtual meeting to progress collaborative research activities, 3 February.
13.	Shekibi, Bijan, PhD UOW/St Vincent's Melbourne, visited Ben Rollo at the Alfred Institute Melbourne to tour the facilities, 11 February.
14.	Tomaskovic-Crook, E, UOW RF met with CSIRO and other researchers using organoid technologies to attend a CSIRO workshop (Cutting Edge Symposia – Challenges and opportunities for "*ex-vivo*" model systems), and networking opportunities, 26-28 February.
15.	Howard, Mark, RF Monash, visited ACES Alumni Dr Katrina Hutchison, Macquarie University, to host a reading group and work-in-progress session for the Centre for Agency, Values and Ethics (CAVE) bioethics reading group, and finalise a co-authored manuscript, 26-27 February.
16.	Faisal, Shaikh Nayeem, ECR UOW, visited Prof Mainank Majumdar at Monash University to work on characterising ACES graphene materials in commercial pouch cells, 2-5 March.
17.	Shekibi, Bijan, PhD UOW/St Vincent's Melbourne, visited Ana Antonic-Baker at the Alfred Institute Melbourne to collect neural differentiated iPSC cells, 3 March.
18.	Pozo-Gonzalo, Cristina ECR Deakin, visited Aleks Nikoloski at Murdoch University in Perth for research collaboration, 10-12 March.
19.	Forsyth, M, CI Deakin, visited Prof. Rohit Bhagat and Prof. Alex Roberts at Coventry University to discuss PhD projects for battery research, London, England, 3 March.
20.	Forsyth, M, CI Deakin, visited Prof Magda Titirici at Imperial College London to discuss a potential European project grant on Sodium ion batteries, 4 March.
21.	Meisam Hasanpoor, PhD Deakin, Visited Polymat, San Sebastian, Spain for research collaboration, March.
22.	Forsyth, M, CI Deakin, visited Polymat, San Sebastian, Spain, to review facilities, 1-19 March.
23.	Pringle, Jenny CI Deakin, visited Prof Kondo-Francois Aguey-Zinsou, to discuss collaborative research opportunities and see the laboratories, UNSW, 5 March.
24.	Xi-Xuan Guo, RF Monash met with Mr Thang Vu Dinh, Department of Materials Engineering, Monash to discuss on the CO_2 reduction results, 19 March.
25.	Pringle, J, CI Deakin, presented a seminar at UNSW to the Chemical Engineering department (invited by Da-Wei Wang) 5 March.
26.	The Soft Robotics team have monthly meetings with their collaborators at the Prince of Wales Hospital regarding amputee trials and updates on progress, March-December.
27.	Junji Fukuda, AI Monash, and PhD student Ellen Sugiyama, Yokohama National University Japan visited UOW undertake preliminary experiments using QCM, 2-6 March.
28.	Zhilian Yue, AI UOW, met with Prof Gerard Sutton of Sydney Eye Bank to discuss Corneal Bioengineering project, May.
29.	David Officer, CI UOW and Shaikh Faisal, ECR UOW, collaborated with University of Queensland, Prof. Joe Shaptar and Alexander Corletto (PhD student), regarding to continue working on graphene dough as electron transporting layers in Perovskite solar cell, 9 June.

ACES Invited Seminars/Collaborative visits showcasing research activities in 2020	
30.	Zhilian Yue, UOW, met regularly over the year with Dr Enrico Lucarelli (Rizzoli, Italy) on hybrid printing for cartilage repair and regeneration, UOW PhD student, Yuchao Fan, presented research, 2 July.
31.	Mark Howard, RF Monash, met up with Katrina Hutchison and Josh Hatherley (Monash) to discuss emerging health technologies, gender bias, and commercial imperatives, July.
32.	Klaudia Wagner, UOW, met with Dr Damia Mawad, University of New South Wales, regarding conductive polymers for biointerfaces, 14 July.
33.	Klaudia Wagner, UOW, met with Jonathan Hopkins, University of New South Wales, Spectroelectrochemistry of conductive polymers – measurements, 14 July.
34.	David Officer, CI UOW, met with Prof Paul Dastoor, Centre for Organic Electronics, University of Newcastle, to discuss collaborative research opportunities, 24 July.
35.	Mark Howard, RF Monash, met with the Victorian Heart Institute to discuss the new institute at Monash and possible collaborations in the area of the ethics of emerging technology, 28 July.
36.	Mark Howard, RF Monash, met with Katrina Hutchison (Macquarie Uni) and Josh Hatherley (Monash) to discuss emerging health technologies, gender bias, and commercial imperatives, 30 July.
37.	Zhilian Yue, AI UOW, participated in a meeting on tissue glue and wound healing with Professor Fiona Wood, the Burn Injury Research Unit, University of Western Australia, 24 July.
38.	Hao Zhou, ECR UOW, met with Greg Bowring, Director of Rehabilitation Medicine of Prince Of Wales Hospital, to discuss the collaboration about amputee trials of ACES prosthetic hands and some other clinical applications of soft robotics, 30 July.
39.	Jeremy Crook, CI UOW visited Prof. Jonathan Clark and Prof. Lisa Horvath from Chris O'Brien Lifehouse Research Laboratories including VectorLAB Cancer Research of the Chris O'Brien Lifehouse comprehensive cancer hospital, to discuss collaborative research opportunities and review facilities, 20 July.
40.	Faisal Collaboration with Prof. Paul Dastoor Group at University of Newcastle to develop Flexible solar cell integrated energy storage device (Photo-charger), August.
41.	Cristina Pozo-Gonzalo has initiated a research collaboration with Dr. Fangfang Chen (Deakin) on cobalt speciation in ionic liquids, and with Dr. Goujon (Polymat, Spain) on polymers for metal air batteries, August.
42.	Laura Garcia-Quintana met with Dr. Mega Kar to plan the collaboration work in hybrid electrolytes (DMSO:IL) for Zn-air batteries, 27 August and 17 December.
43.	Klaudia Wagner had a meeting with Dr Damia Mawad (UNSW), David Officer and Pawel Wagner to discuss conductive polymers for biointerfaces, and did the spectroelectrochemical measurements on conductive polymers with Jonathan Hopkins (UNSW), 1 September.
44.	Si-Xuan Guo had a meeting with Thang Vu Dinh, Dept. of Materials Science and Engineering, Monash Univ. to discuss the collaborative project on the eCO2RR, 16 September.
45.	Jeremy Crook, CI UOW, visited Dr. Shane Ellis; Mass Spectrometry Imaging Laboratory, Molecular Horizons, University of Wollongong to discuss collaborative research opportunities and review facilities, 9 September.
46.	David Officer, CI UOW and Shaikh Faisal, ECR UOW, collaborated with UNSW, Prof. Chun Wang and Dr. Saiful Islam, regarding ongoing collaboration on fire retardancy property of EFG-Epoxy composites, September.
47	David Officer, CI UOW and Shaikh Faisal, ECR UOW, collaborated with University of Newcastle, Prof. Paul Dastoor and Dr. Nathan Cooling, regarding ongoing collaboration on photocapacitor development, 12 October.
48.	Simonov, A, RF Monash, remotely participated in an XAS beamtime at BESSY II with CEC-MPI and HZB in Berlin 24-29 November.
49.	Saimon Silva, RF Swinburne - Electrochemical biosensors: Towards point-of-care cancer diagnostics - Bachelor of Chemistry Students from Universidade Federal dos Vales do Jequitinhonha e Mucuri, Diamantina, Brazil, 4 December.
50.	Andres Ruland, RF UOW - Seeking collaborations with James Yoo, Wake Forest University, USA to test their biomaterials and constructs.
51.	Chunyan Qin (UOW) visited Robert Forster of Dublin City University, DCU Dublin to transfer expertise in the formation of biocompatible films of conducting polymers to the DCU lab, perform wireless electrostimulation experiments on cardiomyocytes and neural cells and present invited seminar.

ACES Invited Seminars/Collaborative visits showcasing research activities in 2020	
52.	Invited seminar: Alici, G, CI UOW, University of Alberta, Canada, "Soft Robotics for Prosthetic Devices; is soft robotics one of the enabling technologies to restore normality for people with limb difference?" 10 January.
53.	Invited seminar, Sparrow, R, CI Monash, AI Now, New York University, "Machines and moral expertise", USA Virtual, 9 May.

Appendix 15: ACES International Events 2020

	2020 Global Engagement Event Description	Attendees	Date	Venue
1.	**14th Annual International Electromaterials Science Symposium.** The annual International Electromaterials Science Symposium brings together leaders in electromaterials science research across a broad range of disciplines in electromaterials science research across a broad range of disciplines. Plenary speakers for the Symposium included Prof Richard Kaner from the University of California, Prof Jadranka Travas-Sejdic from the University of Auckland and Prof Justin Gooding from UNSW, each delivering on their area of expertise whilst offer some interesting takeaways for all guests.	120	5-6 Feb	ANU Canberra
2.	**9th International Workshop Advances in Cleaner Production (IWACP) Towards Sustainable Energy-Water-Food Nexus - The Contribution of Cleaner Production** Organised by ACES team members. IWACP is a multi/interdisciplinary forum for the exchange of information and research results on technologies, concepts and policies based on Cleaner Production and conceived to assist the desired transition to a sustainable society.	600	26 May	Virtual
3.	**ACES Full Centre Meeting** ACES is internationally recognised as a leader in electromaterials research, focused on turning our fundamental knowledge of cutting-edge materials into the next generation of 'smart devices' for the benefit of the community. Our Full Centre Meeting is a fantastic opportunity to gain insights into developments in electromaterials research, how our work has real world applications to build new innovations and industries, and opportunities for engagement between researchers, industry and end-users. Hear the latest on electrofluidics and diagnostics, synthetic energy systems, synthetic biosystems, soft robotics, and 3D electromaterials, as well as ethics, policy and public engagement considerations associated with these new technologies.	Day 1 – 121 Day 2 - 155	20-21 Aug	Virtual (Monash)
4.	**Sutrode Workshop** This workshop was held with ACES collaborator Mario Romero-Ortega University Texas Houston USA investigating the uses of the functional Sutrode (combines the electrical properties of an electrode with the mechanical properties of a suture) in research activities within the Centre. Exploring lessons learnt to date and what the future may hold for this ground breaking technology.	12	9 Feb	University of Melbourne & RMIT
5.	**Joint UOW/Hanyang University Workshop** This event provided an opportunity to advance a number of on-going research projects and joint research publications in biomedical engineering.	24	11 Feb	iCampus Wollongong UOW

	2020 Global Engagement Event Description	Attendees	Date	Venue
6.	**3D Printed Prosthetic Ears Workshop** The workshop discussed how advances in 3D printing could be used to further develop new technologies to tackle significant medical challenges that included 3D printing of prosthetic ears as low cost as possible.	19	14 Feb	iCampus Wollongong UOW
7.	**Australia-India MedTech 3D Printed Ears** ACES hosted a workshop with AMTZ (Andhra Pradesh MedTech Zone Ltd based in Vizag) and leading Australian clinicians to explore how these organisations can work together to ensure effective translation of innovative 3D bioprinting initiatives in Australia and India. Attendees heard about the exciting collaborations to utilise 3D bioprinting and additive manufacturing to tackle clinical challenges, international education opportunities to inspire the next generation of researchers, and the engagement of policy makers to achieve global impact.	45	26 June	Virtual (UOW/ RPA Sydney)
8.	**Ammonia Energy Association Conference** ACES hosted the Ammonia Energy Association Conference for 2020. The international conference focused on ammonia's role in a hydrogen economy. Alan Finkel, Australia's Chief Scientist, gave the opening address.	115	27-28 Aug	Virtual (Monash)
9.	**3D Bioprinting Short Course 10 weeks –** 1. Intro to Bioprinting: Building Collaborations 2. Intro to Biomaterials and Ink Formulations 3. Intro to 3D Printer Hardware 4. Characterising Bioinks and Testing Printability 5. Printing with Cells 6. Cartilage Regeneration in the Knee 7. 3D Printed Ears 8. Islet Cell Transplantation 9. Wound Healing 10. Printers in Action: Virtual Tour of TRICEP	28 Aug - 30 Oct	Virtual	11

Appendix 16: ACES International Academic Visitors 2020

The list below does not include visitors to ACES as part of events or conferences that ACES organised throughout 2020.

	ACES International Academic Visitors 2020
1.	Assoc Prof Electromaterials Laboratory, Benny Kim, AI UOW, Dept. of Printed Electronics Engineering, Sunchon National University, South Korea, visited UOW for collaboration work, 13-14 January.
2.	Dr BinBin Zhang, JSPS Fellowship, KISTEC from YNU, Japan, met with Gordon Wallace & Stephen Beirne to disucss purchase of a custom purpose printer, 24 January.
3.	Professor Michel Armand, CIC EnergiGUNE, visited Deakin University for an Academic talk and visit, 21 January – 5 April.
4.	National Academy of Engineering Korea (NAEK) visited ACES Monash to tour the facilities and understand the expertise in the hydrogen technology capability, March.
5.	Professor Herman Terryn, Vrije Universiteit Brussel, visited Deakin University for academic visit and talk, 8-18 February.
6.	Dr. Pierre A Martin, Chalmers University of Technology a research visit to Deakin, February.
7.	Dr Nagore Oritz-Vitoriano, CIC EnergiGUNE, a collaborative research visit to Deakin, February.
8.	Professor David Mecerreyes, Polymat, attended collaborative research meetings with Deakin research team, February.

ACES International Academic Visitors 2020	
9.	Dr Preston Sutton, SNF Postdoc. Mobility Fellow with Deakin University for 2 year period from February 2020 – 2022.
10.	ACES PI Seon Jeong Kim and the Hanyang University delegation visited ACES UOW for a tour of the facilities at UOW ACES, TRICEP/ANFF and participated in a joint workshop, 10-11 February.
11.	Prof. Feng Pan, from Peking University, China, met with Jie Zhang, Monash, for collaboration discussions 26 February.
12.	Prof David Mecerreyes, POLYMAT - University of the Basque Country Spain, visited ACES Deakin to progress research activities on polymer anodes for batteries, 17-20 February.
13.	Prof Feng Pan, Peking University, China visited Jie Zhang CI Monash and Si-Xuan Guo about collaboration possibilities involving FTACV techniques for studying battery electrodes, 26 February.
14.	Six academic members from Suchon University, South Korea, visited UOW to tour facilities to learn more about Bioprinting; Park Sang Won (Graduate Student-Master Course), Lee Seong Eum (Graduate Student-Master Course), Jeong Cheol (Graduate Student-Master Course), Kale Amol Marotrao (Graduate Student- Doctorate Course), Hwang Eun Hee (Staff), Hwang Ji Hyun (Staff); 3 February.
15.	Dr Nagore Ortiz-Vitoriano, CIC Energigune Spain, visited Deakin to learn further about electrolyte characterisation techniques, 10-29 February.
16.	Prof Bong Sup Shim & Prof Sugeun Yang from Inha University Korea and Prof Kim Byung Chul from Sunchon Nation University Korea, visited for Prof Simon Moulton, CI Swinburne, for the Joint Australia-Korea Foundation meeting, 10-11 February.
17.	Dr. Stephen Feldberg, from Brookhaven National Laboratory, USA, met with Jie Zheng, CI Monash, for collaboration discussions, 24 February – 20 March.
18.	National Academy of Engineering Korea (NAEK) visited ACES Monash to tour the facilities and understand the expertise in the hydrogen technology capability, March.
19.	Dirk Guldi, PI Friedrich Alexander University Germany, visited UOW to progress collaborative activities, 11-21 March.
20.	Alexandr Simonov, RF Monash, hosted a senior delegation from the National Academy of Engineering Korea (NAEK) to showcase Monash expertise in the hydrogen technology capability. The visitors included: Chinho Park, Professor Yeungnam University; Hongki Lee, Chairman of Hydrogen & Fuel Cell Regional Innovation Center, Woosuk University; Woong-Seong Chang, Professor Inha University; Bo Ki Hong, Fuel Cell Research Fellow of Hyundai Motor Company; Wonchul Cho, Senior researcher of Korea Institute of Energy Research; Oh-Kyong Kwon, NAEK President. 4 March.
21.	Prof Vijay Kumar, University of Connecticut, USA, visiting scholar 13 March.
22.	Prof. Tadaharu Ueda, of Kochi University, Japan, met with Jie Zhang, Monash, for collaboration discussions 9-13 March.
23.	Drs Cameron Bentley and Minkyung Kang from University of Warwick, UK, met with Jie Zhang, CI Monash, for collaboration discussions, May.
24.	Zhilian Yue, AI UOW, met with collaborators Dr Enrico Lucarelli (Rizzoli, Italy) and Yuchao Fan (PhD student) to discuss research progress on hybrid printing for cartilage repair and regeneration, May.
25.	Assoc Professor Zhen Liu from East China University of Science and Technology, visited ANU for CSC-Funded 12 month Sabbatical for research collaboration, 19-20 July.
26.	Minkyung Kang, Leverhulme Fellowship and research visit at Deakin University, August.

Appendix 17: ACES National Academic Visitors 2020

The list below does not include visitors to ACES as part of events or conferences that ACES organised throughout 2020.

ACES National Academic Visitors 2020	
1.	Prof Anatoly Rozenfeld, UOW visited UOW to discuss advanced materials, 3 January.
2.	Dr Fiona Woods, Western Australian Health Service, met with ACES UOW to progress collaborative research activities, 6 January.
3.	Dr Damia Mawad, Senior Lecturer, University of New South Wales, met with David Officer and Pawel Wagner for collaboration discussions, 8 January, 14 July and 1 September.
4.	Dr Kathryn Lomas, CSO Hemideina Pty Ltd, met to discuss 3D printing opportunities and view the in TRICEP/ANFF, 14 January.
5.	Prof Jim Hill, Adelaide University, visited UOW to discuss collaborative research activities, 8 January.
6.	Thang Vu Dinh, student in Department Materials Engineering Monash University, visited ACES SRF Si-Xuan Guo to discuss collaboration in the area of carbon dioxide reduction and progress research project, 10 February and 19 March.
7.	Dr Fengwang Li from University of Sydney met with Jie Zheng, Monash for collaboration discussions, 26 February.
8.	Dr Hongjun Chen from Australian National University met with Jie Zheng, Monash, for collaboration discussions, March.
9.	David Adams, IHMRI UOW, visited ACES UOW, to discuss graphene electrodes, 2 March.
10.	Svetha Venkatesh, Deakin University, and clinical collaborator Payal Mukherjee, Sydney University, zoom meeting with ACES UOW to progress collaborative Indian council project, 16 March.
11.	Dr Manisha Dayal and Dr Tosin Famkinwa, Cluster manager technical services, Western Sydney University, visited ACES UOW to tour the facilities at ACES UOW and TRICEP and hold collaborative discussions, 17 March.
12.	Dr Damia Mawad and Jonathan Hopkins from the University of New South Wales visited Klaudia Wagner for a meeting and spectroelectrochemical measurement of conducting polymers, July.
13.	Dr Damia Mawad and Jonathan Hopkins from the University of New South Wales visited David Officer, CI UOW, for a meeting to discuss conducting polymer research and undertake electrochemical experiments, 14 July.
14.	Klaudia Wagner, RF UOW, met with Dr Damia Mawad, University of New South Wales, regarding conductive polymers for biointerfaces, 14 July.
15.	Klaudia Wagner, UOW, met with Jonathan Hopkins, University of New South Wales, Spectroelectrochemistry of conductive polymers – measurements, 14 July.
16.	Dr Roger Buckeridge, Director Myamyn, visited Gordon Wallace and David Officer to discuss EFG business development project, consultation with research team 24 August.
17.	Dr Jinjing You, Research Fellow Save Sight Institute, University of Sydney, and their students met with Gordon Wallace and Stephen Beirne for discussions regarding TRICEP training services, 18-21 August and 15 September.
18.	Dr Damia Mawad and Jonathan Hopkins from the University of New South Wales visited Prof David Officer, CI UOW, for a meeting to discuss conducting polymer research and undertake electrochemical experiments, 14 July and 1 September.
19.	Dr Jinjing You, Research Fellow Save Sight Institute, University of Sydney, met with Zhi Chen, UOW, regarding the iFix project 15 September.
20.	Hui Wu, Research Fellow MMMB, met with Klaudia Wagner, RF UOW, regarding BAJC, 16 September.
21.	Dr Matthew Griffith, Research Manager University of Sydney, met Andrew Nattestad, AI UOW, regarding measurement of time resolved photoluminescence kinetics for a collaborative project on pre-fabricated pure and multicomponent organic material films and nanoparticles, 11 September.
22.	Arthur Brandwood, Director and Principal Consultant, Brandwood CKC, met with TRICIP for a tour of facilities, 1 October.
23.	Si-Xuan Guo, PhD metwith Thang Vu Dinh, Monash Engineering, to discuss the collaborative CO_2 reduction project, 17 November.

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