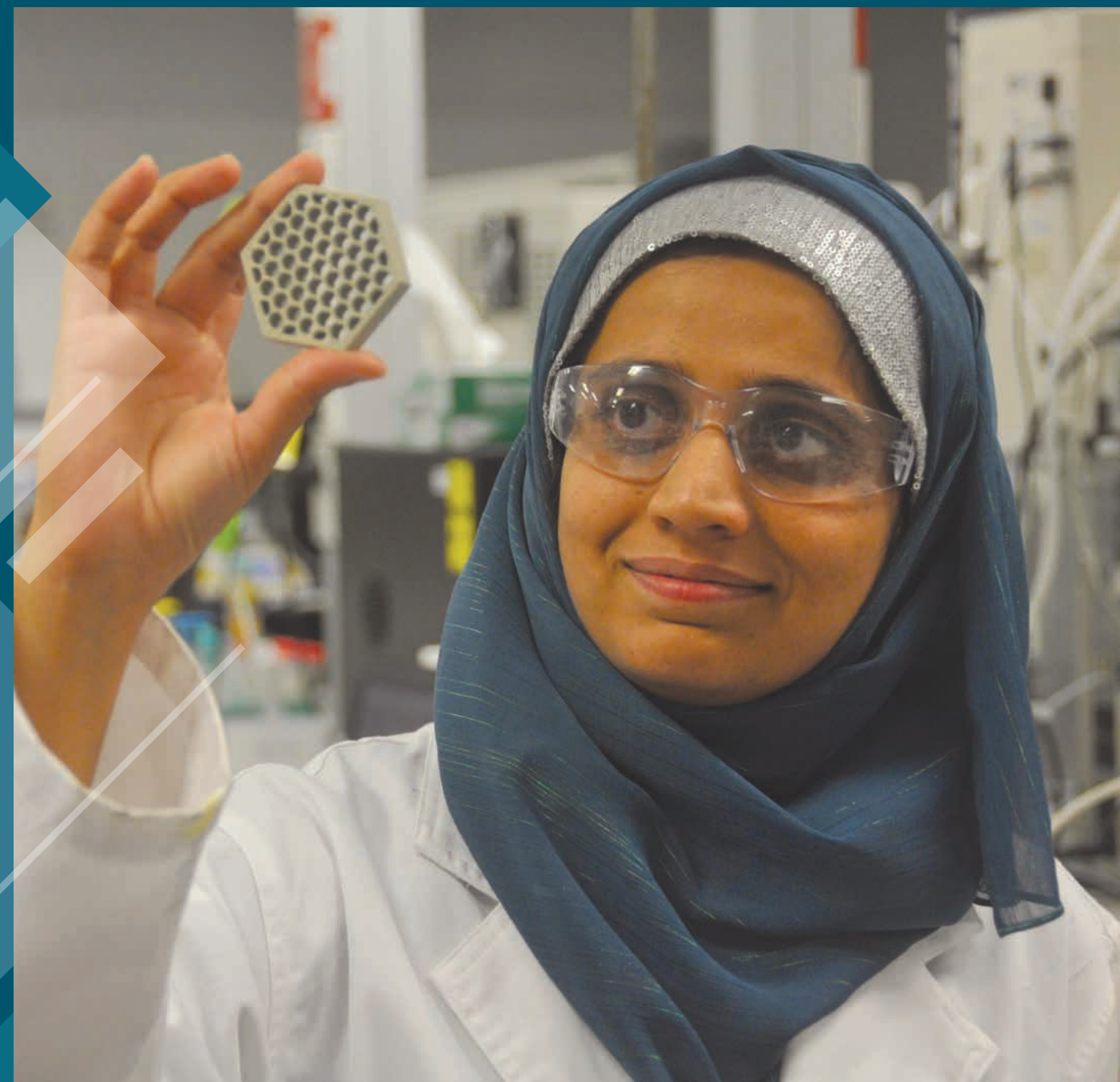




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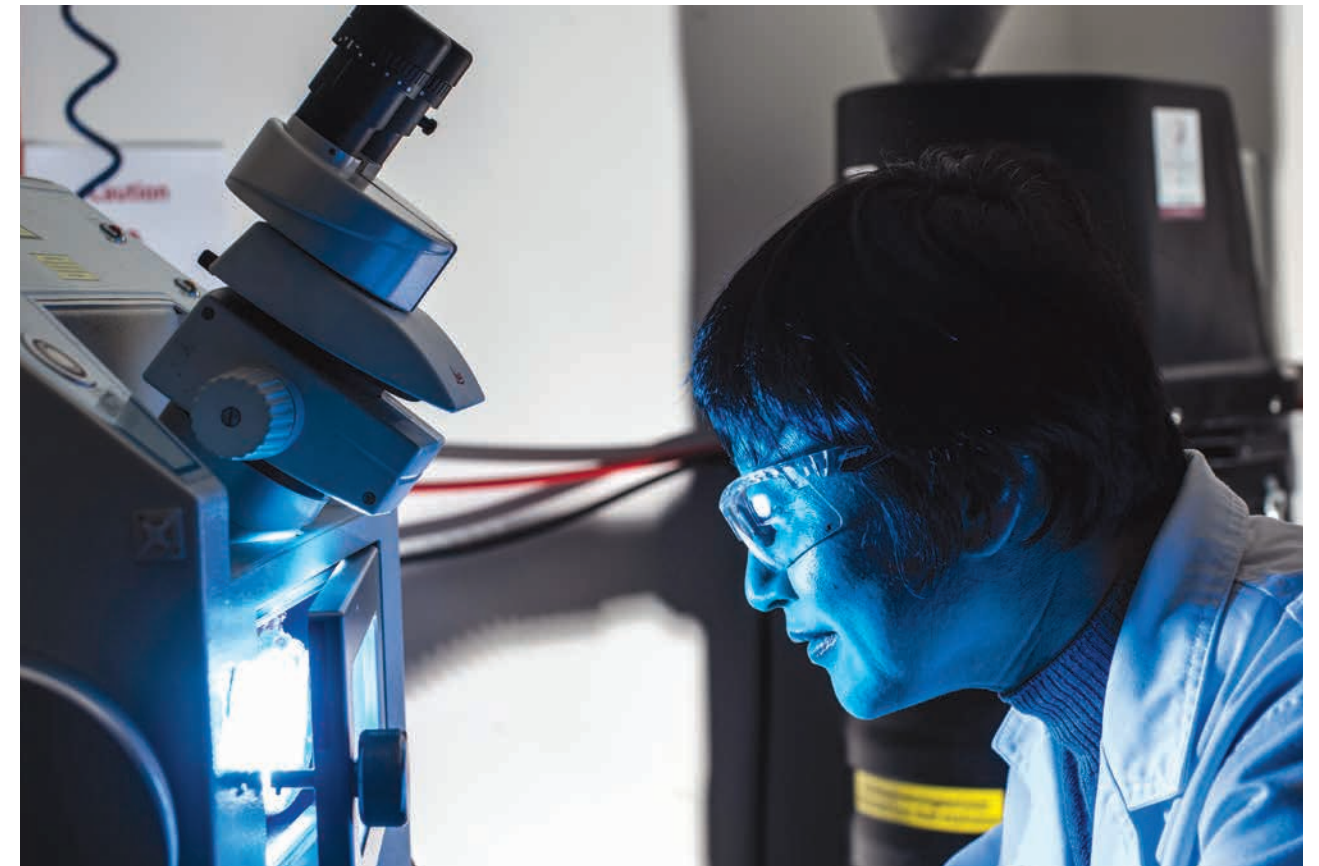
ARC Centre of Excellence for Electromaterials Science Annual Report 2019



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Welcome



OUR VISION

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. In mid 2019, ACES welcomed the addition of La Trobe University and formalised the retirement of the University of New South Wales.

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 2014-2020 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, to assist in developing innovative approaches that encourage entrepreneurship and commercialisation.

Our core funded activities provides a fundamental research program, facilities and expenditure that has enabled us to pursue new opportunities through MedTech and Pharma Growth Centre connect (MTPConnect) funded projects, 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.

Vale Naomi Haworth



In 2019 the ACES team was saddened to learn of the passing of Dr Naomi Haworth, a former postdoctoral fellow at ACES' ANU node in Canberra under ACES CI Michelle Coote's guidance between 2014 and 2017.

During her time at ACES, Naomi was instrumental in developing methodology for pKa calculations, a system used to indicate the strength of an acid. Alongside Simone Ciampi (UOW), Michelle Coote (ANU), Nathaniel Bloomfield (ANU), Gordon Wallace (UOW) and researchers from Universitat de Barcelona, Naomi was also a major contributor to the team's paper in Nature in 2016, titled 'Electrostatic catalysis of a Diels-Alder reaction'. As part of this work, the ACES team showed that directional electric fields should be able to affect chemical reactions because most molecules are polar. However, such effects are strongly directional and controlling the orientation of molecules in the field is the big challenge. To solve this problem, scanning tunnelling microscopy (STM) was used to both hold the molecules in place, apply an electric field and measure the

field's impact on their reaction rate, demonstrating electric field catalysis. This work provided essential insights into how the reactivity of reaction centres might affect electric fields within electrochemical devices. In 2018 and 2019, this team were finalists in the Eureka Prize for scientific research.

ACES CI Prof Michelle Coote said Naomi was a tremendous member of the ACES team, who was passionate about her work, the field of chemistry, and beyond.

"Naomi was a talented and dedicated researcher who made a number of important contributions to science, including helping to elucidate the effect of electric fields on chemical reactions. She will be missed by us all," Michelle said.

After graduating in 2003, Naomi spent time in postdoctoral positions with Prof Leo Radom at the University of Sydney, the Victor Chang Cardiac Research Institute, and Deakin University. It was here Naomi was able to expand her interest in computational modelling of biological systems and develop skills in bioinformatics.

In 2005-6, Naomi took up an Alexander von Humboldt Foundation Fellowship, conducting research on electron transport through molecular wires, in Prof Tim Clark's group at the Friedrich-Alexander-Universität Erlangen-Nürnberg in Germany.

Naomi found her way to ACES in 2014, where she was a Postdoctoral Fellow in the group of Prof Michelle Coote at ANU.

Following her time at ACES, Naomi returned full circle, taking on a Research Fellow position at the University of Sydney in the research group of Prof Leo Radom, exploring the chemistry of sulphur radicals in biological systems.

Naomi had additionally built several independent research collaborations, including with Prof Andrea Robinson at Monash University, using computational methods to design and explore the biological activity of new insulin analogues; and with A/Prof Lisa Martin, also at Monash, studying the spectroscopy of molecular ions.

Vale, Naomi. You will be missed, but never forgotten.

A Word from the Director



I would like to say thank you to the Australian Research Council (ARC) and to our numerous collaborating and partner organisations whose support has made this incredible journey possible.

A special thank you to our International Advisory Committee chaired by Dame Bridget Ogilvie for your advice, support and mentorship.

It is an amazing time to be supported to do world-class research.

In recent years, we have witnessed the development of computing power that has enabled an unprecedented ability to model and predict the properties of materials. Machine learning has further enabled our ability to efficiently discover new materials and to optimise performance in systems containing them.

Advanced fabrication approaches such as 3D printing have given us the ability to create structures wherein materials are arranged in a way that optimises system performance – bringing out the best in all of the individual components.

New characterisation tools are giving us insights into the performance of individual materials within these systems – without destruction of the device we have created – enabling unprecedented insights into performance over time.

Progress with living cell technologies are revolutionising how we think about treating human conditions.

The power and robustness of these scientific advances is unquestionable. If advances in each of these were converged, fundamental research could be taken into new technologies and enable us to explore things in a way we have never done before. We are poised to have significant impact on the big challenges our planet faces in the areas of Energy and Health.

However, for now at least, this convergence is dependent on something less robust than the science itself. This convergence is critically dependent on the human scientific chain that links

research, translation and commercial development for social benefit.

That human scientific chain involves many individuals sharing knowledge with others that we trust and have confidence in. We all need to work together to ensure the human chain is strengthened and remains intact, if we are to deliver the outcomes our communities expect.

Personal attributes, such as reliability and integrity, underpin all of the critical relationships that hold the human chain together. At ACES, we have worked with great endeavour and enthusiasm to ensure we are at the forefront of emerging technologies. In parallel we have worked to create the most efficient, reliable and robust human chain possible.

Within ACES we have identified challenges in diagnostics, robotics, energy and health. Challenges that can benefit from our ability to turn that knowledge into real applications.

We have assembled teams of individuals to maximise the opportunity for success.

We have introduced innovative training programs that go beyond the accrual of technical knowledge and impact other skills, that are equally important in ensuring translation.

We have built world-class research and translational facilities. In the translational area, the Battery Innovation Hub (BatTRIHub), at Deakin University with partners CSIRO, and the University of Wollongong's Translational Research Initiative for Cellular Engineering and Printing (TRICEP), in partnership with the materials node of the Australian National Fabrication Facility (ANFF), are examples to the world of what can be done. The first in translating advances in energy storage and the second in biofabrication.

We need to continue to consolidate, to build, and to strengthen that human scientific chain, a chain that is critical to success.

Recently, in an ACES workshop we joined with clinicians and surgeons from across the country to review fundamental advances in biofabrication, stem cell technologies and biomaterials science. We discussed how these advances could be used to further develop new technologies to tackle significant medical challenges that included cartilage regeneration, 3D printing of ears to treat microtia, improvements in islet cell transplantation to treat diabetes and new approaches for wound healing, focussing on burns.

The take home message from that event is applicable to all of our endeavours within ACES.

The workshop started with a plea from Prof Fiona Wood – a globally recognised burns specialist from Western Australia – a plea on behalf of her patients – “We have to do better”.

As we considered the resources and talents available to us in Australia we added “We can do better”.

As we reflected further on the sheer determination and resilience of researchers at the event, we concluded “We will do better!”

So let me leave you with this thought. The communities we work for are facing many critical challenges in Energy and Health – we can provide solutions to these challenges.

We have to do better – We can do better – We will do better!

I am confident the ACES team will continue to deliver great outcomes in 2020. I look forward to working with all my colleagues and our collaborators to do so.

Prof Gordon Wallace
Executive Director of ACES

International Advisory Committee Report



ACES is now recognised not only for its excellent research in the fundamental science of electromaterials, but also for the importance the Centre places on capacity building through researcher training, stakeholder engagement, and, most importantly, for working with end-users to produce outcomes of great potential community value.

The variety of valuable outcomes from the expansive research activities undertaken in ACES, and described in this report, is remarkable. These initiatives are addressing global problems that are highly significant and urgent. Most were not considered so in 2005, when ACES first formed.

ACES is working to produce environmentally sustainable sources of energy and energy storage, which should help to reduce the use of fossil fuels. A team within ACES has also been assessing the policy and supply chain aspects of renewables to assess their impact on equity, access, conflict and resilience to then develop an approach to engagement of key stakeholders in new energy technologies.

Research into the fabrication of body parts using customised bioink formulations and 3D printing is targeted at tackling big medical challenges. These technologies should realise positive effects on medical practices going forward.

ACES is imagining a world where some of our most common illnesses are treated without drugs. Researchers have now taken the material developments and 3D printing technologies to develop structures that can monitor and restore

function in neural tissue. They are using electrical stimulation to influence cell behaviour as a way to treat traumatic brain injuries and neurological disorders such as epilepsy and Parkinson's disease.

Researchers have fabricated suitable implantable electrodes that are enabling the administration of electroceuticals (electrical impulses) that target specific neural circuits in body tissues and organs affected by illness to improve performance.

With an increasing demand and need for more functional hand prosthesis, ACES is developing a soft robotic prosthetic hand, which is customisable, low weight, low power, and has sensory feedback features. The aim is for it to be available at an affordable price. ACES is also interested in transferring its expertise and experience of mechanical design and 3D fabrication techniques, combined with developed soft sensors and compliant actuators to other applications of orthotics and rehabilitation.

Through the ACES ethics, policy and public engagement program, the researchers are further understanding needs and wants of their end-users – something paramount to the design and direction of the fundamental research. To anticipate and address community concerns that may arise from emerging technologies will ultimately realise a greater uptake of the technologies amongst end-user groups and bring about better social outcomes.

3D MADE (3D Printed Miniaturised Analytical Devices) – is yet another

initiative from researchers and collaborators coming together through ACES and the Australian Centre for Research on Separation Science (ACROSS). Researchers can build analytical diagnostic devices around their project ideas, with this initiative offering an ever-growing library of components. The researchers also offer their expertise in customising or building new components.

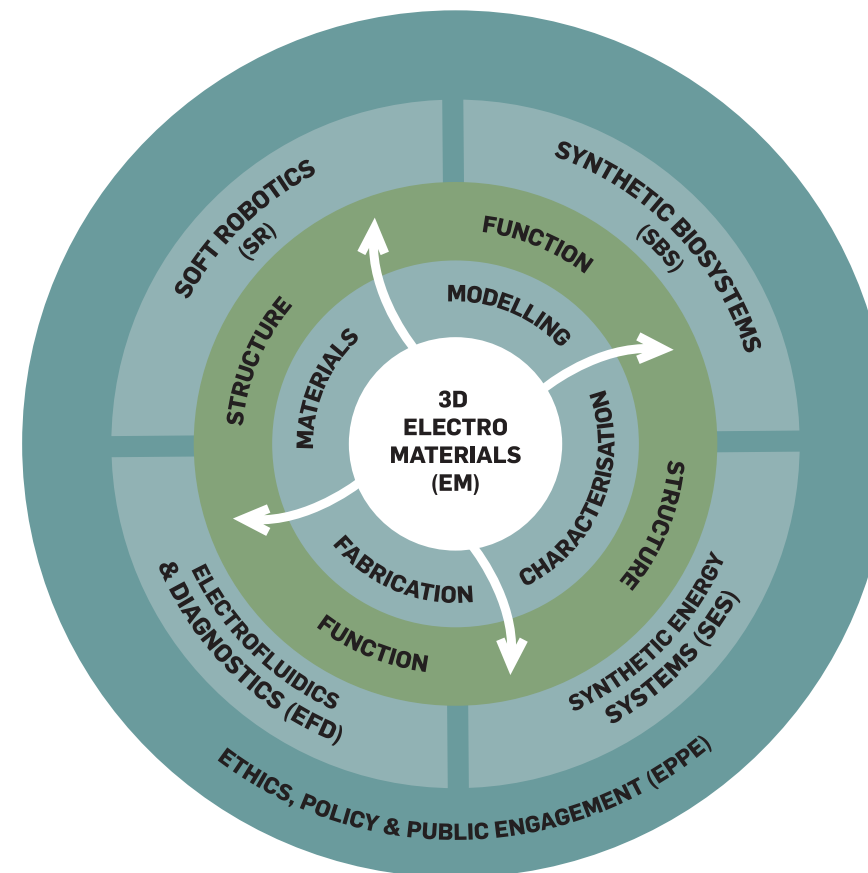
This Centre of Excellence is always looking outward and beyond. Its members recognise the importance of linking existing Australian research strengths with new interdisciplinary networks to achieve global competitiveness for Australian research.

ACES has been contributing to internationally significant research areas that will ultimately become the basis of the next generation of business opportunities and jobs.

'It has been a remarkable experience to be involved with ACES as it has evolved from an organisation mainly focussed on fundamental research on electromaterials into a body that, whilst maintaining its fundamental research, is now working to translate its results into outcomes that address serious community needs in energy and medicine.'

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

ACES Research Outcomes



SCHEMATIC 1: ACES CORE 3D ELECTROMATERIALS RESEARCH THEME AND ASSOCIATED APPLICATION THEMES

RESEARCH FOCUS

The key to successful multidisciplinary research outcomes is collaboration - the ability to link research strengths to build critical mass with new capacity for interdisciplinary, collaborative approaches to address significant research problems.

The research focus in this sixth year of ACES, 2019, continued to be on using the fundamental knowledge in electromaterials, reactive systems, materials processing and fabrication approaches, developed in the first half of the Centre in the Electromaterials (EM) theme, to create high impact and translational outcomes in the other five ACES themes. The themes are electrofluidics and diagnostics (EFD), soft robotics (SR), synthetic energy systems (SES), synthetic biosystems (SBS) and ethics, policy and public engagement (EPPE).

As highlighted in the following notable ACES research outcomes in areas relevant to our 2019 Activity plan, success in the majority of the research outcomes has resulted from interactions across themes, leveraging the benefits of the integrated centre research structure.

GRAPHENE

ACES researchers have created new graphene syntheses and developed chemical expertise that is enabling device fabrication and production know-how to help industry turn graphene into practical devices.

We have explored the complete graphene pipeline including evaluating different sources of graphite, chemistries and the physical parameters used to exfoliate graphene oxide with subsequent reduction to graphene. Knowledge has been amassed on characterising formulations and processes for producing large quantities of dispersions. ACES researchers are now using their chemical expertise to tune physical properties while enabling device fabrication and production know-how to help industry turn graphene into practical devices.

The European Union budgeted US\$1.35 billion over a 10 year period to 2021 to take graphene from the laboratory to commercial products. As a result of this and other global initiatives, over 200 graphene or graphene-related companies have emerged globally. Of these, over 90 companies are

producing materials labelled as graphene. However, a recent report that examined the products from 60 of these companies suggested that less than 10% of the products can be considered as graphene and were better labelled as graphite. Therefore, despite intense global activity in graphene production, there is still a great need for a processable form of genuine high-quality graphene and a scalable method for producing it.

Our recently discovered process is scalable and produces highly conductive graphene, which has the potential to fulfil this market need. As a result, the graphene is being assessed for a variety of applications by a number of Australian academic laboratories and industries.

SOLAR FUELS

Advances in electromaterials are central to the realisation of systems producing solar fuels from water, carbon dioxide and nitrogen and we are now poised to achieve optimal systems using 3D additive fabrication. Control of the nano-micro-macro structures of the electrode itself is critical. To make the most of these efficient electrochemical processes requires the ability to transport reactants to and products from the reaction sites.

Drawing on knowledge accrued in the area of fluidics as well as new materials such as graphene, we are now poised to achieve optimal systems using 3D additive fabrication.

ACES has spun out one company in this area (Aquahydrex Pty Ltd in 2012, now relocated to Colorado in 2018, with ten ACES graduates forming the backbone of the company's technical workforce) and a second related to ammonia production is in the formation stages.

A combination of ACES materials has led to significant advances in the electrocatalytic reduction of carbon dioxide (CO₂) to carbon monoxide, a key component for the production of renewable liquid fuels via catalytic and Fischer-Tropsch syntheses as well as specialty chemicals using chemical processes such as hydroformylation. The development of a large scale electrochemical flow cell for CO₂ reduction utilising ACES electrocatalysts has been progressed.

The sustainable ammonia project that has grown out of the early discoveries in ACES and is now supported by ARENA funding is progressing towards a spin-out company in 2020 with a



consortium of investors. The research team is broadening the intellectual property base of the original discoveries by investigating new catalysts and electrolyte mediators that are capable of producing high selectivity towards nitrogen reduction to ammonia.

ADVANCED BATTERY TECHNOLOGIES

Since its inception, ACES has been undertaking the research and development of novel nanostructured materials and structures, including solid state electrolytes, that enables the creation of the next generation high energy density electrode materials for energy storage such as higher performance batteries and capacitors.

ACES researchers have been leading the world in many of these technologies. As a result of research outcomes from ACES in this area, the Deakin node of ACES established the BatTRIHub, in 2016, in collaboration with CSIRO. The hub has facilitated rapid development of advanced prototypes, and is poised to assist the nascent battery-related industry in Australia, through collaborations with SMEs and via the CRC schemes. Notably in 2019, ACES researchers at Deakin node are partnering Calix Limited and Boron Molecular Pty Limited in a CRC project for advanced hybrid batteries (2019-2022: grant \$3,000,000 and total project value \$9,385,000).

NEURALLY DRIVEN PROSTHETICS

It is estimated that globally 3-4 million people suffer from upper limb loss and this has driven ACES researchers to utilise their materials, actuator designs and 3D printing capability to create a monolithic soft hand replica. Movement of the hand is manipulated through wearable electrodes. Sensing technologies based on printable electromaterials that enable feedback from the hand have been identified.

Electromaterials, such as graphene, that are capable of effective interfacing with nerve and/or muscle cells have been discovered and signals from these materials will be coupled to enable neurally-driven control of the soft robotic hand. ACES has designed a "living electrode interface" for motor nerve systems. In conjunction with collaborators, ACES has developed this concept to a multi-electrode array (MEA) system in which the electrical signals

harvested from muscle cells grown on the MEA surface were able to move the fingers on an electro-mechanical hand.

BRAIN ON A BENCH

To study complex neural systems requires the ability to arrange appropriate cell lines in three dimensions (3D). In a world-first, ACES researchers have produced 3D printed structures that support the growth of brain-like tissue from human stem cells. The team also created 3D electrode structures that enable interrogation of these neuronal networks.

Electrifying stem cells can accelerate the development of 3D brain-like tissue. An international collaborative team worked together and used electricity to produce living three-dimensional human neural tissues in the laboratory.

The pioneering approach brought together several cutting-edge technologies developed at ACES UOW, The University of Auckland and Tampere University of Technology Finland, including a novel method of engineering 3D human neural tissues from neural stem cells and an electrically conductive biogel, as well as an array of 3D printed microelectrodes. By interfacing the former with the latter, the team not only demonstrated the ability to sustain and electrically stimulate stem cells in 3D but also accelerate their differentiation into excitable nerve cells with specialised connections and increased drug responsiveness.

Researchers believe this platform will be broadly useful for both research and translation, including modelling tissue development, function, dysfunction, pharmaceutical responsivity, as well as for electroceuticals and regenerative medicine.

Developing biologically relevant systems will allow researchers to have a more accurate picture of how the brain responds to disease and new treatments, paving the way for an improved understanding into disease development, including epilepsy, Parkinson's and schizophrenia.

The project team led by ACES CI A/Prof Jeremy Crook, ACES Director Prof Gordon Wallace and ACES research fellow Dr Eva Tomaskovic-Crook, took out the coveted Frontiers Research Award at the 2019 Research Australia Health and Medical Research Awards for this work. The team were acknowledged 'for their work in creating novel ways to use human stem cells to assist in regenerative tissue engineering research for the treatment

"The ACES- ANFF partnership can take world-class science and turn it into next generation manufacturing in partnership with local industries – for VSS this has been a win-win. Although seaweed and 3D printing may appear an unlikely pair, we're confident that partnering with ACES-ANFF will deliver future significant outcomes and breakthrough medical innovation."

Pia Winberg, Director and Chief Scientist Venus Shell Systems

of diseases'. This work is an excellent example of the importance of global collaboration in delivering efficient, effective and high impact advances in research and innovation.

With the increasing use of stem cells in ACES and worldwide, and the rapidity that new human pluripotent stem cell (hPSC) lines are generated, exchanged and implemented, it is essential that unambiguous cell line authentication is maintained. ACES researchers have been involved in an international effort to create a standard nomenclature for referencing and authentication of such pluripotent stem cells.

PERSONALISED MEDICINE

We have developed bioinks and fabrication tools such as the biopen (Axcelda pen) - a hand-held 3D printer that delivers bioinks containing stem cells into defects to enable cartilage regeneration - that allow the implementation of patient-specific solutions for a multitude of conditions.

The same principle is being used for printing ears, for the repair of corneal defects, nerve repair, and islet cell transplantation in the treatment of diabetes. These projects illustrate our ability to manage a successful pipeline to turn fundamental research into a strategic application to create a new health solution to improve people's lives.

The worlds of medicine and biomaterials have collided with advances in 3D printing and bioprinting. The global 3D bioprinting market is forecast to reach US\$1.8 billion by 2027. No Australian manufacturers produce bioinks or bioprinters – yet Australia leads the world in research and education in this area. TRICEP – the UOW's Translational Research Initiative for Cellular Engineering and Printing – is providing critical input into biofabrication research and training initiatives.

TRICEP, housing more than 400m² of dedicated translational laboratories, forms part of UOW and is situated in the industrial park of North Wollongong

in close proximity to UOW's innovation campus. The facility is equipped with world-leading research infrastructure to develop innovative technologies in 3D bioprinting, including printer manufacturing, biomaterials, and bioinks. It was established in 2018, and built on the back of ACES fundamental research and partnership with the Australian National Fabrication Facility (ANFF) Materials Node.

The additive fabrication tools enable the development of not only 3D structures such as bioscaffolds but those tools are also used to develop the next generation of biofabrication hardware for use in both laboratories and clinical settings. In addition, TRICEP offers essential software design and model preparation suites to equip our expert technical staff with the tools to engineer, prototype and prove a solution to practical clinical needs. Implementation of a Quality Management System (QMS) is in progress.

TRICEP is taking on the challenge of expanding the currently limited range of 3D printable bioinks that meet a number of interdependent requirements, including those that lead to optimal structural and printing properties, and required biological outcomes.

A key element of this approach is developing new innovative, affordable and effective materials for bioinks. MTPConnect funding was used to engage with SMEs to produce a new range of bioinks based on biomolecules extracted from seaweed in 2019.

The team is collaborating with Dr Pia Winberg, Chief Scientist of Venus Shell Systems, and the driving force behind the pioneering development and production of Australia's unique seaweed biomass and extracts.

In 2015, world leaders agreed to 17 goals for a better world by 2030. Goal 14 focused on 'Life Below Water', to conserve and sustainably use the oceans, seas and marine resources for sustainable development. Part of this goal included a target to increase the economic benefits from sustainable use of marine resources.

Seaweed holds numerous therapeutic properties, and presents a range of opportunities in health applications as well as innovative products. The gel-like glycan polysaccharides in the seaweed mimic human connective tissue, which has been identified as a potential biomaterial source in 3D printing to reconstruct soft tissue for functions such as wound healing and 3D tissue printing, an area that is limited in functional inks. The team is capitalising on the opportunity to link these two technologies to unlock an opportunity in improving human health.

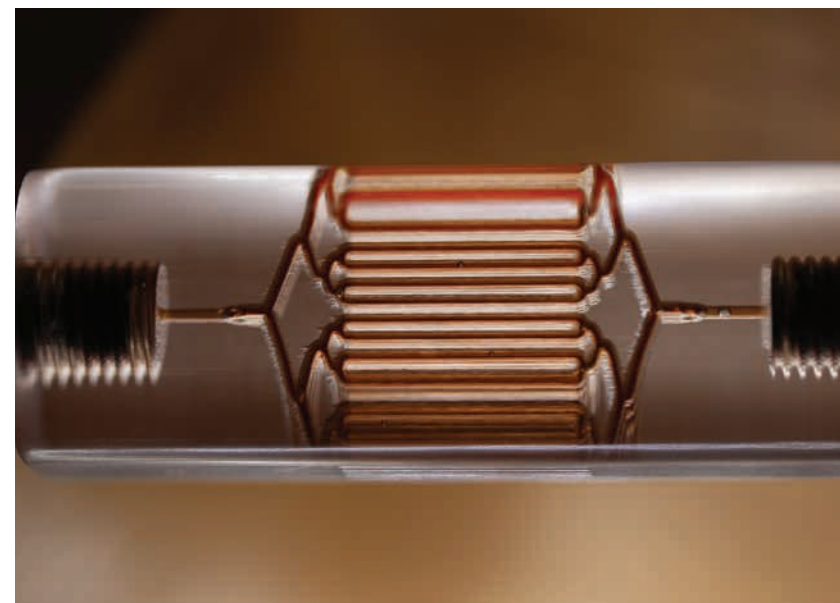
The collaboration between TRICEP and Venus Shell Systems showcases the potential for transforming a local manufacturing source, in this instance a local seaweed biomass producer, into high tech products. By taking advantage of the knowledge and expertise in areas such as materials processing, and by tapping into internationally recognised and networked research organisations, such as ACES, local industries can realise global opportunities. Likewise, by partnering with local industries, research groups can further their world-class science right in their own backyard, to make a real difference to the health of our communities.

In 2019, TRICEP activities also included working with:

- ▶ Romar Engineering combining robotics and 3D printing; specifically exploring the manufacture of a 3D printer for prosthetic ears.
- ▶ Inventia Life Science startup company on the supply of bioinks aimed at developing drug testing assays for the pharma industry.
- ▶ Gelomics startup company on supplying high quality bioinks for the use in bioassays.

ACES and ANFF material node members have been supporting the development of emerging commercial entities – the Axcelda pen for cartilage regeneration and the iFix pen for treatment of painful and potentially blinding corneal ulcers.

iFixMedical Pty Ltd is a company currently being established and attracted funding through the NSW Medical Devices Funding (\$1.1 million). There are approximately 55,000 visits to hospital across Australia for corneal ulceration per year. The estimated cost to the government per Accident and Emergency visit is approximately AU\$220. If the iFix system could reduce the need for a single follow up visit, that



would mean a cost saving of over \$1M.

The key social advantage provided by the introduction of the iFix system would be reduced pain and morbidity for patients with corneal ulceration. Loss of vision has been shown to impact not only on patients' visual tasks but also leads to social isolation, depression and anxiety disorders and increased rates of falls in the elderly.

The team has made some exciting advances, in 2019, towards the development of a number of iFix Pen concepts. The group has developed a number of prototypes to provide delivery of an appropriate bioink composition to the point of injury with high resolution, which address different market needs. These concepts aim to keep clinician need in the forefront of the design, with the group currently testing prototypes that enable effective sterilisation, provide greater flexibility and independence in the operating theatre, as well opportunities to deploy the technology in external environments.

3D MADE

During the past four to five years of the Electrofluidics and Diagnostics (EFD) theme projects, ACES researchers have been developing new analytical devices to address some of the current and high-interest problems in the field. Presentation of that research in national and international conferences usually resulted in the request from audience members to get access to these devices.

As a result, in 2019, University of Tasmania (UTAS) ACES CI Prof Brett Paul and early career

researcher Dr Vipul Gupta teamed up to create 3D MADE (3D Printed Miniaturised Analytical Devices). 3D MADE is a 3D printing initiative (<https://www.3dmade.com.au>) to bridge the gap between project requirements and the commercially available analytical devices, building on the expertise of various people from ACES and the Australian Centre for Research on Separation Science (ACROSS).

Through this venture, ACES researchers are enabling researchers around the world to think outside the small box of conventional analytical devices, allowing them to develop analytical devices around their project ideas and not vice-versa.

While the business is in its infancy, the ACES researchers have been able to attract an international audience from Ireland, USA, and Australia. The major portion of the sales to date have been from the consultation-based stream, where ACES actively works with the researchers who are struggling with the procurement or development of high-performance analytical devices for their projects.

INTEGRATED MICROFLUIDIC DETECTION SYSTEM

At ACES Swinburne work has progressed to optimise existing material synthesis to achieve controlled near infrared (785nm) stimulated drug release, using the test drug dexamethasone.

At ACES UTAS work progressed on development, characterisation and production of 3D printed microfluidic

platforms for a modular system, including controlled drug release, detection zones, mixing and microfluidic distributors, and cell culture reservoirs. This included designing and printing microfluidic components for modular 'brain-on-a-bench' research.

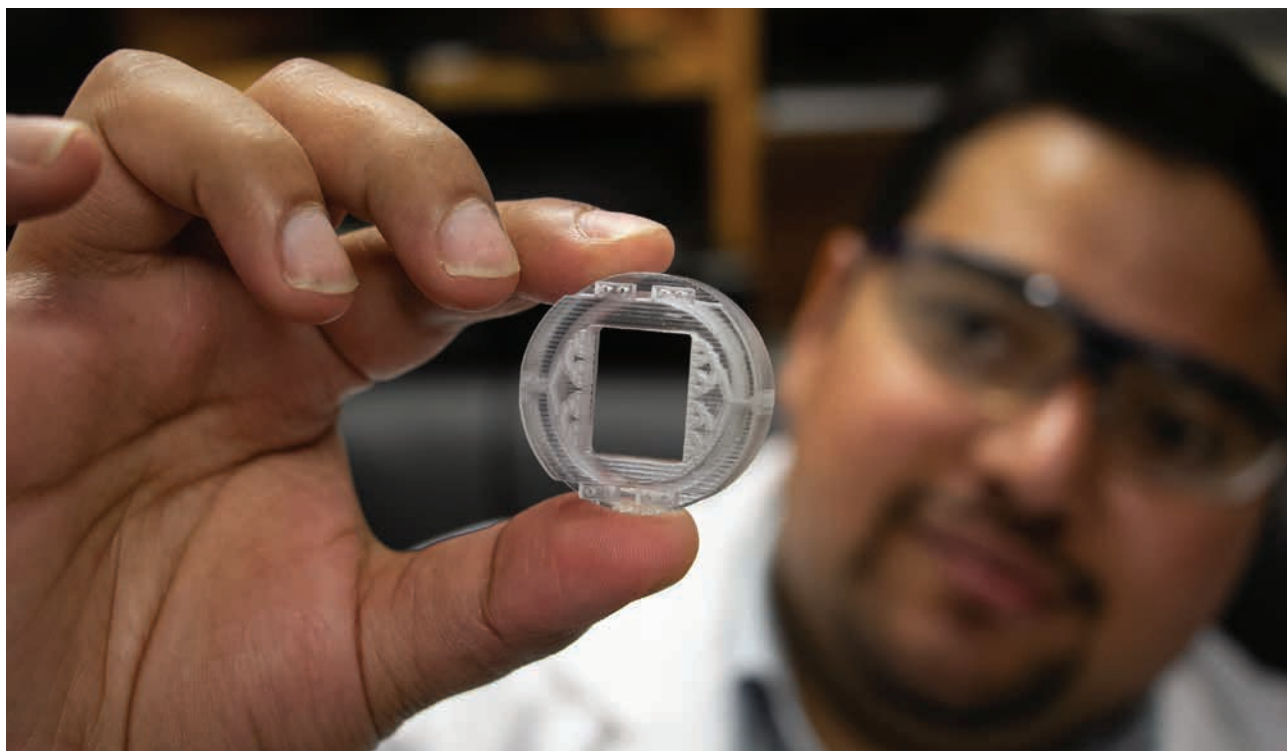
ULTRASOUND

As the field of tissue engineering and regenerative medicine progresses towards the goal of stem cell therapies and artificial tissues on demand, new challenges in tissue characterisation arise. One requirement for the evaluation of artificial tissues is the need for non-invasive and non-destructive techniques that are able to monitor the development of living cells over extended periods of time. Within this scope, techniques with imaging capabilities are preferred, as they provide an additional level of information.

Traditional imaging techniques used in the field are optic-based, providing a high level of detail. However, they are limited to constructs of less than 1 millimetre in thickness. The loss of resolution in ultrasound compared to optic-based techniques is not detrimental, as it provides important information of the tissue microstructure rather than focusing on single cell behaviour. This is of practical relevance as it bridges the gap between the micro and macroscopic scale. In addition, ultrasound does not require the use of molecular markers, often used in optic-based techniques. Thus, ultrasound offers an alternative to the current challenges not found in other commercial products within its application scope.

ACES are interested in bringing this bench-top quantitative ultrasound imaging device, Ultramage, into a commercially available product. Such enterprise requires the integration of modular hardware components into a single standalone device. ACES are also interested in transferring our proprietary MATLAB signal processing and imaging code into a protected and deployable software in combination with the Ultramage device.

The system is based on the measurement of the acoustic properties of soft tissues. In particular, the use of high frequency ultrasound for the characterisation of the physical and biological properties of a sample under interrogation. Typical samples would



comprise a construct containing living cells and biologically compatible materials such as hydrogels.

Quantitative information can be deduced from the time and frequency domain of the acquired radiofrequency signals. This allows the determination of the speed of sound, thickness, attenuation, cell density estimation and the determination of the cell cluster size via spectral modelling. Determined parameters are related to the sample microscopic features and indirectly to its mechanical properties. Data representation can be in the form of nominal values, spectra, or as parametric images in the 2 or 3 dimensions (*Acta Biomaterialia*, 2019, Vol 91, pages 173-185).

Ultramage is specialised for *in vitro* studies. Possible application fields include:

Bioprinting: Visualisation and quantification of cellular distribution within a bioprinted construct. Ultramage can also be used for quality control or optimisation of bioprinting parameters, or detection of structural defects, which may not be obvious from a vertical field of view when using a microscope.

Growth factors and cell stimulation: 3D or 2D cross-section images can be useful in monitoring the effect of growth factors or cell stimulation as a function of cell proliferation and spatial distribution.

Anticancer drugs: The use of quantitative procedures for cell density and cell

cluster size modelling can be a useful tool to track effects of drugs on tumour cells. The use of a precision stage allows the evaluation at the same locations over the course of the study.

Artificial tissues: The ultrasound parameter – attenuation – is reported to follow in close relationship the formation of cartilage, following adipose stem cell differentiation. With Ultramage one can perform attenuation imaging for monitoring cartilage formation as a function of time.

As testament to the interest in using ultrasound for non-invasive imaging, presentation of this work by Dr Andres Ruland ACES ECR at UOW was awarded best oral presentation overall at the Tissue Engineering & Regenerative Medicine International Society (TERMIS) 2019 congress. The work also gained a lot of interest at BioFab2019 in Ohio, USA.

ETHICS OF EMERGING TECHNOLOGIES

Our ACES ethics, public policy and engagement team as well as ACES researchers throughout 2019 engaged and interacted with various stakeholders, working towards contributions to policy development and influence on the national research strategy.

That is, EPPE researchers are 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.

EPPE - ENERGY

The ACES energy team is concerned with the politics and policies relating to renewable energy, sustainability, disaster resilience and the down-stream impacts of transitions into different energy economies. Areas of focus include:

- ▶ Full circle economy on renewable energy (including battery recycling)
- ▶ Ethical supply chain of rare earths and conflict minerals; such as lithium and cobalt
- ▶ Energy policy, politics and corporate lobbying
- ▶ Transnational exports of renewable energy
- ▶ Japan's hydrogen economy and extraction of La Trobe valley lignite coal for Japan's hydrogen economy
- ▶ Energy resilient energy infrastructure in disaster zones in India
- ▶ Renewable energy and corporate involvement in peace making
- ▶ Energy justice and just transitions in community-based research in Germany and Australia

Towards 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.
- ▶ conducting research that has resulted in two book chapters submitted 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.

Discussing activities with various stakeholders, participating in webinars and interviewing key stakeholders underpins the research activities of the EPPE-Energy team: 63 such interactions are listed in Appendix 1.

ACES CI Prof Linda Hancock was an invited referee of the The Intergovernmental Panel on Climate Change (IPCC) of the first draft of the Expert Review of the First Order Draft (FOD) of the Working Group II (WGII) Contribution to the IPCC Sixth Assessment Report (AR6). The IPCC Working Group II (WGII) assesses the vulnerability of socio-economic and natural systems to climate change, negative and positive.

Engaging with and reporting findings back to stakeholders is an important part of this work. ACES members do this by means such as:

Oral presentations at conferences. For example three such presentations: (i) "Conflict and critical materials in Solar PV supply chains: embedding ethical materials choices in research, design and product lifecycle of solar PV "; (ii) "Big Energy (Coal) and India's 2-percent CSR under the Companies Act 2013" and (iii) "Preventing Violent Extremism: Cases, Proposed Practice and an Agenda for Research" were given at International Conference on Public Policy in Montreal. ACES members Hancock and Ralph were also co-convenors of two panels: (i) Understanding Power in Energy Policymaking and (ii) Business and Countering Violent Extremism, at this event.

Joining broader research groups. For example in June, Natalie Ralph, RF Deakin, was invited to be a member of 'Business in Conflict Areas Research Group' (BICAR) under the American University of Beirut's (AUB) Business School (a research-based group).

In the news. An interview with James Mitchel Crow, for an article in New Scientist on hydrogen and other Australian exports in June by ACES member Natalie Ralph.

Podcast. ACES CI Prof Linda Hancock joined scholars from a range of disciplines for a conversation surrounding environmental disasters on the Sydney Ideas podcast (<https://soundcloud.com/sydney-ideas/environmental-disasters>). The conversation looked at what we need to do to effectively govern disasters such as bushfires, hurricanes, heatwaves and floods, and who should govern such environmental disasters and how. Sydney Ideas is the University of Sydney's public events program. The podcast aims to bring thinkers from all over the world together to share ideas and make a difference.

EPPE – HEALTH

The EPPE Health team is concerned with exploring the ethical and socio-political impacts of emerging technologies. The research encompasses: (i) identifying the epistemic and ethical limitations of randomised clinical trials for regulation and approval of personalised medicine; (ii) ethical responsibilities of manufacturers for prosthetic organs and ethical importance of assumptions about disability, therapy and enhancement and (iii) identifying implications of new medical diagnostic systems for access to health care and international aid policy.

Increasingly, the EPPE health team is conducting research involving collaboration with researchers in other ACES themes or on topics relevant to other themes. For example, EPPE has conducted a range of research related to robotics relevant to soft robotics; conducted a survey on user preferences for robotic limbs, which has now been published, and worked also with members of the Synthetic Biosystems team on various papers. Affiliates and associate investigators of ACES EPPE collaborate on research exploring the intellectual property (IP), copyright and ownership regimes related to 3D bioprinting, and developing analyses of the challenges of translating personalised medicine into clinical practice.

ACES AI Frederic Gilbert, ACES CI UOM Mark Cook and clinical collaborators Profs O'Brien and Illies published 'Embodiment and Estrangement: Results from a First-in-Human "Intelligent Brain Computer Interface" Trial', in *Science and Engineering Ethics*. 2019, 25 (1): 83-96.

CI Sparrow work on Ethics of Robotics has been accepted as a book chapter in Hugh LaFollette (Ed) *International Encyclopedia of Ethics* in 2019.

Towards translation, the EPPE Health team has been discussing the various issues with relevant end-users. Examples include:

- ▶ ACES CI Dodds and Wallace presentations on ethical issues in 'New and Emerging Technologies for Surgery Information and 3D Bioprinting' an information session at RPA Institute of Academic Surgery in Sydney in March 2019. ACES collaborator A/Prof Payal Mukherjee spoke on her 3D printed Ear project.
- ▶ ACES AI UTAS Gilbert presented 'Me, Myself and e-I: Ethics of Artificially Intelligent Brain-Computer Interfaces' at the Technology & Wellbeing Roundtable at the Telstra Foundation Melbourne.
- ▶ ACES ECR Monash Mary Walker presented 'Diagnosis, screening and defining disease' at the University of Melbourne Department of General Practice Seminar.
- ▶ ACES ECR UNSW Eliza Goddard was an invited participant in the interdisciplinary, multi-stakeholder workshop 'Building our 3D printed future: Backcasting device-based precision medicine', at Deakin Downtown Melbourne.
- ▶ ACES CI Robert Sparrow was an invited panelist for 'Technology that serves society - the ethical foundations of the data age', at the IFA+Summit – The next level of thinking, Berlin. The IFA+Summit brings together the world's leading thinkers, global trendsetters and creative visionaries, who share their new ideas of our digital future with academics, artists, developers, researchers and digital pioneers.

TRANSITIONING FUNDAMENTAL RESEARCH TO APPLICATIONS

Together with the above examples, further stories on how ACES has been transitioning fundamental research into strategic applications can be found in the ACES New Dimensions 2019 magazine, along with researcher spotlights, showcased on the ACES website (electromaterials.edu.au).

Communicating Research Findings

Publishing ACES research is essential for knowledge translation. Publishing both in academic journals and explaining the potential impact of that research to our community through our website portal provides an important means in which we disseminate the body of ACES knowledge.

Here we highlight a few stories from 2019 on how research collaboration has been pivotal to translation of the vast body of knowledge that ACES is generating as well as descriptions of discussions on policy and regulatory issues associated with or arising from the research activities. The stories highlight how our research training has led to some very creative, accomplished next-generation researchers tackling real world challenges throughout the ACES extended collaboration network.

RESEARCHERS HELP TO TURN BACK TIME ON THE CARBON EMISSIONS CLOCK

Researchers at ACES are part of a world-first project to turn carbon dioxide back into solid coal using liquid metals that could revolutionise our ability to remove greenhouse gas from the earth's atmosphere.

The team from our Monash and UOW nodes collaborated with a number of universities in Australia (RMIT, UNSW, QUT), Germany (University of Munster), China (Nanjing University of Aeronautics and Astronautics), the US (North Carolina State University), and the ARC Centre for Future Low-Energy Electronics (FLEET) on this work (*Nature Communications*, February 2019).

A new technique was developed by the team that can efficiently convert carbon dioxide (CO₂) from a gas into solid particles of carbon. Current technologies for carbon capture and storage aim to compress CO₂ into liquid form for injection underground, however a number of economic and engineering challenges including potential leaks back into the atmosphere have hampered this process.

To overcome these concerns, the team set out to investigate the potential of liquid metals as a catalyst to transform CO₂ from a gas into a solid product that could be stored without the problems posed by current carbon capture methods.

ACES CI Prof Doug MacFarlane said the team decided to design a reduction

electrocatalyst that could work at room temperature to improve carbon capture efficiencies and open up new avenues for permanent storage of CO₂ from the earth's atmosphere.

There were a number of challenges in developing the ACES catalyst, as CO₂ is a remarkably stable molecule, and many products that could form from it would cause damage to the catalyst's surface in a process known as coking.

The liquid metal catalyst developed is resistant to the coking process. In addition, it remains liquid at room temperature avoiding the need to use high temperatures, it provides great conductivity, and it is capable of dissolving most other metallic elements at concentrations suitable for catalysts. This has allowed the development of an efficient and environmentally friendly process to convert CO₂ to a solid product for capture, as a real step forward towards negative carbon emission technologies.

RMIT researcher and former ACES PhD student, Dr Torben Daeneke said converting CO₂ into a solid could be a more sustainable approach for carbon capture and storage. While we can't literally turn back time, turning carbon dioxide back into coal and burying it back in the ground is a bit like rewinding the emissions clock.

To date, CO₂ has only been converted into a solid at extremely high temperatures, making it industrially unviable. By using liquid metals as a catalyst, ACES researchers have shown it's possible to turn the gas back into carbon at room temperature, in a process that's efficient and scalable.

As a side benefit of the process the carbon can hold electrical charge, becoming a supercapacitor, so it could potentially be used as a component in future energy storage devices.

The ACES team included Prof David Officer, Prof Gordon Wallace and ACES PhD student Jaecheol Choi from UOW, Prof Doug MacFarlane from Monash, ACES Associate Investigators and former ACES PhD student Dr Torben Daeneke and affiliated students Dr Dorna Esrafilzadeh and Dr Rouhollah Jalili.

3D ALEK WORKING TO COMBAT CONGENITAL EAR DEFORMITY

Royal Prince Alfred Hospital (RPA) in Sydney is home to a world-first customised 3D bioprinter designed to

create and make a 3D printed human ear, thanks to researchers from ACES.

RPA took possession of the printer in March 2019. This was a key milestone for a joint research project funded by The Garnett Passe and Rodney Williams Memorial Foundation, between ACES UOW node and Ear, Nose and Throat (ENT) surgeon at Royal Prince Alfred hospital (RPA), A/Prof Payal Mukherjee, to develop a clinical 3D bioprinting solution to treat microtia, a congenital deformity where the external ear is underdeveloped.

Prof Gordon Wallace and A/Prof Payal Mukherjee explain on the ACES YouTube channel, the research problem and what strategies are being built into the project (<https://www.youtube.com/user/ACESElectromaterials>).

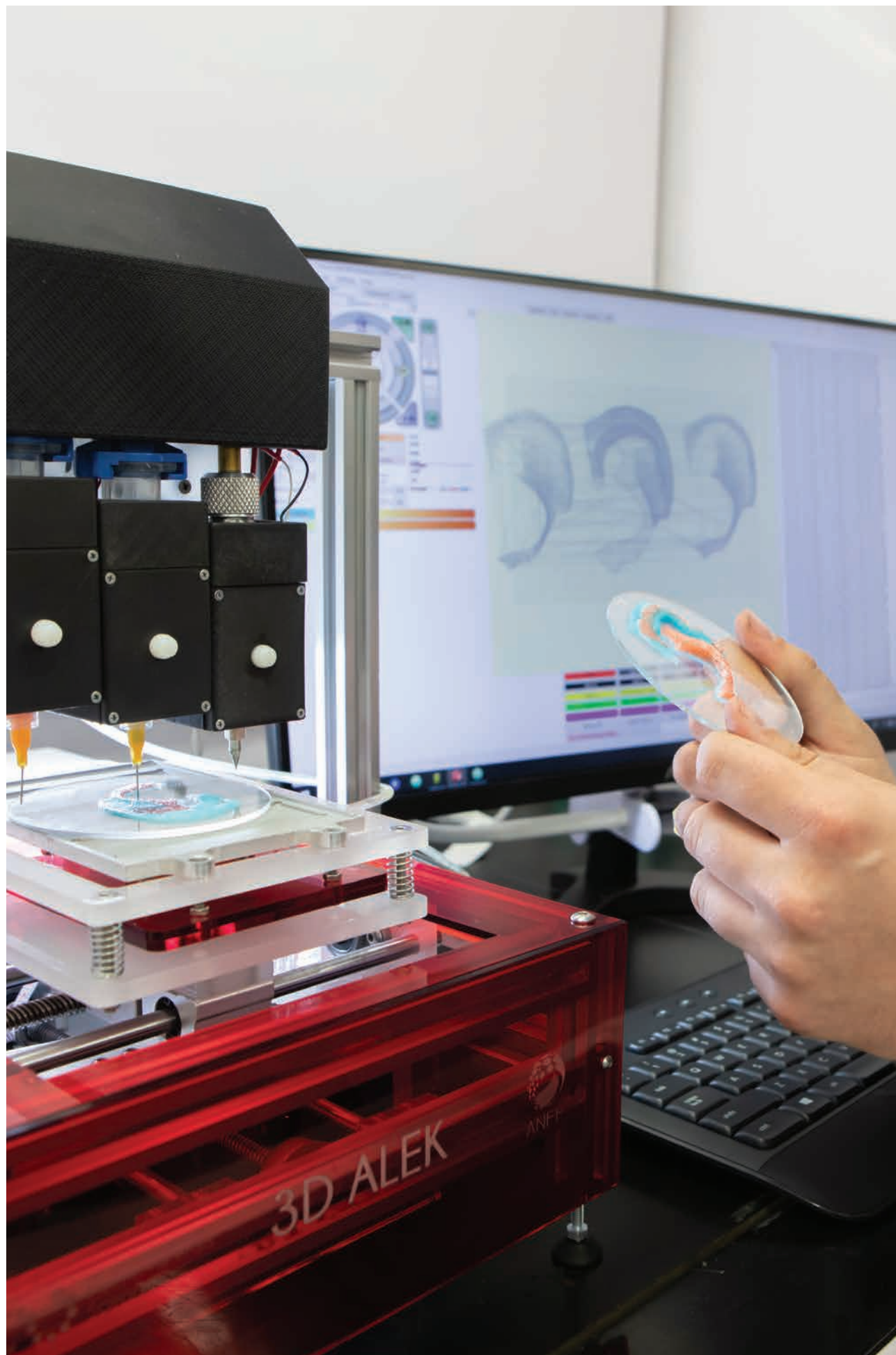
The project illustrates ACES' ability to manage a successful pipeline turning fundamental research into a strategic application to create a new health solution to improve people's lives. ACES-ANFF partnership has been responsible for the primary sourcing of materials; the formulation of bioinks and the design and fabrication of a customised printer; the design of required optimal protocols for cell biology; through to the final clinical application.

A/Prof Mukherjee said she was thrilled to be working with ACES researchers to develop a solution to combat microtia that is individualised to match the patient's own anatomy.

"Treatment of this particular ear deformity is demanding because the outer ear is an extremely complex 3D shape, not only in length and breadth, but also in height and projection from the skull," A/Prof Mukherjee said.

"This is where bioprinting is an extremely exciting avenue, as it allows an ear graft to be designed and customised to the patient's own face using the patient's own natural tissue, resulting in reduced operating time and improve cosmetic outcome, and avoids the current complication of requiring a donor site for cartilage, usually from the patient's rib cage."

The team will continue to advance this research, including undertaking initial clinical trials with a focus on accelerating the development of the specialised bioink by using stem cells from human tissue, with the hope of eventually being able to print a living ear using a patient's own stem cells.



"Burns medicine is a highly complex field, and there is always room to improve our approach as our understanding is continually evolving. Working with Professor Wallace and his team will be invaluable as it will expose us to new knowledge in biomaterials, bioinks and fabricating delivery systems for wound healing and artificial skin".

Prof Fiona Wood, FRACS AM

NEW EMERGING TECHNOLOGIES AND INNOVATIONS - WHAT ABOUT RISKS?

3D printing is a disruptive technology. It has made everyone dramatically rethink the whole definition of a medical device and many of these 3D applications are making tangible clinical impact now.

While Australia is leading the world in the next generation of such personalised medical implants with bioprinting, it is important that we realise that without a strong and interconnected partnership with all stakeholders, such innovation will take a long time to reach patients.

In recognition of this, the Royal Australian College of Surgeon's NSW state committee organised a collaborative event. Clinicians and scientists across NSW leading research in this area were present along with representation from Therapeutic Goods Administration (TGA), hospital CEO's, Agency for Clinical Innovation, patent lawyers, health economists, Medical Service Advisory Committee and other stakeholders. They discussed the current and future implications of new regulatory rules proposed by the TGA and its effect on various aspects of the health system.

The outcome of that evening was published in a discussion paper in the ANZ Journal of Surgery, the leading surgical journal of the Australasian Surgical community, to disseminate this information to a larger community as well as to the TGA, government and important stakeholders. The paper had contributions from both ACES Director Gordon Wallace and A/Prof Payal Mukherjee.

EXPLORING 3D BIOPRINTING FOR WOUND HEALING

The Centre's leading researchers in biomaterials and advanced fabrication technologies joined with Prof Fiona Wood, in 2019, to explore wound healing strategies, the creation of

artificial skin, and developing practical applications in a clinical environment.

Prof Wood is one of Australia's most innovative and respected surgeons and researchers, and is most well known for her pioneering work in developing the 'spray-on skin' technique, and her outstanding efforts to treat victims of the 2002 Bali Bombings.

Both research teams are passionate about collaborating across disciplines. It allows researchers to combine a range of critical research strengths, ensuring that everyone has the full picture when translating research to improve clinical outcomes.

ACES showcased our leading research in biomaterials and advanced fabrication technologies and benefited from Fiona's team knowledge about burn care, trauma and scar reconstruction. This collaboration enabled us to share ideas on how we can improve wound healing in real life scenarios.

A reciprocal translational workshop was held in Perth in December 2019, with over 70 attendees. The first proof of concept research activities begin early 2020.

BREAKTHROUGH IN ARTIFICIAL MUSCLES

Putting 'socks' on helps artificial muscles made from inexpensive materials produce 40 times more flex than human muscle, a global research project has found.

Researchers at ACES UOW, including ACES CI Prof Geoff Spinks, ACES AI Dr Javad Foroughi and PhD students Dharshika Kongahage and Sepehr Talebian, joined with international partners from the USA, China and South Korea to develop sheath-run artificial muscles (SRAMs), that can be used to create intelligent materials and fabrics that react by sensing the environment around them.

ACES researcher and ARC DECRA Fellow Dr Javad Foroughi said these new muscles build on the team's work over the past 15 years in artificial muscle

performance, which has led to four papers in the reputable **Science** journal.

The sheath-run artificial muscles feature a sheath around a coiled or twisted yarn, which contracts, or actuates, when heated, and returns to its initial state when cooled. The outside sheath absorbs energy and drives actuation of the muscle. The muscles can also operate by absorbing moisture from their surroundings.

The SRAMs are made from common natural and man-made fibres, such as cotton, silk, wool and nylon, which are cheap and readily available. ACES CI Spinks said the team wanted to improve upon its previous artificial muscle work, which relied on coiling and twisting more sophisticated materials like carbon nanotube (CNT) yarn.

While there's no doubt CNTs make wonderful artificial muscles, CNTs are also a very expensive product. This latest work utilises inexpensive, commercially available yarns with a CNT polymer coating for the sheath. Previously, the researchers were applying energy to the entire muscle, but only the outer part of the fibre was responsible for actuation. By placing a sheath on the muscle, they could focus only that energy on the outer part of the fibre, and convert this input energy more quickly and efficiently.

The application possibilities for SRAMs are diverse. When talking about artificial muscles, it is not just talking about a technology for replacement of muscles in the body. These muscles could be woven into comfort-adjusting textiles that cool in summer and warm in winter, depending on their exposure to temperature, moisture (like sweat), and sunlight, or as smart controlled drug release devices for localised delivery through the actuation of valves that control the flow of liquids depending on their chemical composition or temperature.

ACES Director Prof Gordon Wallace said, *"this work is an excellent example of the importance of global collaboration in delivering efficient, effective and high impact advances in research and innovation."*

"The success of our Centre's work on artificial muscles is the result of our highly skilled researchers being important contributors to a diverse and multidisciplinary team assembled from across the globe. Building these links enables the realisation of exciting new technologies."

Publications

HIGH QUALITY INTERNATIONAL OUTPUTS

In 2019, ACES members published a book, 6 book chapters and 216 articles that have ARC Centre of Excellence for Electromaterials Science in the address line indicating ACES members' involvement in that research. The overall publication and citation activity for ACES affiliated publications 2019 and 2014-2019 (source, Scival based on SCOPUS data 6.1.20) is shown in Table 1. Please note that not all publications listed in Scopus (216) were available for analysis in the SciVal database (196 as at 6.1.20).

BOOK

1. Vipul Gupta, Pavel Nesterenko, Brett Paull. 3D Printing in Chemical Sciences: Applications Across Chemistry. RSC Publishing. 2019.

This book provides a timely and extensive review of the reported applications of 3D Printing techniques across all fields of chemical science. It will be of interest across the chemical sciences in research and industrial laboratories, for chemists and engineers alike, as well as the wider science community.

BOOK CHAPTERS

1. Tomaskovic-Crook E, Crook JM. 3D Bioprinting Electrically Conductive Bioink with Human Neural Stem Cells for Human Neural Tissues In Crook J.M. (Ed) 3D Bioprinting: Principles & Protocols. Invited book for Methods in Molecular Biology Series. Humana Press (Springer imprint), New York. August 2019.
2. Eliza Goddard and Susan Dodds, 'Ethics and policy', in J.M. Crook (Ed), 3D Bioprinting: Principles & Protocols. Invited book for Methods in Molecular Biology Series, Humana Press (Springer imprint), New York. August 2019.
3. Crook JM, Tomaskovic-Crook E. Bioprinting 3D Human Induced Pluripotent Stem Cell Constructs for Multilineage Tissue Engineering and Modelling In Crook JM (Ed) 3D Bioprinting: Principles & Protocols. Invited book for: Methods in Molecular Biology Series. Humana Press (Springer imprint), New York. August 2019.
4. Ralph, N. 'Business for Peace: a Holistic Research Approach to Corporations, Local Business

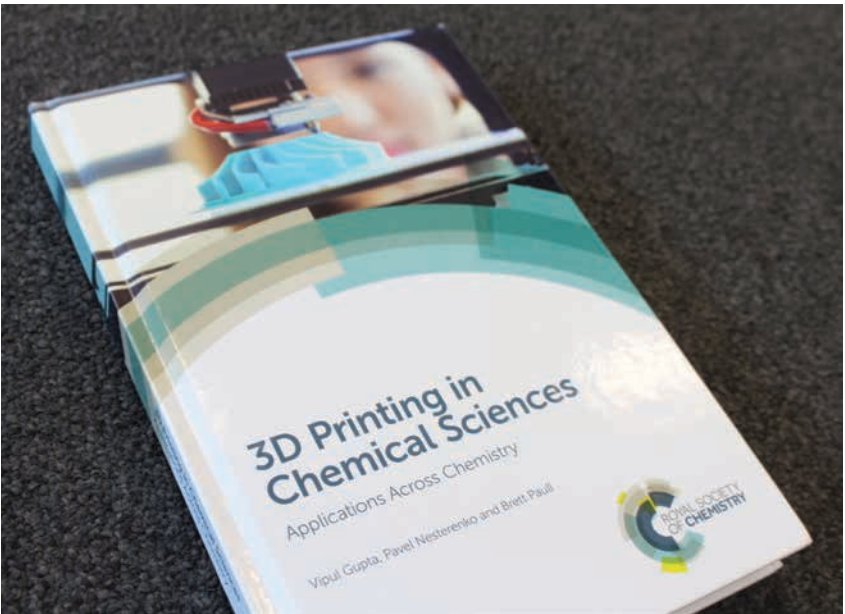


TABLE 1: OVERALL PUBLICATION AND CITATION ACTIVITY FOR ACES AFFILIATED PUBLICATIONS 2014-2019 (SOURCE, SCIVAL BASED ON SCOPUS DATA 6.1.20)

Output Description	2019	2014-2019
Number ACES publications (SCOPUS)	210	1158
Number of ACES publications (SciVal)	196	1145
Number of subject areas (main categories) ACES published in	21	24
^^ Views count	4,025	51,526
^Views per Publication (articles and reviews)	20.5	45.0
Outputs in Top 1% of world views	10 (5.1%)	89 (7.8%)
Outputs in Top 10% of world views	82 (41.8%)	579 (50.6%)
Outputs in Top 25% of world views	123 (62.8%)	896 (78.3%)
Number of citations	579	21,899
Number of citing countries	54	110
Average citations/publication	3.0 (106 cited pubs)	19.1 (990 cited pubs)
Outputs in top 1% most cited	19 (9.7%)	98 (8.6%)
Outputs in top 10% most cited	75 (38.3%)	422 (36.9%)
Outputs in top 25% most cited	106 (65.1%)	745 (54.1%)
Field Weighted Citation Impact (#FWCI - for articles and reviews)	2.83	2.13
International collaboration	102 (52.0%)	626 (54.7%)
National collaboration	88 (44.9%)	441 (38.5%)
Publications in top 1% journal percentage by SJR	27 (15.0%)	119 (11.2%)
Publications in top 10% journal percentage by SJR	107 (59.4%)	601 (56.4%)
Publications in top 25% journal percentage by SJR	154 (85.6%)	914 (85.7%)

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.

and Social Entrepreneurship in States Affected by Conflict, Violent Extremism and (Un)sustainability', in H. Gregorian (Editor), *Frontiers of Peacebuilding*, Fall 2019.

5. Lilith Caballero Aguilar, Saimon M. Silva, Simon E. Moulton, '3D printed drug delivery systems', in *Engineering Drug Delivery Systems* (Elsevier). Accepted for publication 2019.

6. Sparrow, R. 2019: 'Robotics', in Hugh LaFollette (eEd) *International Encyclopedia of Ethics*. Malden, MA: John Wiley & Sons. Accepted for publication 27 July 2019.

JOURNAL ARTICLES

The publications listed, from highest impact factor, are what the SCOPUS database captured with ACES in the address line (as of 6.1.2020) and were used to calculate the statistics in Table 1.

1. Zhang, X.; Sun, X.; Guo, S. X.; Bond, A. M.; Zhang, J., Formation of lattice-dislocated bismuth nanowires on copper foam for enhanced electrocatalytic CO₂ reduction at low overpotential. *Energy and Environmental Science* **2019**, *12* (4), 1334-1340, Impact Factor = 33.250.

2. Kar, M.; Tutusaus, O.; MacFarlane, D. R.; Mohtadi, R., Novel and versatile room temperature ionic liquids for energy storage. *Energy and Environmental Science* **2019**, *12* (2), 566-571, Impact Factor = 33.250.

3. Choi, J.; Kim, J.; Wagner, P.; Gambhir, S.; Jalili, R.; Byun, S.; Sayyar, S.; Lee, Y. M.; MacFarlane, D. R.; Wallace, G. G.; Officer, D. L., Energy efficient electrochemical reduction of CO₂ to CO using a three-dimensional porphyrin/graphene hydrogel. *Energy and Environmental Science* **2019**, *12* (2), 747-755, Impact Factor = 33.250.

4. Zhuang, L.; Jia, Y.; Liu, H.; Wang, X.; Hocking, R. K.; Liu, H.; Chen, J.; Ge, L.; Zhang, L.; Li, M.; Dong, C. L.; Huang, Y. C.; Shen, S.; Yang, D.; Zhu, Z.; Yao, X., Defect-Induced Pt–Co–Se Coordinated Sites with Highly Asymmetrical Electronic Distribution for Boosting Oxygen-Involving Electrocatalysis. *Advanced Materials* **2019**, *31* (4), Impact Factor = 25.809.

5. Wang, K.; Frewin, C. L.; Esrafilzadeh, D.; Yu, C.; Wang, C.; Pancrazio, J. J.; Romero-Ortega, M.; Jalili, R.; Wallace, G., High-Performance Graphene-Fiber-Based Neural Recording Microelectrodes. *Advanced Materials* **2019**, *31* (15), Impact Factor = 25.809.

6. 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* **2019**, Impact Factor = 25.809.

7. 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* **2019**, Impact Factor = 25.809.

8. Robertson, J. C.; Coote, M. L.; Bissember, A. C., Synthetic applications of light, electricity, mechanical force and flow. *Nature Reviews Chemistry* **2019**, *3* (5), 290-304, Impact Factor = 25.59.

9. Pai, N.; Lu, J.; Gengenbach, T. R.; Seeber, A.; Chesman, A. S. R.; Jiang, L.; Senevirathna, D. C.; Andrews, P. C.; Bach, U.; Cheng, Y. B.; Simonov, A. N., Silver Bismuth Sulfoiodide Solar Cells: Tuning Optoelectronic Properties by Sulfide Modification for Enhanced Photovoltaic Performance. *Advanced Energy Materials* **2019**, *9* (5), Impact Factor = 24.884.

10. Lee, C. Y.; Mitchell, D. R. G.; Molino, P.; Fahy, A.; Wallace, G. G., Tunable solution-processable anodic exfoliated graphene. *Applied Materials Today* **2019**, *15*, 290-296, Impact Factor = 24.537.

11. Forsyth, M.; Porcarelli, L.; Wang, X.; Goujon, N.; Mecerreyes, D., Innovative Electrolytes Based on Ionic Liquids and Polymers for Next-Generation Solid-State Batteries. *Accounts of Chemical Research* **2019**, *52* (3), 686-694, Impact factor = 21.661.

12. Suryanto, B. H. R.; Wang, D.; Azofra, L. M.; Harb, M.; Cavallo, L.; Jalili, R.; Mitchell, D. R. G.; Chatti, M.; MacFarlane, D. R., MoS₂ Polymorphic Engineering Enhances Selectivity in the Electrochemical Reduction of Nitrogen to Ammonia. *ACS Energy Letters* **2019**, *4* (2), 430-435, Impact Factor = 16.331.

13. Choi, J.; Wagner, P.; Gambhir, S.; Jalili, R.; Macfarlane, D. R.; Wallace, G. G.; Officer, D. L., Steric Modification of a Cobalt Phthalocyanine/Graphene Catalyst to Give Enhanced and Stable Electrochemical CO₂ Reduction to CO. *ACS Energy Letters* **2019**, *4* (3), 666-672, Impact Factor = 16.331.

14. Talebian, S.; Mehrali, M.; Taebnia, N.; Pennisi, C. P.; Kadumudi, F. B.; Foroughi, J.; Hasany, M.; Nikkhah,

M.; Akbari, M.; Orive, G.; Dolatshahi-Pirouz, A., Self-Healing Hydrogels: The Next Paradigm Shift in Tissue Engineering? *Advanced Science* **2019**, *6* (16), Impact Factor = 15.804.

15. Yang, F.; Gao, H.; Hao, J.; Zhang, S.; Li, P.; Liu, Y.; Chen, J.; Guo, Z., Yolk–Shell Structured FeP@C Nanoboxes as Advanced Anode Materials for Rechargeable Lithium-/Potassium-Ion Batteries. *Advanced Functional Materials* **2019**, *29* (16), Impact Factor = 15.621.

16. Liu, J.; Yu, L. J.; Yue, G.; Wang, N.; Cui, Z.; Hou, L.; Li, J.; Li, Q.; Karton, A.; Cheng, Q.; Jiang, L.; Zhao, Y., Thermoresponsive Graphene Membranes with Reversible Gating Regularity for Smart Fluid Control. *Advanced Functional Materials* **2019**, *29* (12), Impact Factor = 15.621.

17. Al-Attafi, K.; Jawdat, F. H.; Qutaish, H.; Hayes, P.; Al-Keisy, A.; Shim, K.; Yamauchi, Y.; Dou, S. X.; Nattestad, A.; Kim, J. H., Cubic aggregates of Zn₂SnO₄ nanoparticles and their application in dye-sensitized solar cells. *Nano Energy* **2019**, *57*, 202-213, Impact Factor = 15.548.

18. Rana, H. H.; Park, J. H.; Ducrot, E.; Park, H.; Kota, M.; Han, T. H.; Lee, J. Y.; Kim, J.; Kim, J. H.; Howlett, P.; Forsyth, M.; MacFarlane, D.; Park, H. S., Extreme properties of double networked ionogel electrolytes for flexible and durable energy storage devices. *Energy Storage Materials* **2019**, *19*, 197-205, Impact Factor = 15.97.

19. Lin, L.; Lei, W.; Zhang, S.; Liu, Y.; Wallace, G. G.; Chen, J., Two-dimensional transition metal dichalcogenides in supercapacitors and secondary batteries. *Energy Storage Materials* **2019**, *19*, 408-423, Impact Factor = 15.97.

20. Kumar, A.; Ghosh, A.; Roy, A.; Panda, M. R.; Forsyth, M.; MacFarlane, D. R.; Mitra, S., High-energy density room temperature sodium-sulfur battery enabled by sodium polysulfide catholyte and carbon cloth current collector decorated with MnO₂ nanoarrays. *Energy Storage Materials* **2019**, *20*, 196-202, Impact Factor = 15.97.

21. Wang, X.; Chen, F.; Girard, G. M. A.; Zhu, H.; MacFarlane, D. R.; Mecerreyes, D.; Armand, M.; Howlett, P. C.; Forsyth, M., Poly(Ionic Liquid)s-in-Salt Electrolytes with Co-coordination-Assisted Lithium-Ion Transport for Safe Batteries.

Joule **2019**, *3* (11), 2687-2702, Impact Factor = 15.04.

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CONFERENCE – FULL WRITTEN PAPER-REFEREED PROCEEDINGS

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Research Training



GLOBAL OPPORTUNITIES

ACES provides inclusive and supportive global research training opportunities. ACES has established a culture of collaboration wherein an appreciation and respect for individual talents and an awareness of the value of the team approach is continually highlighted.

Our students and researchers have access to an international network of partners as well as a dynamic end-user network. These networks open up global opportunities for our graduates.

Students and researchers alike benefit from ACES linking with other initiatives. For example:

- ▶ with RMIT, QUT and Deakin universities in the ARC Linkage Training Hub in Biofabrication
- ▶ with UniSA and UTAS in the ARC Linkage Training Hub in Portable Analytical Separation Techniques
- ▶ with medical device industry in the ARC Training Centre for Biodevices
- ▶ with clinical end-users in the ARC Training Centre Cognitive Computing for Medical Technologies

- ▶ with fourteen organisations across government and industry, and four other Australian universities, in the ARC Training Centre for Future Energy Storage Technologies

Material scientists and engineers from ACES are collaborating on multidisciplinary projects with neuroscientists and cell biologists via the Illawarra Health and Medical Research Institute (IHMRI) to deliver next generation medical devices and therapies. IHMRI and ACES have jointly funded three PhD scholarships.

ACES utilise our alumni network to enhance end-user engagement and increase the number of collaborative facilities accessible to ACES members.

FORMAL TRAINING INITIATIVES

Since 2014 ACES has overseen the establishment of the following formal training initiatives:

- ▶ Joint Master of Philosophy (Electromaterials Science) launched by UOW and Deakin (2016-current).

- ▶ Master of Philosophy (BioFabrication) launched by UOW, with ACES support, in collaboration with QUT, Utrecht University (Netherlands) and the University of Wurzburg (Germany) (2014-current).
- ▶ Entrepreneurship and Innovation Certificate through UOW and UOW's Sydney Business School (2015-current).
- ▶ Massive Open Online Course (MOOC) in Additive Biofabrication developed by ACES and ANFF Materials Node staff (2015-current).
- ▶ Online Graduate Certificate of Additive BioFabrication building upon the MOOC (2018-current). The Graduate Certificate in Biobrication also provides an entry pathway into the Master of Philosophy (BioFabrication) which involves undertaking of a research project in an affiliated ACES laboratory.
- ▶ ACES, through Deakin University, are involved in the European Masters course 'Materials for Energy Storage and Conversion' (MESC). ACES Deakin involvement in the formal MESC program, supported by Erasmus Mundus funding, runs from

2018-2024. A 2018 MESC student hosted in ACES, Karolina Biernacka began her PhD with ACES at Deakin University in 2019.

- ▶ Massive Open Online Course (MOOC) 'How to Survive on Earth: Energy Materials for a Sustainable Future' developed by ACES CIs and Als (2019-current).

The 2019 MOOC 'How to Survive on Earth: Energy Materials for a Sustainable Future' has reached approximately over 1400 people worldwide in the first two runs. The second run attracted 533 learners from 85 countries, with 26 percent of these learners between the age of 26 and 35 and 19 percent above 65 years old. Of the 81 who completed the post survey, more than 95% stated the course met or surpassed their expectations. 100% stated they gained more knowledge and 83% have since shared what they learned.

SUMMER SCHOLARSHIP PROGRAM

The ACES summer scholarship program is designed to encourage undergraduates into ACES post graduate programs. The scholarships run full time for 10 weeks.

Benjamin Filippi, a summer student with ACES 2018-19, has subsequently been competitively recruited to a 3-year position within the ANFF Materials node at TRICEP.

In 2018-19, ACES UOW hosted six students, five from UOW and one from the University of Melbourne. Over the summer 2019-20, ACES UOW hosted three students, 2 from UOW and one from RMIT, working on 3D printing protocols for 3D Educational printers. ACES Deakin hosted two summer students, 1 from Monash University and 1 from Deakin University working on: (i) recovery of valuable metals from electronic waste and (ii) next generation of sodium-oxygen batteries.

BEYOND TECHNICAL TRAINING

ACES understands technical research training is at the core of what we do - but today's graduates need to be able to adapt, re-skill and take on new challenges. Therefore, in addition to being trained to be at the forefront of their craft from a technical perspective,

ACES offers our students and ECRs training in:

- ▶ communication, to enable them to engage across disciplines and explain their research to the wider community.
- ▶ commercial awareness, entrepreneurship and innovation provided via an intensive short certificate course.
- ▶ ethics and public engagement, so they have the ability to recognise ethical and regulatory issues that might need to be addressed to ensure the real impact of fundamental discoveries is delivered to those that can use them.

COMMUNICATIONS TRAINING

ACES currently employs two communications officers who not only focus on ACES media, end-user and outreach activities, but also provide educational tips and assist in in-house training for ACES members.

ACES members were provided with a Fact Sheet "Making a great Poster" from the communications team. It contained tips to ensure your poster is readable, appealing, and easy to follow with sections: Before you get started, content, way to read a poster, colour, fonts and font sizes, images, graphics and branding.

Videos are a powerful communication tool that allows one to reach a broad, diverse audience. At ACES, we have our dedicated YouTube channel, which is a valuable medium for researchers to share their research with the world and build up an audience of interested followers.

At the ACES Full Centre meeting in July, our communications team ran a video competition where entrants were asked to make a short (<3 min) video thinking about how to take technical information and communicate it clearly in a way that captures a broad audience's attention. To assist, the ACES Communications Team put together a short video "our top video making tips".

ACES commissioned video exit interviews with students. Director Gordon Wallace interviewed students on their experiences at ACES and their goals going forward. The students talk about coming to ACES to learn about materials science, what their project involved, working in an interdisciplinary team, where they are off to next and more. The students can refer to their interviews to showcase to future

employers or use the skills learnt when seeking their next challenge. The videos are posted on the ACES YouTube channel and in the ACES website NEWS section.

Also as reflection on student experiences with ACES we had blog contributions from students about their experience (<https://electromaterials.edu.au/2019/10/28/guest-blog-colin-kang-on-his-aces-affiliated-phd-experience/>); exit interviews as they left for new adventures and interviews with our current PhDs on their perspective of being part of a Centre of Excellence (see ACES website news section for these). All contribute to communications training.

The communications team travel to all nodes, as well as attend Centre meetings, to interview members of our ACES team about their research and assist our members to produce short articles, pictures and videos for ACES social media platforms, YouTube channel and website.

ENTREPRENEURSHIP & INNOVATION TRAINING

ACES, in collaboration with UOW's Sydney Business School, developed the Certificate in Entrepreneurship and Innovation (E&I). Through this course, young researchers are challenged and encouraged to maximise end-user engagement and consider commercial opportunities that may arise from their research activities.

Led by ACES CI Mozer and Dr Tillmann Boheme from Sydney Business School, a group of 17 ACES and affiliated members, commenced the certificate in July 2019. Expert tuition was given from the Sydney Business School and industry professionals, plus each group was assigned mentors (ACES CIs and AIs) for the technical aspects of their project. This program has been developed to place ACES projects in a business context over the next nine months by the teams; culminating with each team giving a feasibility pitch. A mid-year review was held 31 October 2019 and pitches, awards and conclusion of the program will take place at the 2020 ACES Electromaterials Symposium.

Participants receive six credit points towards the UOW Graduate Certificate in Entrepreneurship and Innovation if they wish to continue further studies in this area upon completion.

ETHICS AND PUBLIC ENGAGEMENT TRAINING

ACES teamed with the ARC Centre of Excellence in Convergent Bio-Nano Science and Technology (CBNS) to run a symposium '**Biomedical Futures 2: Values, responsibility, critical engagement in nanotechnology and electromaterials**'.

The symposium brought together collaborative innovations in biomedical research, which addressed the shaping in disciplines of bioethics, science and technology studies and science communication. Focusing on research in nanotechnology and electromaterials – with an emphasis on the development of biomedical technologies, therapies and devices – the aim was to foster careful dialogue about the social, political, and ethical dynamics of technosciences by enabling interdisciplinary exchange between social science, humanities and laboratory practitioners.

The research symposium was designed for early career researchers (ECRs) and PhDs as well as collaborative partners. The focus was on three core themes: Values, responsibility, critical engagement in nanotechnology and electromaterials. Through a series of presentations and panel discussions, the workshop explored innovations in biomedical research and the potential offered by early critical engagement for translation.

Feedback from attendees stated overwhelmingly that they had a new awareness of the importance of ethical considerations in every aspect of the research pathway. Quite a few also said they took away from this event ideas about how to approach collaboration and how to consider end-users as collaborators. One suggestion was to include case study examples, rather than to always talk subjectively.

RESEARCH THEME AND TRAINING WORKSHOPS

The ACES Research Training Group (RTG) is responsible for designing, establishing and implementing an innovative research training and career development/mentoring program, including various industry and web-based programs.

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 2019 were undertaken in the form of:

- ▶ ACES Full Centre Meeting "**Boot Camp: Training for Translation**" held 3-4 July with professional training activities such as equity and diversity, science communications, creating an effective video, an overview of the APR Intern program, translating research training, networking for building and maintaining research collaborations and social media included on the program.
- ▶ A monthly 'Strategic Application' Meeting (March-December) between all nodes within the Centre via video link. Meeting topics include Chemical Fuels, Controlled Delivery Systems, Neural Interfacing and Ionics.
- ▶ A monthly 'ACES All' virtual meeting (March to December). 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 were conducted as required to progress and co-ordinate the research activities to address the research milestones.
- ▶ A number of face to face targeted ACES research theme workshops. 2019 workshops included: Interfacing Sutrode with Nerves and Muscles; Clinical Connections; Contactless Characterisation of Biosystems; Islet Cell Printing; joint ACES-IHMRI 'Materials in Medicine'; 3D Bioprinting for Wound Healing and Artificial Skin; joint ACES-NCTU 'biointerfaces' workshop; Antifouling Coatings; Ionic Liquids; Visuals in Science; Wireless Communication - Enabling Electroceuticals with Biosystems; poster design and career development.

The Strategic Application meetings and ACES all meetings, between all nodes within the Centre via video link, replaced the weekly theme meetings held previously in the Centre (2014-2018).

All these workshops provide specialist research training for PhD and ECRs, and include mentoring for research planning and positioning for career opportunities (see Appendix 2 for a table listing all these activities and number of participants).

WEBINARS

Four webinars were hosted in 2019.

Grant Writing for Success (by Robin Taylor, IFM marketing and Communications Manager and Grant officer, Deakin University) ran 11 March 2019. This interactive webinar included tips and tricks on writing a successful grant proposal, including:

- ▶ Different types of grants and various funding sources available;
- ▶ How to target the correct audience;
- ▶ What to include and what not to include in your application; and
- ▶ Appropriate writing style and language pointers.

Scientific Paper Writing (by Doug MacFarlane Monash University) run 2 April 2019. This webinar covered a range of aspects central to producing a great paper, including:

- ▶ Defining the story of your paper;
- ▶ Breaking down the writing process into digestible steps;
- ▶ Constructing a great paper;
- ▶ Tips to ensure you achieve your highest possible standard of writing

Scientific Paper Writing Part 2 (by Doug MacFarlane Monash University) run 24 September 2019. Following on from Part 1 held in April, ACES communications Director Doug MacFarlane provided insight into producing quality publications to keep students and academics career on track and to excel in your chosen fields. Included was:

- ▶ How to get the story clear and straight
- ▶ Intelligent use of supporting information
- ▶ Impactful use of graphics and figures
- ▶ Making it readable: traps and styles to avoid
- ▶ Editing for success: participants worked through the example distributed in advance.

Visuals in Science (by Patton'd studios) run 4 November 2019. Knowing what to include in scientific visuals can be confusing. Graphics are different abstracts, which are different to journal covers. In the webinar the different types of visuals in science, were discussed along with their function and how to use them effectively. This webinar was hosted by Patton'd studios, a creative agency dedicated to scientific communication.



CAREER DEVELOPMENT

ACES MENTORING

An ACES mentoring program has been designed and implemented. The aim was to provide support and encourage mentees to manage their own learning in order for the mentee to maximise their potential, develop their skills, and help them to become the person they want to be. Mentors were primarily concerned with assisting mentees in practical matters such as goal setting, problem solving, developing action plans, and with work-related matters such as assistance with promotion applications or networking and project management.

After a call for expression of interest, early 2019, two students availed themselves of the opportunity to participate in the ACES mentoring program. Dr Anita Quigley ACES RF UOW at St Vincent's Hospital Melbourne was mentor for Laura Garcia Quintana ACES PhD Deakin and Prof Maria Forsyth ACES CI Deakin mentored Rebecca Hodgetts

ACES PhD Monash throughout 2019.

ACES CI Monash Robert Sparrow was an invited panelist for the 'engineering ethics panel', which was run as part of the Monash Engineering Leadership Program, Melbourne, 28 August 2019.

ACES CI Deakin Jennifer Pringle was an invited panel member for 'ECR academic career pathways' session at the IUMRS-ICA 2019, 20th International Union of Materials Research Societies Conference in Perth, 22-26 September 2019.

ACES CI ANU Michelle Coote was co-organiser along with Nanda Dasgupta (ANU) and Nalini Joshi (USyd) of a Mentoring and Guidance in Careers workshop, held at ANU University House for approximately 40 participants, mainly female ECRs in maths, physics and chemistry from academia, industry and the public sector, from 18-22 November 2019.

ACES RF UOW Dr Chong Yong Lee was scientific mentor to Callum King, year 12 Extension Science Student from Edmund Rice College, Wollongong. This involved evaluation of Callum's research

proposal/report and supervision of Callum's two-day laboratory work at ACES UOW 18-19 August 2019.

PROFESSIONAL INTERNSHIPS

ACES invited Mark Ovens, Business development officer with the APR Intern program to introduce ACES members to their service and outline potential outcomes. ACES PhD Joshua Brooks secured an APR internship with Bluescope Innovation laboratories in November 2019. A few further students are waiting to see if their applications are successful.

ACES has supported ACES undergraduate student internships in 2019.

► Jayde Bagnall a 3rd-year student at UOW, studying a Bachelor of Medical Biotechnology (Honours) took the option to undertake a UOW Student Internship (CRLP200) with TRICEP (July-October 2019) as she was interested in ulvan bioink production.

► Ayden Carmichael-Whyte, a 3rd-year student at UOW, to work on

preparation and characterisation of ulvan-based bioinks and performing 3D printing and characterisation of 3D printed ulvan structures using commercial and customer's bioprinters (12 weeks professional experience, Dec 19-Feb 20).

► Xiao Li, a 3rd-year student at UOW, to work with the islet cell team to develop bioprinting platform towards the application in islet transplantation (12 weeks professional experience, Dec 19-Feb 20).

► Eileen Wallace, a student studying biomedical engineering at UOW, to train on printing technologies for 3D printed ear projects with the intent to facilitate translation of printing hardware to partner research laboratories (12 weeks professional experience, Dec 19-Feb 20).

HOSTED WITH ACES

INTERNATIONAL STUDENTS

25 students from international universities were hosted with ACES in 2019.

1. Ms Marion Cretin, ENSCBP affiliated with Bordeaux Maigne University, France, exchange student doing project at ACES Deakin, 6 August 2018-15 February 2019.

2. Jacopo Bani, Utrecht University in Netherlands, at ACES UOW completing the second year of the dual degree, from November 2018-September 2019.

3. Ane Urigoitia Asua, Utrecht University in Netherlands, at ACES UOW completing the second year of the dual degree, from November 2018-September 2019.

4. Ane Albillos Sanchez, Utrecht University in Netherlands, at ACES UOW completing the second year of the dual degree, from November 2018-September 2019.

5. Sanz Gutierrez, Utrecht University in Netherlands, at ACES UOW completing the second year of the dual degree, from November 2018-September 2019.

6. Ms Danielle Warren, Masters Student, University of Wurzburg, Germany spending 6 months in ACES UOW from 2 January 2019.

7. Mr Takuya Harada, visiting student from Shinshu University, Japan working for 2 months in ACES UOW from 21 January 2019.

8. De Nerea Casado, POLYMAT, University of the Basque Country Spain, visited ACES Deakin to undertake collaborative research activities, 1-15 February 2019.

9. Esther Udabe, student POLYMAT, University of the Basque Country Spain, visited ACES Deakin to undertake collaborative research activities, 1 February to 30 April 2019.

10. Leire Meabe, student POLYMAT, University of the Basque Country Spain, visited ACES Deakin to undertake collaborative research activities, 1 February to 30 April 2019.

11. Yu-Wei Lin, PhD student from National Cheng Kung University in Taiwan, visited ACES UOW to undertake his research project and progress a joint collaboration project for 3 months from 13 February 2019.

12. Kun-lin Tsou, PhD student from National Cheng Kung University in Taiwan, visited ACES UOW to undertake his research project and progress a joint collaboration project for 3 months from 13 February 2019.

13. PhD student Ms Mio Aoki, Graduate School of Engineering at Yokohama National University in Japan visited ACES at UOW to carry out experimental analysis of electrochemical cell detachment using QCM, 18-22 February 2019.

14. Gabriel Comeron Castillo, Masters of Energy Storage and Conversion (MESC) student, 6 month research project 'Harvesting waste heat using thermoelectrochemical cells' at Deakin University, 19 February to 17 August 2019.

15. Mr Conrad Holc, University of Nottingham, UK, visited ACES Deakin node to undertake a research project, 20 February-31 August 2019.

16. Mr Ludovic Carre, masters student intern from University of Montpellier France, doing a project at ACES Deakin on 'A theoretical and experimental study of ionic liquid electrolytes for sodium-ion batteries', 22 February-31 August 2019.

17. Mr Camille Pinchart, masters student intern from University of Montpellier France, visited ACES Deakin to do research project 'Ionic liquid for recycling critical material, 22 February-31 August 2019.

18. Vianka Reddy, Department of Chemistry, University of Warwick, UK, has a placement at ACES Deakin from 1 April 2019.

19. Ruijie Qiu, a visiting Master Student from Shaanxi University of Science & Technology student began a 3 month research visit at ACES UOW from 17 June 2019.

20. Jiahao Zhang, a visiting Master Student from Shaanxi University of Science & Technology student began a 3 month research visit at ACES UOW from 17 June 2019.

21. Ms Amelie Lambert, ENSCBP affiliated with Bordeaux Maigne University, France, exchange student doing project at ACES Deakin, 24 June-8 November 2019.

22. Shun-Min Chang and Ming-Chun Tsai, Master Students from National Cheng Kung University in Taiwan worked at ACES UOW for collaborative project on photoelectrochemical reforming of glucose to formate, 1-31 July.

23. Mr Vincent Vangrunderbeek, Vrije Universiteit Brussel, exchange student doing project at ACES Deakin from 2 July 2019.

24. Mr Aitor Gastaminza Unanue, POLYMAT, San Sebastián, Spain, visited ACES Deakin to progress collaborative project, 7 July-18 July 2019.

25. Babak Vajdi Hokmabad PhD student from Max Planck Institute for Dynamics and Self-Organization undertaking research on the collaborative project as part of an Australian-German grant at ACES UOW from 19 November to 14 December 2019.

CROSS-NODAL EXCHANGES

The exchange of personnel between nodes is also a vibrant area of activity within ACES. Members regularly attend ACES targeted workshops organised as part of ACES research training activities. Members also travel between the nodes to undertake multidisciplinary research tasks-brainstorming, project meetings, laboratory measurements, etc.

Support for cross-nodal interactions is provided by the Centre, where appropriate. Examples of cross-nodal visits (51 in total) are listed in Appendix 3. These visits are additional to the support provided to attend targeted workshops or ACES events/conferences.

Translation

INTELLECTUAL PROPERTY

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 Fourth Industrial Revolution that we are in the midst of. Industry 4.0 is the new wave of innovation which brings with it incredible new opportunities.

ACES is searching for material breakthroughs that will not only improve the productivity of existing industries and help create new ones, but will also provide energy solutions and improve health and lifestyle.

Three patents were lodged in 2019 (see Table 2) and the executive received five IP disclosures. Through TRICEP no new patentable IP has been generated. However, what has been generated is know how in material extraction, purification, packaging and sterilisation for bioinks and know how in bioprinter fabrication and custom control software development to access functionality enabled by hardware developments.

TABLE 2: ACES PATENT FILINGS 2014-2019

Patent Description			Lead for Submission	Year filed
1.	Thermo-Electrochemical Cell and Method of Use	PCT/AU2015/901513	Deakin & Monash Universities	2015
2.	Functionalised Photo-Electrocatalyst and Method for Chemical Conversion	PCT/AU2015/000248	Monash University	2015
3.	Chemical Gradients	PCT/US/14/768,820	University of Texas Dallas	Aug 2015
4.	Nanostructured electrode for CO ₂ reduction	2016/903555	Monash University	2016
5.	High-efficiency electrochemical conversion of nitrogen into ammonia	2016/900354	Monash University	2016
6.	High-efficiency electrochemical conversion of nitrogen into ammonia	2016/900613	Monash University	2016
7.	Sodium-ion Electrolyte Composition	PCT/AU2016/051172	Monash University	2016
8.	Appartus and method for handheld free-form Biofabrication	PCT/AU2016/050886	St Vincents Hospital Melb	Sept 2016
9.	Method and Cell for Conversion of Dinitrogen into Ammonia	PCT/AU2017/000036	Monash University	3 Feb 2017
10.	Method and Cell for Conversion of Dinitrogen into Ammonia	AU2018900370 (Prov)	Monash University	7 Feb 2018
11.	Method and Cell for Conversion of Dinitrogen into Ammonia	AU2017902960 (Prov)	Monash University	27 Jul 2018
12.	Method and Cell for Conversion of Dinitrogen into Ammonia	PCT/AU2018/000122	Monash University	26 Jul 2018
13.	Drug Delivery Device	AU Prov Patent No. 2018903570	University of Wollongong	23 Sept 2018
14.	Edge Functionalised Graphene	AU Prov Patent No. 2018903793	University of Wollongong	8 Oct 2018
15.	A device and a method for using a device to receive and/or deliver a substance <i>in vivo</i>	PCT/AU2018/051033, WO/2019/068136	University of Wollongong	April 2019
16.	A device for immobilising a robotic capsule within a body lumen	PCT/AU2018/051034, WO/2019/068137	University of Wollongong	April 2019
17.	Dispersible edge functionalised graphene platelets	PCT/AU2019/051076	University of Wollongong	2019

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. 59 business briefings took place via visits or teleconferences to ACES (listed in appendix 4); 17 interactions with government or non-government organisations (listed in appendix 5) and a further 52 briefings by ACES members visiting personnel within the government, industry or part of the business community (listed in appendix 6). ACES also hosted or showcased 21

events (listed and summarised in appendix 7) in the 'bio-space', 'energy space' and 'materials/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. From these activities, ACES members become involved in other research initiatives. A list of funding awarded in 2019 to researchers is in Table 3.

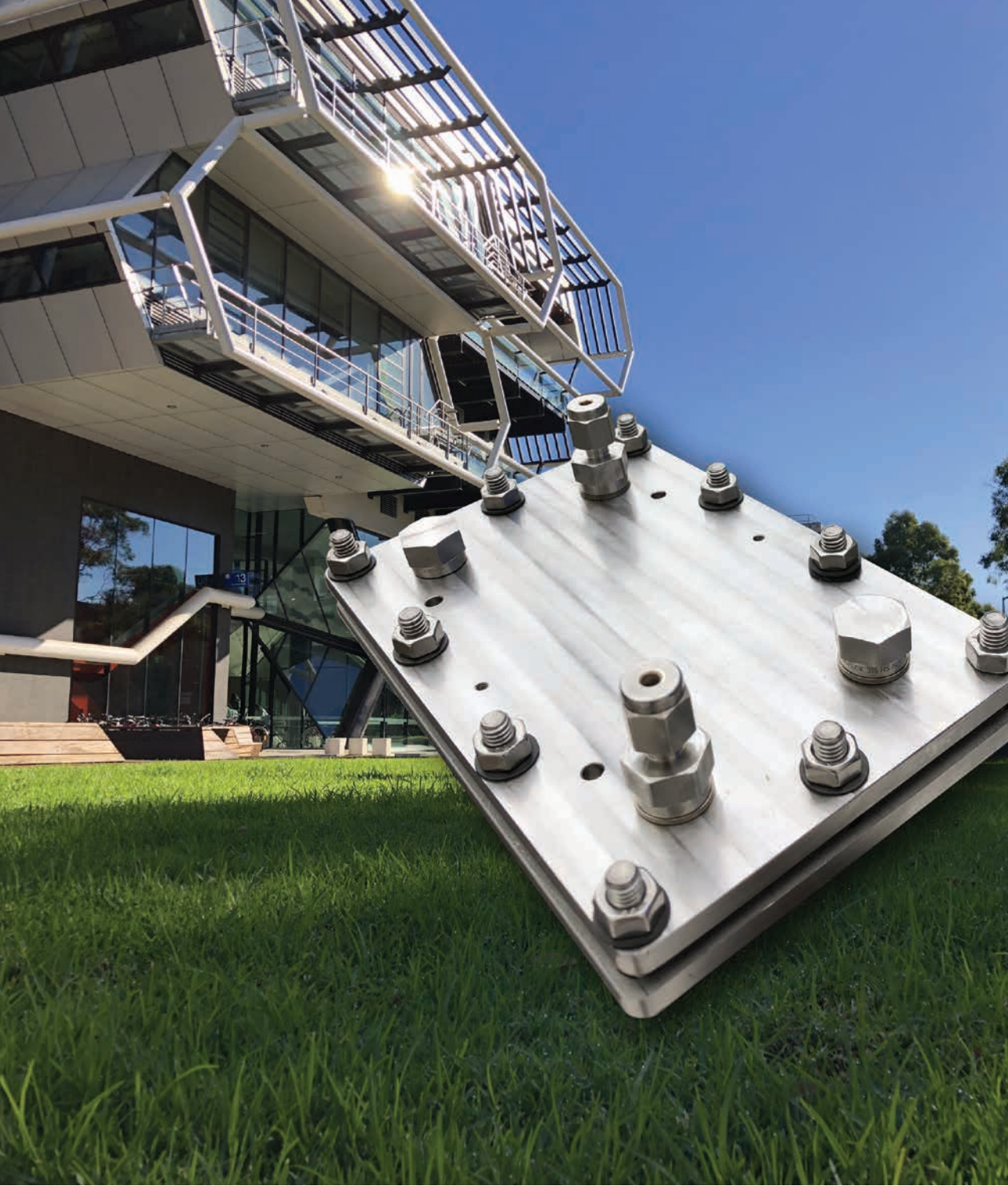
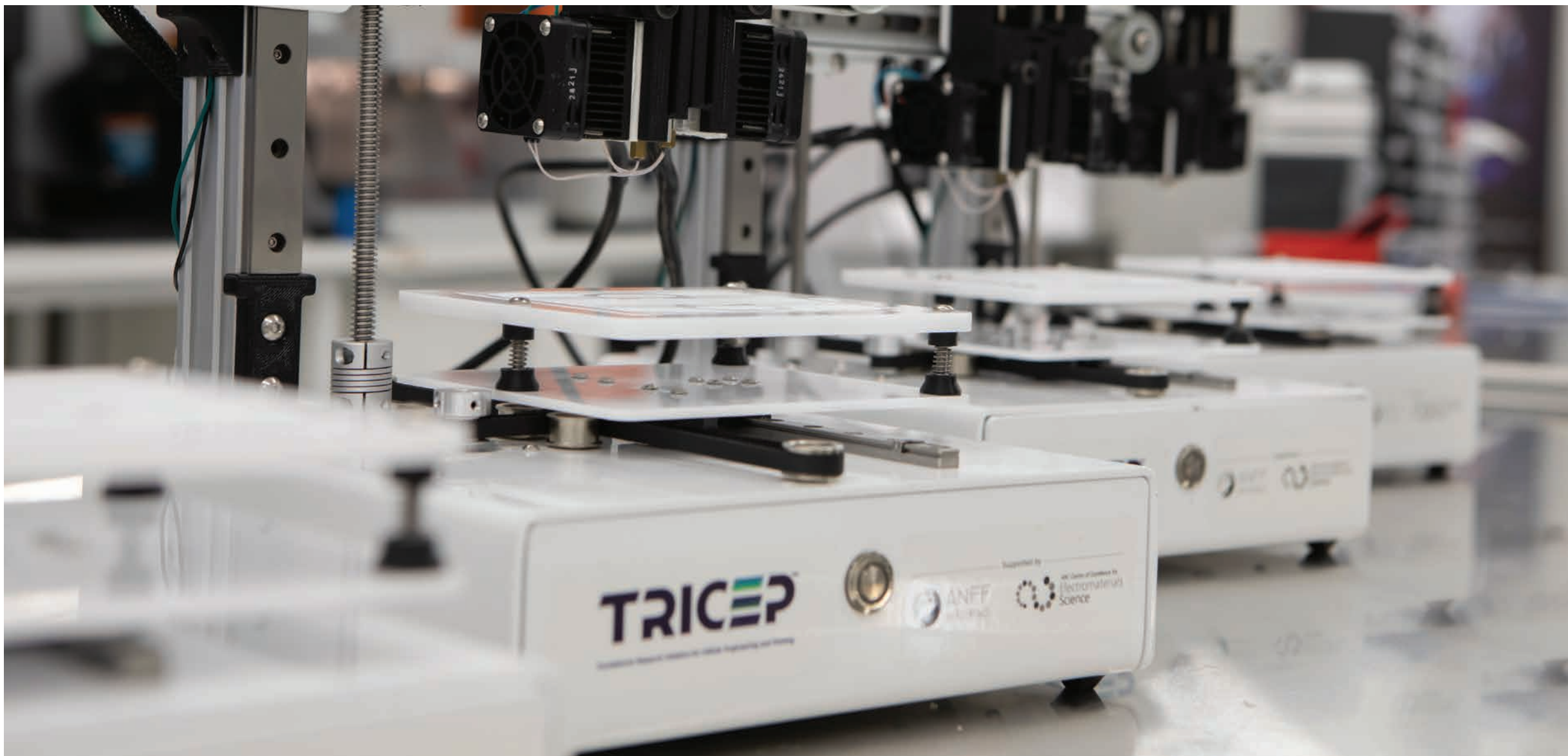


TABLE 3: FUNDING AWARDED IN 2019 LEVERAGED FROM ACES RESEARCH ACTIVITIES

Funding leveraged from ACES research activities	Team and Project Description
Australian Research Council (ARC) Future Fellow: \$989,000	ACES UOW CI Prof Michael Higgins for research looking at protein interactions at the interface between a device and its biological environment.
Australian Research Council (ARC) DECRA: \$400,660	ACES UTAS ECR Dr Vipul Gupta for “3D printing multi-level porosity glass”.
Australian Research Council (ARC) DECRA: \$420,770	Former ACES PhD Monash Dr Fengwang Li for “Developing sustainable liquid fuels from carbon dioxide conversion”.
Australian Research Council (ARC) Discovery Project: \$935,000	ACES Monash CI MacFarlane and ACES SRF Simonov for “Sustainable nitrogen chemistry”.
NHMRC Ideas Grant 1183119: \$371,928	ACES CI Mark Cook for “Changes in brain resilience underlie seizure susceptibility in epilepsy”.
Federal Government's Cooperative Research Centre Projects (CRC-P) program 2019-2022: total grant \$3,000,000 and total project value \$9,385,000.	The Deakin node are partnering Calix Limited and Boron Molecular Pty Limited for “advanced hybrid batteries” to work on creating a new type of battery material that will reduce the cost and environmental impact of high performance batteries.
Medical Research Future Fund – Frontier Health and Medical Research Program Stage One - \$895,000	ACES CI Swinburne Simon Moulton is one of the CI's on this project EVE-M (Enhancing the Vaginal Environment and Microbiome) Initiative.
Toyota Motor Corporation (Japan): \$206,100	ACES CIs Prof Patrick Howlett, Prof Maria Forsyth and ACES AI Dr Robert Kerr, Deakin University for “Next-generation solid-state batteries to drive an automotive revolution”.
BASF (2019): EURO 40,000	ACES CI ANU Prof Michelle Coote for “Chemistry of sterically hindered piperidines”.
Lincoln Agritech Ltd (industry): \$80,000	ACES CI Deakin Xungai Wang and Rangam Rajkhowa for “Protein Fibre Powder Production Technology”.
Australian Academy of Technology and Engineering: \$50,000	ACES CI Deakin Xungai Wang with Jinfeng Wang and Bin Tang for “Achieving sustainability in wool scouring”.
Australian Centre for HIV and Hepatitis Virology Research (ACH2) : \$49,000	ACES CI Simon Moulton for “Development of lactic acid polymer coating for fabrication of multiple API delivery from over the counter intravaginal rings (OTC IVRs).”
UTAS DVCR Grant	ACES ECR Dr Vipul Gupta towards starting the new company, 3D MADE – 3D Printed Miniaturised Analytical Devices.
Fusion Biobased Materials P/L (Industry): \$31,000	ACES CI Deakin Xungai Wang with Jinfeng Wang and Bin Tang for “Natural fibre reinforced biodegradable materials”.
Defence Science & Technology Group project: \$30,000	ACES SRF Caiyun Wang and ACES CI Wallace for “Assembly of wearable body armour-type multifunctional battery”.
UOW Global Challenges Seed Grant: \$25,000	ACES UOW members, RFs Alex Harris and Eva Tomaskovic-Crook, ACES CI Jeremy Crook, Johnson Chung and ACES AI Frederic Gilbert (UTAS) with collaborators at UOW Prof Patrick McGivern and Dr Lezanne Ooi for “Modelling emergent properties in the brain to combat Neurodegenerative Disease”. https://www.uow.edu.au/global-challenges/living-well-longer/combating-neurodegenerative-disease/
St Vincent's Hospital Research Endowment (REF) Grant (\$20k, 2019)	ACES RF Quigley with associate researchers ACES AI Ngan, AI Choong and CI Kapsa for ‘3D printing human iPSC derived skeletal muscle and implantation of constructs for innervation and vascularisation’.
St Vincent's Hospital Research Endowment (REF) Grant (\$20k, 2019)	ACES PhD Lilith Caballero Aguilar for ‘Fabrication of a chondrogenic hydrogel for in situ 3D bioprinting’.
St Vincent's Hospital Research Endowment (REF) Grant (\$20k, 2019)	ACES PhD Lilith Caballero Aguilar with Margaret Young for ‘Arthritis research’.
UOW AIIIM for Gold Investigator grant: \$14,000	ACES UOW AI Xiao Lui and SRF Zhilian Yue for “Microporous hydrogel based bioink towards high permeability and cell viability”.
UOW-ANSTO seed funding grant: \$11,000	ACES SRF Caiyun Wang for “A radio-electrochemistry platform to produce [11C]-based radiotracers”.
ARC LEIF Grant (LE190100031): \$514,000	ACES CI Deakin Xungai Wang was amongst the CIs awarded for “Manikin Flash Fire Evaluation System for material thermal Protection”.
UOW Major Equipment Grant (MEG) grant (\$246k, 2019)	ACES CIs Michael Higgins, Jun Chen, Jeremy Crook and Gordon Wallace for “Application Acoustic Force Spectroscopy Instrument for High-Throughput Single Cell Measurements”.



ENGAGEMENT FACILITATOR

The NSW Government invested \$500,000 through its Research Attraction and Acceleration Program (RAAP) to help ACES facilitate the commercialisation of our research. In 2019, Dr Tillmann Boehme began his role with ACES/ TRICEP as Engagement Manager, working alongside the three Associate Directors of TRICEP.

Throughout the year, Tillman provided mentoring and training to early career researchers and TRICEP staff in regards to commercialisation, company/ industry engagement and value stream and process mapping. Tillman also worked to develop and implement strategies to promote and facilitate end-user engagement in TRICEP with a particular focus on local SME engagement.

INDUSTRY

TRICEP - the UOW's Translational Research Initiative for Cellular Engineering and Printing - has progressed engagement with the broader industry community on a number of fronts including:

- ▶ Purification and scaleup of biomaterial production
- ▶ Supply of bioinks
- ▶ Supply of customised 3D printers for research training
- ▶ Design and development of customised printers for medical applications
- ▶ Developing 3D fabrication strategies for industry

The team at TRICEP has developed a novel communication channel approach for knowledge transfer through active local industry engagement. On this front, TRICEP is inviting technical as

well as management employees from participating companies to engage in our tailored TRICEP local industry engagement workshop. The workshop aims to maximise impact for the partner company and stretches over three distinct stages with minimum disruption to participating firms. In stage 1, the multidisciplinary TRICEP team undertakes an onsite visit to the industry partner. Stage 2 is conducted at TRICEP, demonstrating the additive manufacturing capabilities and presentation of case study examples of TRICEP working with international and national collaborators. Stage 3 is a follow up session, a minimum of one month after stage 2, held at the participating company to develop a potential action plan for future interactions.

INTERNATIONAL

International engagement activities have mainly remained unchanged

in 2019. That is, engagement has been through reciprocal site visits, technology presentations, end-user and research translational workshops, research collaborations progressed through federal government international grant funding and displaying capabilities in trade booths. From the four trade booths, listed below, interest was captured in TRICEP products from over fifty companies and individuals.

- ▶ Biomedical Showcase preceding the Annual Graeme Clark Oration, Melbourne, July 2019 (>1000 attendees).
- ▶ The Tissue Engineering and Regenerative Medicine International Society (TERMIS) and the 7th Asian Biomaterials Congress, Brisbane, October 2019.
- ▶ International Society of Biofabrication (ISB) conference in Ohio, USA, October 2019 (500 attendees).

- ▶ University of Wollongong BIG IDEAS sold out festival in Wollongong, October 2019.

INDIA

Director Wallace, TRICEP Associate Director Gambhir and ACES Clinical Associate Investigator A/Prof Payal Mukherjee travelled to Visakhapatnam to visit Andhra Pradesh MedTech Zone Limited (popularly known as AMTZ) in May 2019 where a workshop was held. The purpose for the visit was for ACES/TRICEP to develop business opportunities involving our 3D printing capabilities.

AMTZ is an enterprise under the Government of Andhra Pradesh, a 270 acre zone, dedicated for Medical Device Manufacturing. An objective behind the 'One-Stop- Solution' is to reduce the cost of manufacturing up to 40%. 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 the world at large.

A second highly successful workshop on 3D printing was hosted at AMTZ in September 2019. The workshop attracted researchers and clinicians from a number of cities across the country where the most recent advances in 3D printing for medical applications were discussed. Also discussed was the need for innovative deployment programs and engagement with regulators to ensure widespread access to these emerging technologies.

On September 10, University of Wollongong (UOW) signed a memorandum of understanding (MOU) with AMTZ to lay the framework for progressing our collaborative efforts in both research and research training in 3D printing.

Subsequently, the partnership between ACES/TRICEP at UOW, the University of Sydney, and advanced medical technology collaborators in India was one of 11 successful projects across Australia to receive funding from the Federal Government's Australia-India Council (AIC).

A further collaboration is also in progress with New Big Innovation Laboratory (NBIL), an Indian company engaged in 3D printing and bioinks. A non-disclosure agreement has been signed.

UNIVERSITY – INDUSTRY MARKETPLACE

University – Industry marketplaces such as IN-PART (Canada) have been explored for industry engagement suitability.

IN-PART is free for companies to access and they don't exclude small and medium enterprises. Since 2014, IN-PART has over 200 registered research institutes (from 21 countries), over 5000 companies and over 11,000 R&D representatives.

This platform is good for academics wishing to pitch their work to an industrial audience. Businesses provide feedback on the research/inventions submitted. IN-PART functions as a mediator matching interests and pointing R&D managers to possibly relevant projects.

Initially ACES intends to pitch projects such as: (i) Edge Functionalised Graphene; (ii) the Soft Robotic hand; (iii) Ultramage; (iv) Thermocells; (v) Sutrode; (vi) Bioinks; (vii) Bioprinters and (viii) Electrifying Fibre Optic Cables.

Global Research Engagement



INTERNATIONAL LINKAGES

ACES continues to be committed to connecting with the international research and end-user communities to strategically expand our global sphere of influence by investing in partnerships, which add value to ACES.

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 joint international workshops and embassy events, as well as exchange visits.

Strategic Collaborative Partnerships

As at the end of 2019, ACES has progressed eight ongoing formal research collaboration arrangements. These are with:

- ▶ Korean Society of 3D Printing in Medicine (KS3DPM) in Korea

- ▶ Institute of Electronics (BETRC) at the National Chaio-Tung University (NCTU) in Taiwan
- ▶ CIC Energigune (The Energy Cooperative Research Centre in the Basque area), Spain
- ▶ The Institute of Materials Jean Rouxel, researchers from both the CNRS (The French National Centre for Scientific Research) and the University of Nantes, France
- ▶ Nanotechnology & Integrated BioEngineering Centre (NIBEC), Ulster University, Ireland
- ▶ Sunchon University, South Korea
- ▶ Istituto Ortopedico Rizzoli, Bologna, Italy
- ▶ Åbo Akademi University, Finland

The collaborations have mainly been progressed through staff and student exchanges and joint research workshops with resulting joint publications.

Australia-Germany Joint Research Grant

Courtesy of a Universities Australia 'Australia-Germany Joint Research Grant', awarded to ACES CI David Officer, collaborative research on aspects of the

fluidic transport project, being developed by ACES affiliated students Yang Xiao and Sara Zarghami, were enhanced. The collaboration with researchers, led by Dr Corinna Maass, at the Max Planck Institute (MPI) for Dynamics and Self-Organisation in Göttingen, Germany progressed through researcher and student exchanges.

Specifically, ACES RF UOW Dr Klaudia Wagner visited MPI in Göttingen along with Sara Zarghami who spent 2 months there undertaking research. Following this, return visits were made to ACES UOW, by both Dr Maass and PhD student Mr Hokmabad, who spent 4 weeks working with ACES researchers.

This collaboration led to new outcomes in both the study of chemotactic droplets as well as the development of light-activated double emulsion droplets that could not have been achieved without such collaborative input.

PUTTING ACES ON THE GLOBAL STAGE

In the quest to consolidate existing collaborations and to initiate new



ventures in research, ACES members were actively out and about speaking of ACES to existing and potential collaborators as demonstrated by numbers of presentations and collaboration visits undertaken in 2019.

PLENARY/KEYNOTE ADDRESSES

ACES members gave 33 plenary or keynote addresses in 2019 (appendix 8).

INVITED TALKS

ACES members gave 69 invited talks at international conferences in 2019 (appendix 9).

DISTINGUISHED VISITOR LECTURES

ACES members gave six invited 'distinguished visitor' lectures in 2019.

- 1. Coote, Michelle (2019) ACES CI ANU gave the Schleyer Lecture at University of Georgia, Athens Georgia USA, 4 February.
- 2. Coote, Michelle (2019) ACES CI ANU gave the Huayuan Lecture at Huazhong University of Science and Technology, Wuhan China, 13 March.
- 3. Zhang, Jie (2019) ACES CI Monash gave a distinguished visitor lecture 'Electrochemical Reduction of CO₂' at National Engineering Research Center for Chemical Fertilizer Catalyst, China, 1 April.
- 4. Paull, Brett (2019) ACES CI UTAS gave a distinguished visitor lecture on the work from Paull, B., Chen, L., Cabot, J., Wallace, G., Daikuara, L., and Yue, Z. (2019), Fibre Electrofluidics: On-Fibre Electrophoresis, Isotachophoresis, Isoelectric Focusing and 'Drug E-Delivery' Using Sutures at the School of Chemistry, University of New South Wales, 1 August.
- 5. Forsyth, Maria (2019) ACES CI Deakin gave an invited Dean's seminar 'Novel electrolyte materials for beyond Li-ion batteries' to the Faculty of Engineering and IT at University of Technology Sydney, 4 October.

TABLE 4: PUBLICATION AND CITATION ACTIVITY FOR ACES AFFILIATED PUBLICATIONS 2014-2019 (SOURCE, SCIVAL BASED ON SCOPUS DATA 6.1.20)

	2019	2014-2019
Number ACES publications (SCOPUS)	210	1158
Number of ACES publications (SciVal)	196	1145
Number of citations	579	21,899
Number of citing countries	54	110
Outputs in top 25% most cited	123 (62.8%)	896 (78.3%)
Field Weighted Citation Impact (#FWCI – for articles and reviews)	2.83	2.13
International collaboration	102 (52%)	626 (54.7%)
National Collaboration	88 (44.9%)	441 (38.5%)

6. Cook, M. (2019) ACES CI UOM Distinguished Visitor Occasional Address at the UOW graduation ceremony, 6 November.

CONFERENCE PRESENTATIONS

84 conference presentations were given by ACES members in 2019 (see listed in appendix 10). Please note that presentations given by ACES members at ACES events would be additional to those listed in the appendices.

INVITED COLLABORATION VISITS

ACES members gave 41 invited seminars at research institutions. In total, ACES members undertook 136 collaboration visits to research groups globally to discuss our research (see list in appendix 11).

INTERNATIONAL WORKSHOPS

The advancement of the scientific knowledge that ACES generates is an important component of Centre activities. ACES international conferences, symposia and events provide ACES students and ECRs the opportunity to communicate their research in ACES showcase sessions and poster sessions at ACES

International events (14 events in 2019, listed and summarised in appendix 12). Networking by ECRs and students with international guests is encouraged. Over the years, ACES has developed a reputation for not only excellence in the educational quality of its conferences, but also the collegial atmosphere.

VISITING ACADEMICS

68 international academics, interns, undergraduate or postgraduate students were welcomed to ACES in 2019 (appendix 13). Activities included, working alongside ACES members to further collaborative research or for the opportunity to present a research seminar to ACES members and view ACES facilities as a first step towards engagement.

57 national academic guests were also welcomed (appendix 14).

OUTPUTS

ACES international linkages through researcher-to-researcher collaborations are illustrated through ACES having published 102 (52%) journal articles with international co-authors in 2019, and 626 articles (54.7%) since 2014. The articles published in 2019 have been cited 579 times (54 citing countries). ACES articles published 2014-2019 have received 21,899 cites from 110 citing countries (SCIVAL, Scopus data 6.1.20, Table 4).

Communications



A major remit of ACES communications is to create effective interfaces that disseminate the science and promote engagement effectively targeting the different stakeholders - in commercial sectors, healthcare, government and the community.

Our outreach efforts involve six key stakeholder audiences.

- ▶ Global research community: ACES is a national resource in state-of-the-art electromaterials science and integrated device fabrication, with 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; 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 augment 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 through open

engagement for the community to participate in the wonder of discovery and what can be achieved, using multidisciplinary research to address real community needs so that science can positively influence people's daily life.

- ▶ Internal: together we have a common purpose - to build a sense of community for the communication of research progress.

MEDIA

During 2019, ACES members and their research activities were highlighted in 173 print and electronic articles and 24 radio, podcast and television stories in the Australian and international media, Table 5.

PODCASTS

Podcasts have now exploded in popularity and risen to become a mainstream form of media. In 2019, ACES members were part of 6 podcasts:

Neural Implant podcast - ACES AI UTAS Dr Frederic Gilbert explains the ethics and effects of deep brain stimulation (4 Feb 2019, 24 mins). Gilbert paints the importance of medical ethics when making medical innovations in order to protect patients. He argues that medical ethics must involve informing patients and their families of all risks associated

TABLE 5: MEDIA OUTREACH SUMMARY

Public Communication	2019 KPI target	Actual
Podcast	0	6
Print	20	17
Radio	10	13
Television	5	5
Web stories	100	156

with treatment. The Neural Implant podcast's purpose is to bring together the field of neuroprosthetics/brain machine interfaces/brain implants in an understandable conversation about the current topics and breakthroughs.

Philosophers on Medicine Podcast – ACES RF Monash Dr Mary Walker talks on overdiagnosis and defining disease with Jonathan Fuller (2 June, 20 mins). Can philosophers studying disease concepts help to clear up our definition of disease – and even the problem of overdiagnosis itself?

BBC Science Focus Podcast - Is an implantable electronic device the future of medicine? (15 Aug 2019, 18 mins). ACES Director Prof Gordon Wallace speaks to BBC Science Focus commissioning editor Jason Goodyer in this episode of the Science Focus Podcast about how researchers in Australia have developed an implantable

ACES COMMUNICATIONS: A SNAPSHOT



thread – a sutrode – that could cure disease by stimulating nerve fibres.

MTPConnect Podcast Spotlight: Enhancing Australia's 3D Bioprinting Capabilities with TRICEP (23 August 2019, 36 mins). Shannan Osrin reports Wollongong, NSW is on the map for a number of reasons, one of them being its world-leading 3D bioprinting facility, TRICEP.

Can You Tell Me How podcast (23 September 2019, 15 mins). ACES Director Prof Gordon Wallace talking about curing disease without drugs with William Verity and Lizzie Jack as part of University of Wollongong 'Can You Tell Me How?' podcast series. Researchers are working on a revolutionary fibre that will allow us to listen to never-before-heard conversations between our vital organs.

IEEE RAS Soft Robotics Podcast (1 Dec 2019, 1:11:46). ACES CI UOW Prof Gursel Alici shares his profound and rich expertise, reflecting his thoughts about the field of soft robotics with Marwa Eidiwiny.

SOUNDCLOUD
Many radio interviews are hosted on Soundcloud. Soundcloud audio is available for the following interviews.

ACES CI UOM Prof Mark Cook joined ABC Radio National to talk about concussion in sport and whether former sports stars should be compensated for conditions they have developed from such injuries, including memory loss and epilepsy.

ACES CI Monash Prof Douglas MacFarlane took the time to talk about the future of hydrogen in the Australian Science Media Centre's media briefing in June. Doug also featured on ABC Radio National's The Science Show talking about the future of hydrogen and ammonia.

ACES Illawarra mornings host Nick Rheinberger spoke with ACES Director Gordon Wallace and ACES international collaborator Prof Mario Romero-Ortega on the new type of graphene fibre that has the mechanical properties of a suture and the electrical properties of an electrode, known as the 'sutrode'. Nick also interviewed Gordon on delivery of 3D Alek to RPA as part of research project to print 3D bioprinted ears.

ABC Illawarra Drive host Lindsay McDougall chatted with ACES UOW PhD candidate Alex Nagle about his journey to and with ACES and in a separate interview with ACES Director Gordon Wallace about his life, and what led him to a career in science.

ACES CI Monash Robert Sparrow was interviewed on ACES The Minefield on the ethics around the sexual fantasies enacted on sex robots.

Radio 3AW in Melbourne caught up with ACES CI Patrick Howlett following the announcement of their CRC-P grant on batteries, talking about how the relationship with Calix Pty Ltd led to this grant.

ABC Radio Melbourne interviewed ACES CI Prof Jeremy Crook on the ACES team's win at the Research Australia awards, and research on electric neural tissue engineering and followed up with a further interview to discuss how UOW researchers grow grey matter in a dish.

COMMUNICATION 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 distributing 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, interesting research and more.

Research can sometimes be hard to interpret, and the ACES website provides a platform where we can promote our amazing research achievements to our communities in plain English.

In 2018 we identified a need to update the ACES website to improve effectiveness, visual appeal and useability for our readers, and undertook a major redesign during 2019. The new-look website was launched in July 2019 with improved features including better site navigation, mobile responsiveness, a more engaging news blog, and a functioning events section that connects directly to our Eventbrite registration platform.

To capitalise on the improved platform, 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. These initiatives

include featured farewell interviews with ACES researchers and students who were finishing their time with ACES including a number of video interviews; an interview series with our international Biofabrication Masters students on their time at the ACES UOW node; a range of interviews with PhD students about their research and future plans; and a monthly node highlight that features the specific researchers and research taking place across ACES.

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 1,330 followers, compared to 1,231 in 2018.

TWITTER
Our Twitter account (twitter.com/ARC_ACES) has over 1,317 followers compared to 1,011 in 2018. 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 2,636 followers, compared to 2,090 in 2018.

YOUTUBE
Videos are a powerful communication tool that allows you to reach a broad, diverse audience. The ACES YouTube channel has over 678 subscribers, and our videos have gained thousands of views.

ACES added 21 videos to the ACES channel in 2019. As you will read below there is a range of subject matter to watch.

Our 'Fishing line artificial muscles' continues to attract the most amount of views, while our top viewing country is in the northern hemisphere, with 18.6% of our audience hailing from the United States of America.

ACES CI La Trobe Prof Susan Dodds spoke on ACES collaborative research 'Engineering Human Brain Organoids' posted (17 Dec 2019, 5:52 mins). 'Should we be worried about engineering human brain organoids?' (https://www.youtube.com/watch?v=u1p6UX2FBb0)

ACES RF Monash Alexandr Simonov introduces the importance and very basic principles of in situ and operando analysis of electromaterials in action. This is described by a recent experiment at BESSY II Synchrotron Facility,



ACES CI PROF MICHAEL HIGGINS FEATURED, ALONGSIDE NINE OTHER RECENTLY PROMOTED PROFESSORS, AT UOW BIG IDEAS FESTIVAL 2019. MICHAEL SPOKE ON 'DECODING HUMAN CELL COMMUNICATION WITH ARTIFICIAL MATERIALS'- ABOUT HOW ADVANCES IN MICROSCOPY ARE USED TO 'TOUCH' AND 'SEE' SINGLE MOLECULES IN ACTION.

highlighting our links to relevant specialists and facilities in Germany (29 October 2019, 6:09 mins).

ACES Director Prof Gordon Wallace introduces the need for non-invasive characterisation techniques to follow biofabrication processes and describes Ultramage: a quantitative ultrasound imaging device developed in ACES (18 June, 3:18 mins).

ACES CI UOW and Electromaterials theme leader Prof David Officer talks about Funky Graphene scale up and applications (1 July 2019, 2:58 mins).

A number of student interviews with ACES Director Gordon Wallace is also available.

MAILING DATABASE

ACES continued to increase its email

databases, with increases to our Industry and End-User, Research and Community Engagement mailing lists. In 2019, these lists received information relevant to their area of interest, including invitations to events and opportunities to participate in the ACES Virtual Tour.

In 2019, our subscriptions numbers are as follows:

- ▶ End-User and Industry – 187 subscribers
- ▶ Research – 393 subscribers
- ▶ Community - 31 subscribers

ACES NEWSLETTER

'The ACES Catch-Up' is our quarterly update for our internal audience. It features a range of information including 'What's new at our ACES nodes', 'Latest News', 'ACES Good

Reads' (recently published papers and media articles), 'Social Media Snapshot', 'Learn with ACES' (study opportunities), and 'Upcoming Events and Meetings'.

In 2019, the newsletter had an average open rate of 58.8% by our readers. The open rate tells us how many successfully delivered emails were opened by subscribers. There is room for error because if a subscriber's email client has images turned off the tracking image, used by mailchimp for counting, will not load.

NEW INITIATIVES

INSTAGRAM

In July 2019, the Communications Team identified a benefit to signing ACES up to Instagram, as it is a popular social media

platform for a younger demographic. ACES officially joined Instagram in February 2019, and at the end of 2019 had 130 followers with 245 posts.

INCREASED ACTIVITY ON LINKEDIN

Activity on the ACES LinkedIn account increased in 2019 to give the Centre's activities more exposure to the professional social media network that utilises the platform. Our LinkedIn followers totalled 570, which included 413 new followers to the ACES page in 2019. The ACES LinkedIn page included 250 updates on our activities, and had 1,011 total page views in 2019.

ELECTROMATERIALS WIKIPEDIA PAGE

The ACES Communications Group agreed to establish an 'Electromaterials' Wikipedia page to assist with promotion

of the field, and provide clarity and assistance when recruiting for Masters students in the area. The content for the page was drafted and reviewed by the ACES team, and uploaded for publishing in 2019.

COLLATERAL

A range of collateral was produced in 2019 to educate our researchers, and to promote our research and services. In particular, a fact sheet was produced for ACES researchers that outlined the key points of making a great scientific poster, and a range of collateral was produced for TRICEP including a large pop-up advertising wall, spec sheets on bioink materials available at the facility, and fact sheets on TRICEP services including Additive Manufacturing.

ACES VIRTUAL TOUR

In 2019, ACES launched its first Virtual Lab Tour to enable industry, research and community members to gain an insight into our world-class research. The ACES HQ @ UOW – The Virtual Tour initiative focused on the ACES lead node, the Intelligent Polymer Research Institute (IPRI), at the University of Wollongong. The tour covered a number of key research areas at IPRI including synthesis of advanced materials such as graphene, manufacturing of composite materials like bioinks containing human cells and methods to create structures from such materials using fibre spinning, and 3D printing.

The initiative included step-by-step footage through the IPRI labs with researchers explaining the work involved in their research. The team was also online to answer any questions during the virtual tour. Two runs of the Virtual Tour were held in 2019 (May and December), with over 110 people from countries including Mexico, Dubai and Ireland registering for the event.

OUTREACH

INSPIRING THE NEXT GENERATION

ACES CI UOW Marc in het Panhuis, was a volunteer for STEM Professionals in School Program with Ulladulla High School (<https://www.csiro.au/en/Education/Programs/STEM-Professionals-in-Schools>).

ACES Director Gordon Wallace gave

a keynote talk 'Nanotechnologies and the Importance of Collaboration' at the Brisbane Catholic Education Stem Symposium, Brisbane, 11-12 March 2019.

ACES UOW hosted Yr 9 students from Warrawong High School in TRICEP to review the latest 3D printing technology, 3 May 2019.

The I-Form Advanced Manufacturing Research Centre in Ireland brought together teachers from the Engineering and Technology Teachers Association, Dublin youth workers and representatives from the Dublin Maker festival to hear about the latest bioprinting research from ACES Director Prof Gordon Wallace and ACES AI Dr Stephen Beirne, June 2019. The aim was to strengthen links between Ireland and Australia in the education space.

ACES UOW hosted Yr 8 and 9 students, with teacher Joel Trist, from Dapto High School in TRICEP to review the latest 3D printing technology, 25 June 2019.

ACES RF UNSW Eliza Goddard was an invited Speaker presenting on "Technology and Identity: Ethical grounds for innovation in emerging health technologies" at the Future Thinking 2019 Preshil Philosophy Conference, Victoria, 21 July. This event was open to the Public with the primary audience: students, teachers, interested community members.

Six Year 12 Chemistry students from Ashwood High School were hosted at ACES Deakin Burwood laboratories, where they were given a short theory based lecture on materials researcher by Dr Matthais Hilder followed by a practical session in the laboratories, 27 August 2019.

ACES CI Deakin Jennifer Pringle presented at the 'Systems Thinking in Chemistry Education Symposium' for School Chemistry teachers, Melbourne, 13 September 2019.

COMMUNITY AND CORPORATE

ACES provides access to the exciting world of science through open engagement for the community to participate in the wonder of discovery and what can be achieved, using multidisciplinary research to address real community needs so that science can positively impact on people's daily life. A list of these activities can be found in Table 6.

TABLE 6: A SUMMARY OF ACES OUTREACH ACTIVITIES AND ACES INVOLVEMENT WITH COMMUNITY AND PROFESSIONAL BODIES IN 2019

Outreach Activities		When	Where
1.	LKM Address. This annual public address celebrates the life of one of Australia's great scientific minds. Leon Kane-Maguire was on of Australia's leading scientists, pioneering research in nanomaterials – all balanced by his down to earth attitude and wicked sense of humour. In 2019 Prof Margaret Sheil AO, Vice-Chancellor and President of the Queensland Univeristy of Technology (QUT) gave the address. In 2017, Prof Sheil was made an order of Australia for her distinguished service to science and higher education as an academic and administrator, through significant contributions to the national research landscape and to performance standards.	5 February 2019	iC campus UOW Wollongong
2.	ACES CI UOW Jun Chen talked all things ACES and more to Northern Illawarra Univeristy of 3rd Age (U3A) group meeting.	12 March 2019	Thirroul
3.	ACES RF Deakin Natalie Ralph participated in the Working Group meeting, Business for Peace PRME/UN Global Compact , to discuss business and towards establishing a committee for corporate engagement.	16 April 2019	Melbourne
4.	Prof Wood public address titled 'Tissue Regeneration, Tissue Delivery and Tissue Integration Challenges of the Future'. This was a fantastic opportunity, for the 121 attendees, to explore how discoveries in biomaterials and advanced fabrication technologies are having a profound effect on how we think about wound healing strategies and the creation of artificial skin, and the recent advances and outstanding challenges to ensure successful practical applications in a clinical environment. Winthrop Prof Fiona Wood is a Plastic & Reconstructive Surgeon specialising in the field of burn care, trauma and scar reconstruction. As Director of the Burns Service of Western Australia, Professor Wood is consultant at Perth Children's Hospital and Fiona Stanley Hospital, where she leads an interdisciplinary team with broad collaboration focused on translation to improve clinical outcomes. Prof Wood was the recipient of the 2003 Australian Medical Association 'Contribution to Medicine' Award and a 2003 Order of Australia Medal for her work with Bali bombing victims. In 2005 Prof Wood won the Western Australia Citizen of the Year award, and that same year received the honour of being named Australian of the Year. In 2005, Prof Wood and co-founder of Clinical Cell Culture Pty Ltd (now Avitamedical) Marie Stoner, won the Clunies Ross Award (Australian Academy of Technological Sciences and Engineering) for their contribution to medical science in Australia.	6 May 2019	iC campus UOW Wollongong



THE 2019 BILL WHEELER PRIZE WAS AWARDED TO ACES UOW AFFILIATE PHD STUDENT CHUNYAN QIN FOR BEST COMMUNICATING THE SOCIAL IMPACT OF HER BIONICS RESEARCH. CHUNYAN'S RESEARCH PROJECT LOOKS AT INJECTABLE NANO-MICRO PARTICLES OF ORGANIC CONDUCTORS TO ENABLE WIRELESS STIMULATION USING BIPOLAR ELECTROCHEMISTRY.

Outreach Activities		When	Where
5.	ACES CI Deakin Linda Hancock gave a presentation on ACES Energy and Ethics and Public Engagement research around energy to Victorian University Regional Research Network (VURRN).	10 May 2019	Melbourne
6.	Science at the Shinedome. ACES CI Deakin Jennifer Pringle gave a talk 'Supporting sustainability through electrochemical energy storage' at this event where Australia's most influential scientists gather to celebrate and honour outstanding achievements in science.	28-30 May 2019	Canberra
7.	ACES HQ@UOW - The Virtual Tour. Keen to get an insider's view of cutting edge research into advanced materials and device fabrication for game changing health and energy solutions? Guests were invited to receive an insight into our team's fundamental work including synthesis of advanced materials such as graphene, manufacturing of composite materials like bioinks containing human cells and methods to create structures from such materials using fibre spinning and 3D printing – all from the comfort of their own home or workplace. ACES and ANFF materials node researchers were online to answer questions.	28 May, 30 May and 10 December 2019	Virtual
8.	ACES Director in Fireside chat at the Australian Embassy in Ireland. Approx 35 members of the public and some aspiring scientists attended this moderated chat which was followed by a Q&A with Gordon. Questions and discussions were based around the following: <ul style="list-style-type: none">▶ What led you to your area of expertise?▶ Who has been the most significant mentor figure in your life?▶ You have been awarded many accolades. What have been the highlights of your career?▶ What have you observed as the most important discovery or progression in science in your career▶ What do you think will be the next big thing in medicine and science / your field▶ What do you think of how technology is impacting medicine and how does this apply to your field▶ What are the challenges in this type of work▶ What advice would you give your younger self starting out your career after gaining qualifications	17 June 2019	Australian Embassy Dublin, Ireland
9.	Educating Teachers. 3D printing and education roundtable was held to strengthen links between Ireland and Australia in the education space. Held at ACES partner DCU node teachers were given an introduction to 3D printing, the relevant aspects of facilities at all the ACES nodes, nationally and internationally, an introduction to Bioprinting and the Educational printers being made out of TRICEP.	19 June 2019	Dublin Ireland
10.	Science Gallery Dublin Public Event – THE PURSUIT OF PERFECTION IN SCIENCE AND ART PANEL DISCUSSION with Gordon Wallace (ACES Director), Louise Allen (Head of Innovation, Design and Crafts Council of Ireland) and Adam Peacock (featured artist) tying in with PERFECTION exhibition launch in Science Gallery Dublin. Following brief introductions from Science Gallery Director and Australian Ambassador the discussion highlighted the parallels between the pursuit of perfection in both art and science, using examples from the expert panelists who have used technology to manipulate and/or enhance materials and bionics.	20 June 2019	Science Gallery, Dublin, Ireland
11.	Public Talk Kiama. ACES CI Gordon Wallace gave a public talk 'Biographene' as part of Science week at the Kiama Library. The talk was followed by a Q&A session.	13 August 2019	Kiama
12.	Illawarra Community Open Day. 50 members of the general public enjoyed touring the ACES headquarters. Visitors were able to speak with local researchers about their cutting edge technologies including: human hair size graphene fibre electrodes to provide recordings from brain cells; materials that can electrically stimulate brain cells to potentially reverse schizophrenia; and the amazing properties of bioinks to assist in wound healing, the regrowing of ears, and treating diabetics. The Centre's 3D Bioprinting techniques were on display, which have created opportunities to repair damaged cartilage to prevent osteoarthritis and corneal damage, and develop prosthetic ears to treat the congenital deformity microtia.	15 August 2019	iC campus UOW Wollongong

Outreach Activities		When	Where
13.	<p>Bill Wheeler Prize and Symposium. Held during Science week, following the ACES UOW Community Open Day, was the annual Bill Wheeler Symposium – a night that celebrates bionics research.</p> <p>The 90 attendees were able to hear ACES collaborator and professor from Sydney Eye Hospital, Lions Eye bank and University of Sydney, Prof Gerard Sutton, give what was a moving talk on the latest advancements of his corneal work. Prof Sutton explained how far corneal research has come since he began his career and spoke on the exciting future for his research and the development of the iFix Pen – a project in collaboration with Prof Gordon Wallace and our team here at ACES.</p> <p>The 2019 Bill Wheeler Prize went to ACES UOW affiliate PhD student Chunyan Qin for best communicating the social impact of her bionics research. Chunyan's research project looks at injectable nano-micro particles of organic conductors to enable wireless stimulation using bipolar electrochemistry.</p>	15 August 2019	iC campus UOW Wollongong
14.	Engineering ethics panelist. ACES CI Monash Robert Sparrow was an invited panelist for the "engineering ethics panel" which was run as part of the Monash Engineering Leadership Program.	28 August 2019	Melbourne
15.	Potentials of 3D printing at Questacon - The National Science and Technology Centre. ACES CI UTAS Brett Paull spoke to the potentials of 3D printing at Questacon - The National Science and Technology Centre.	2 September 2019	Canberra
16.	ACES UOW Future Students Open Day - "Considering WHAT'S NEXT in your studies?" ACES promoted this event for future students to "Get involved in ground-breaking research making a real difference in shaping the NEXT GENERATION of smart materials to improve people's lives!" Short presentations from current students and potential supervisors followed by a tour of the facilities.	17 September 2019	iC campus UOW Wollongong
17.	ISBF conference launch: BIOFABRICATION 2020 conference launch – 'Biofab by the Beach'. The international Society for Biofabrication (ISBF) holds an annual conference that aims to bring together the global community with the objective of providing a broad communication platform for this multidisciplinary area of endeavour. Clinicians, commercial entities and researchers are brought together to exchange and disseminate recent scientific discoveries, research activities and development, as well as emerging applications in the field of biofabrication. Wollongong will be hosting the event 27-30 September 2020 – the first time this event has been brought to Australia. This event, with ISBF president Prof James Yoo as special guest, was for 75 members from our local community to learn more about this international event and give an opportunity for our diverse network to come together with the common aim of making this event a huge success.	10 October 2019	Novatel Wollongong
18.	DSTG Aerospace divisional women's networking lunch. ACES CI Deakin Maria Forsyth was invited to address the 44 attendees on 'career, juggling work and raising children and other various career obstacles'.	15 October 2019	Melbourne
19.	<p>UOW Big Ideas Festival 2019 showcases the University's ground-breaking research and outstanding academics.</p> <p>ACES CI Prof Michael Higgins featured, alongside 9 other recently promoted professors at UOW. Each gave short talks on their big ideas related to their field of research.</p> <p>Michael spoke on 'Decoding human cell communication with artificial materials' (https://youtu.be/_dTlhrbznUE) – about how advances in microscopy are used to 'touch' and 'see' single molecules in action. This provides unprecedented insight into the interactions between biomolecules and various artificial materials or surfaces that are increasingly finding their way into the human body.</p> <p>TRICEP/ACES/ANFF had a demonstration booth 'ACES translating through TRICEP' at the event where researchers were on hand to speak to guests about our research activities.</p> <p>Guest speaker Emeritus Professor Maree Smith AC from the University of Queensland spoke about the unmet medical need driving novel pain-killer discovery and development. Other topics from speakers included the importance of green spaces in our cities, financial literacy, diseases of the brain, the importance of purple coloured foods, delirium vs dementia, educational inequalities and more. Due to the event's popularity, the event was fully booked out, so people were offered the opportunity to live stream the event.</p>	16 October 2019	
20.	ACES CI UOW Jun Chen talked all things ACES and more to Kiama group of the University of 3rd Age (U3A).	5 November 2019	Kiama



Awards



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

TOP GONG AT 17TH RESEARCH AUSTRALIA HEALTH AND MEDICAL RESEARCH AWARDS

ACES took out the coveted Frontiers Research Award at the 2019 Research Australia Health and Medical Research Awards.

The project team led by ACES UOW CI A/ Prof Jeremy Crook, ACES Director Prof Gordon Wallace and ACES UOW RF Dr Eva Tomaskovic-Crook, were acknowledged for their work in creating novel ways to use human stem cells to assist in regenerative tissue engineering research for the treatment of diseases. The group is investigating the use of electrical stimulation to influence cell behaviour as a way to treat traumatic brain injuries and neurological disorders such as epilepsy and Parkinson's disease.

"We can see such potential for our research to treat neurological disorders, as well as provide donor tissues for vital replacement therapies following trauma and disease. Our world-first new in vitro platform brings together several cutting-edge technologies

and integrates biologically relevant human cell lines with advanced techniques for 3D tissues engineering and 3D electrical stimulation that better represents human cell growth and tissue inside the human body." Jeremy said.

The team's success was supported by our international research partners, who brought critical skills and a breadth of knowledge necessary for success. As part of this project, ACES members had the opportunity to work with renowned researchers from the University of Auckland in New Zealand and Tampere University of Technology in Finland.

Research Australia is the national peak body that promotes and champions health and medical research, and represents organisations across the entire health and medical research pipeline. The Research Australia Health and Medical Research Awards have been held annually since 2003 to celebrate the people who make a difference in the lives of the Australian community through their contribution to health and medical research.

The Frontiers Research Award category recognises transformative research projects that extend existing knowledge and understandings within health and medical research that will enable Australia's health system to position itself as a global leader.

ROYAL AUSTRALIAN CHEMICAL INSTITUTE PHYSICAL CHEMISTRY DIVISION MEDALLIST

ACES ANU CI and Laureate Fellow Prof Michelle Coote was awarded the 2019 Royal Australian Chemical Institute (RACI) Physical Chemistry Division Medallist, the premier award of the Physical Division medal. The medal is awarded in recognition of outstanding contributions, by an individual, to the field of Physical Chemistry in Australia.

Michelle also received a citation from the Royal Australian Chemical Institute (RACI) Polymer Division.

Michelle gave the 2019 Paul Schleyer Lecture at the University of Georgia on 5 February. The Schleyer Lecture, held annually at the University of Georgia, is from a guest lecturer nominated to present their research in the field of organic chemistry. Michelle is the first female Schleyer Lecturer in its 18-year history, and only the second Australian selected, following Leo Radom's talk in 2008.

In 2019, Michelle was awarded a Huayuan Lectureship at the Huazhong University of Science and Technology, Wuhan, China.

The invisible catalyst team, led by Michelle, were named finalists for the

prestigious Eurkea Prize in the ‘Scientific research’ category, for the second consecutive year, for their investigation into using electrical fields to catalyse chemical reactions. View the video explaining the research behind the nomination (<https://www.youtube.com/watch?v=rd0IOpv6juE&feature=youtu.be>).

ASSOCIATE MEMBER OF THE ROYAL SOCIETY

ACES UOW affiliate PhD student Lingzhi Kang was invited to give a talk to the Royal Society of New South Wales on her PhD project on wound healing, where she was elected as an Associate Member of the society.

SIR JOHN MONASH DISTINGUISHED PROFESSOR

Douglas MacFarlane, ACES CI Monash University, was appointed as a Sir John Monash Distinguished Professor at Monash University, the most prestigious title for serving professors of the University. The award recognises professors of outstanding distinction, presented to those who have made exceptional and sustained contributions to their discipline at Monash University and within the community. Prof MacFarlane shares this honour with only five other current and with just a dozen total throughout the history of Monash University.

Doug was also elected as one of six new International Society for Electrochemistry (ISE) Fellows in 2019.

ACES RESEARCHERS SHINE IN CSIRO'S ON PRIME PROGRAM

ACES UOW ECR Shaikh Faisal, ACES UOW PhD student Aida Naseri and ANFF materials node staff member Gregory Ryder shone in CSIRO's ON Prime program. Their team, NanoG, were awarded a facilitators performance bonus for their graphene-based coolant project. The bonus included \$2000 of travel funding in recognition of their insight and engagement throughout the program, on top of the \$3000 awarded to each participating team.

ACES UOW RF Dr Alex Harris and UOW collaborators Lezanne Ooi and Patrick McGivern team 'Emergent Neural Systems' received a \$1000 bonus on top of the \$3000 award for the participating team.

ON Prime is a national program that is open to researchers from Australian universities as well as research organisations, helping to empower them and attract resources needed to create impact. The purpose built program runs over eight weeks, which involves teams shaping their project, testing their ideas, sharpening their communication skills and importantly receiving mentoring, guidance and feedback from expert facilitators and leadership coaches. The team looks at connecting with potential beneficiaries, new partners and industry.

ACES GRADUATE RECIPIENT OF CHINESE GOVERNMENT AWARD

ACES UOW affiliate PhD student Long Zhang, was a recipient of the Chinese Government Award for 'Outstanding Self-financed Chinese Student Abroad'. Long had outstanding academic accomplishments studying at UOW with his principal supervisor Dr Simone Ciampi, now at Curtin University WA, and ACES members at UOW and ANU. The award ceremony was held at the Consulate General of the People's Republic of China in Sydney, 24 May 2019.

2019 BILL WHEELER PRIZE WINNER

The 2019 Bill Wheeler Prize went to ACES UOW affiliate PhD student Chunyan Qin for best communicating the social impact of her bionics research. Chunyan's research project looks at injectable nano-micro particles of organic conductors to enable wireless stimulation using bipolar electrochemistry.

The award, includes community-raised funds to assist in travel (\$2,000) to help the winner collaborate and share their research with an international audience.

VIDEO CHALLENGE WINNER

ACES UOW Affiliate PhD candidate Abdul Moqeeet Hai has been named as a winner for the Global Challenges 2019 Travel Scholarship Challenge for his video, 'Silk Based Electrowritten Scaffolds for Tissue Engineering'.

The Scholarship Challenge, now in its sixth year of running, encourages UOW students studying research degrees to create a two-minute video on their

project, whilst explaining how it relates to one of the global challenge areas that include Living Well Longer, Making Future Industries and Sustaining Coastal and Marine Zones.

Abdul, who is researching the fabrication of silk-based structures for corneal applications for his PhD, addressed the challenges of Living Well Longer and Making Future Industries in his video.

The scholarship grants each winner \$2000 to support travel in 2020 to a destination of their choice to help further research.

This is the third year in a row that an ACES student has been awarded a Global Challenges Scholarship, with Charbel Tawk amongst last year's winners and Syamak Farajikhah in 2017.

ACES STUDENTS DO WELL IN 3MT

ACES UOW PhD student Charbel Tawk, from the Soft Robotics theme, was awarded runner-up at the UOW 2019 Three Minute Thesis (3MT) Final presenting 'Don't take it for granted, for some it is a dream!' on 26 July 2019. Charbel was named the People's Choice Winner for his presentation 'Do you want a hug a robot?' at the UOW Engineering and Information Sciences Three Minute Thesis Competition, June 2019.

ACES UOW affiliate PhD Lingzhi Kang, was the joint winner for People's Choice at the UOW 2019 3MT in July 2019. Lingzhi also won first prize and the people's choice award at the UOW Australian Institute for Innovative Materials (AIMM) 3 Minute Thesis competition on 'artificial skin for burn patients', June 2019.

OTHER ACCOLADES AND AWARDS

ACES UOW RF Paul Molino was awarded a Japan Society for the Promotion of Science (JSPS) Post Doctoral Fellowship to work with ACES AI Prof Junji Fukuda at Yokohama National University (YNU) in Japan, for 9 months from April 2019. YNU is a partner organisation of ACES.

ACES Swinburne PhD student Daniela Duc's paper on Cell Stimulation received a Commendation in the HDR Outstanding Article category for the Swinburne University 2019 Faculty of Science, Engineering and Technology Research and HDR Awards, June 2019. (<https://doi.org/10.1002/adhm.201801321>)

ACES ECR UTAS Umme Kalsoom



received the UTAS Business Development and Technology Transfer Office (BD&TT) award for her work on a 3D printed passive sampler.

ACES CI Prof Simon Moulton from our Swinburne University node and the entire team at the ARC Training Centre in Biodevices, were awarded Swinburne University of Technology Vice-Chancellor's Research Excellence Award. They work in collaboration with various partners on projects that include: using a 3D printing method to personalise hearing aids and earphones; using stem cell science to contribute to cartilage repair and stopping neurodegenerative diseases such as Alzheimers, Parkinson's, Mad Cow Disease or Motor Neurone disease.

ACES PhD Monash Rebecca Hodgetts awarded first prize for her poster "Universal quantification of ammonium by rapid 1H NMR Analysis for Nitrogen reduction studies" at the Ammonia = Hydrogen 2.0 Conference, Ammonia Energy Association, Clayton, Victoria, 22-23 August.

ACES CI Deakin Prof Linda Hancock, was awarded 'Best Oral Presentation' at the International Workshop on Cleaner Production held in Sanya, China 13-15 November, for her presentation 'Aligning governance of renewable energy 'technology minerals' with circular economy principles for sustainable, ethical and just, energy transitions'.

ACES affiliate PhD Jawairia Khan was a best poster nominee at the Materials Research Society (MRS) Fall conference in Boston. Although not the winner, it was a privilege being selected from the 700 posters in the session.

ACES AI UTAS and former ACES ECR Frederic Gilbert awarded a \$3000 seed grant to run a conference on the "Ethics of Artificial Intelligence" at UTAS.

Susan Dodds, ACES Chief Investigator University of New South Wales, promoted to DVC Research and Industry Engagement at La Trobe University, June 2019.

ACES Chief Investigators, Jenny Pringle (Deakin) and Attila Mozer (UOW) promoted from Associate Professor to full Professor.

ACES SRF Deakin Fangfang Chen and ACES ECR Deakin Faezeh Makhlooghiazad received Future Women Leaders Conference Awards to attend The Future Women Leaders Conference, Melbourne, 18-19 November 2019. Developed and run for the first time in 2015 by Prof Ana Deletic, UNSW PVC Research, this unique series of events is specifically designed to support female academics in engineering, IT and physical sciences, in progressing their career. The conference, co-hosted by UNSW Sydney, Monash University and the University of Melbourne covered a range of skill development workshops and opportunities to learn strategies to deal with the specific challenges facing women in engineering, physical sciences and IT will be held and attendants will have the opportunity to network with their peers.

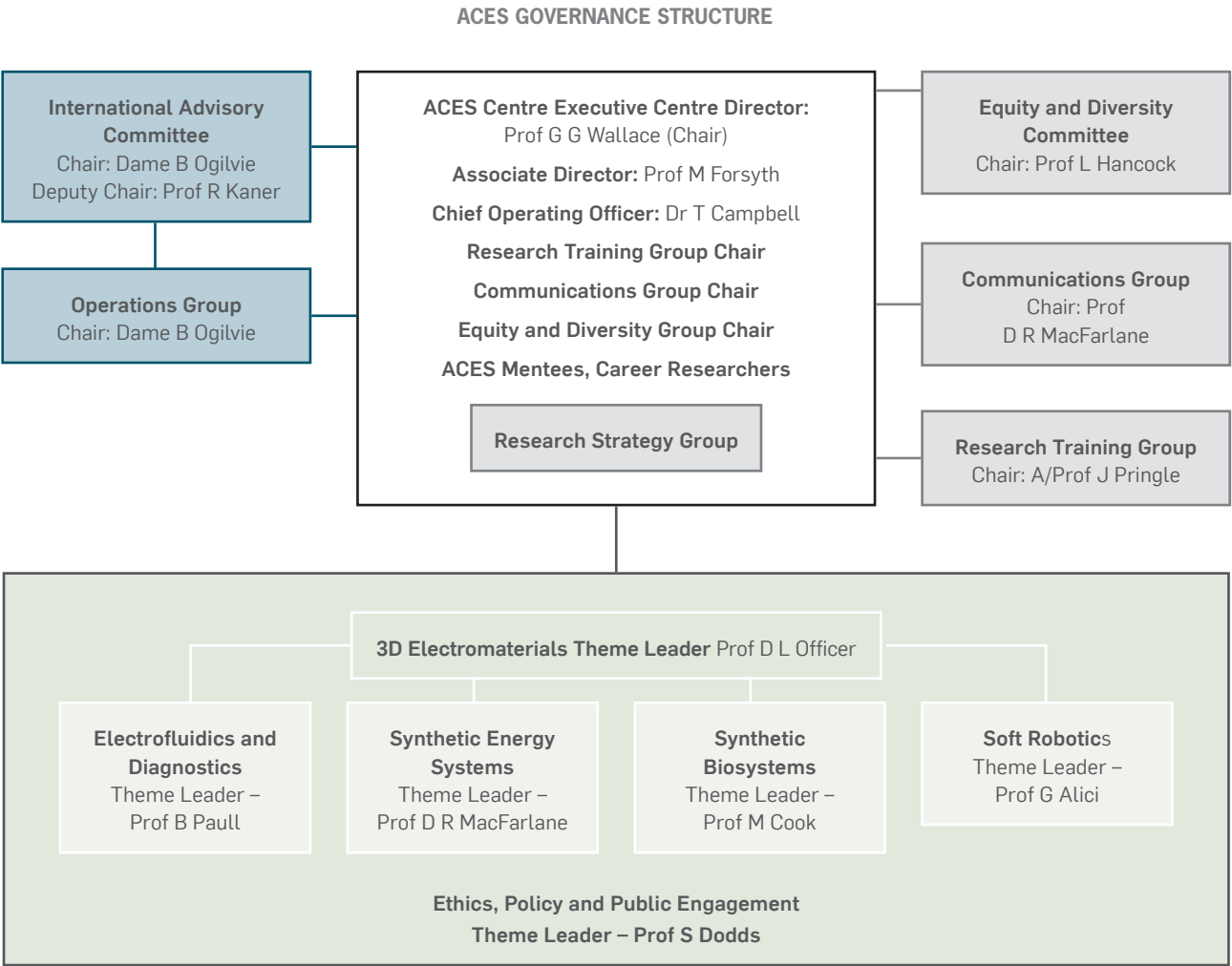
Performance Indicators

Key Performance Indicators (KPI)	Target 2018	Actual 2018	Target 2019	Actual 2019
Number of research outputs				
Journal publications	120	224	130	210
Book chapters	2	4	2	7
Conference publications/abstracts	50	224 ► 11 refereed papers ► 2 non-refereed papers ► 211 abstracts non-ACES conferences	70	186 ► 12 refereed papers ► 174 abstracts non-ACES conferences
Patents (filed)	2	5	2	3
Quality of research outputs				
Quality of research outputs	50% with impact factor >3.1	66% (148 publications)	50% with impact factor >3.15	74% (156 publications)
Cumulative Citation data Average cumulative citation per publication	16 Av cumulative citation per publication	14.5 (778 cited publications from 961 published 2014-2018)	20 Av cumulative citation per publication	19.1 (990 cited publications from 1145 captured in database 2014-2019)
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%	1.8 30.1% 35.4%	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%
Number of invited talks/papers/keynote lectures given at major international meetings	30	104 32 plenary/keynote 72 invited talks	35	102 33 plenary/keynote 69 invited talks
Student prizes and awards	1	12	1	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 = 70 Thematic workshops: 15 Summer scholarships: 8 Researcher exchanges: 47 ► 39 international students hosted by ACES (>5 days) ► 8 ACES national X-nodal student exchanges (>3 days)	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)
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 = 42 Full Centre Meeting: 2 International Symposium/Event: 9 International or National Joint workshops: 11 End-User sessions: 20	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

Key Performance Indicators (KPI)	Target 2018	Actual 2018	Target 2019	Actual 2019
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: 18 Affiliate PhD students: 39 Masters by research students: 20 Associate Investigators: 26	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
Number of postgraduate completions	18	17	10	33 ▶ 23 PhD ▶ 7 Masters ▶ 2 Grad Cert ▶ 1 Honours
Number of mentoring programs offered by the Centre	Total = 5 Webinars: 2 Additional skill training activities: 2 End-user mentoring program: 1	2 Webinars: 0 webinar scheduled for Dec 2018 postponed to 2019. Additional skill training activities: 2 End-user mentoring program: 0 EOI from ACES members sent - no additional end-user mentoring requested or required.	Total = 5 Webinars: 2 Additional skill training activities: 3 End-user mentoring program: 1	Total = 7 Webinars: 4 Additional skill training activities: 2 End-user mentoring program: 1 APR Internship
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: 30 To professional organisations and bodies: 10 Other (STEM education activities):1	To the public: ▶ 101 web ▶ 26 print ▶ 28 radio ▶ 20 television To government: 13 (appendix 4) To industry/business/end-users: 103 (appendices 3 & 5) To professional organisations and bodies: 12 Other (STEM education activities): 16	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

Key Performance Indicators (KPI)	Target 2018	Actual 2018	Target 2019	Actual 2019
Number of new organisations collaborating with, or involved in, the Centre since 2014	1	2 ▶ Korean Society of 3D Printing in Medicine (KS3DPM) ▶ Institute of Electronics (BETRC) at the National Chaio-Tung University (NCTU) in Taiwan	1	2 ▶ AMTZ, India ▶ Max Plank Institute, Germany
Centre-specific Key Performance Indicators				
Commercial translation of Centre research	Ongoing through life of Centre	See Knowledge Translation chapter	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 Knowledge Translation chapter	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	Establish an Equity and Diversity action committee to drive activities within ACES: (i) Review the 2017 ACES gender equity plan (ii) Review available ACES data to establish KPI targets. (iii) Organise one training activity on equity or diversity each year.	Equity and Diversity committee formed July 2018, with terms of reference established. ▶ Reviewed CAASTRO reporting documents (as recommended by the ARC) and Science in Australia Gender Equity Forum (SAGE) documents. ▶ First draft of an ACES code of conduct sent to Executive ▶ Statistical analysis: diversity and gender profiles for student and staff members 2014 onwards. ▶ Gender Equity session run at full centre meeting July.	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 Pls) ▶ 53% identified as female ▶ 47% identified as male ▶ 0% identified as an indigenous Australian Response rate 91%.

Governance



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.

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 ACES governance structure 2014-2016 (p 93, Annual Report 2016) enabled engagement of expertise from across the nodes in global strategy (by the Global Engagement Group (GEG)) and commercial developments (by the Commercialisation Development Group (CDG)). Having fulfilled their purpose these two governance groups ceased to be part of the Centre's formal governance structure in 2017. The approaches refined

by those groups are being utilised now through the Research Training and Communication groups. Chairs of the GEG and CDG, Profs Chicharo and Glynn, sit on the International Advisory Committee with their expertise still available to implement previously agreed strategies across the nodes.

In 2018, ACES established an Equity and Diversity action committee to establish and drive these activities within ACES. The schematic above reflects these changes to the governance structure.

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. 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.

CENTRE EXECUTIVE COMMITTEE

The Centre Executive Committee oversees the Centre's operations and reviews performance against defined indicators. It is responsible for reporting outcomes to the ARC and other stakeholders and for setting strategic directions and broad budget allocations. The committee is advised by the International Advisory Committee.

ACES appoints CIs and ECRs to the ACES Executive Committee for 12 months as

part of the mentoring arrangements within the Centre. ECR Binbin Zhang and CI Jeremy Crook (2015-16); ECR Justin Bourke, RF Natalie Ralph and CI Marc in het Panhuis (2016-17); CI Jun Chen (2018-19) and RF Lijuan Yu (2019).

The executive committee met five times in 2019 (February, May, July, September and December) where it reviewed and endorsed the activities of its sub-committees (Research Strategy Group, Research Training Group, Communications Group and Equity and Diversity Committee).

INTERNATIONAL ADVISORY COMMITTEE

The International Advisory Committee (IAC) provides high level strategic advice to the Centre Director into the positioning of the Centre's activities to secure and retain a position of global leadership in electromaterials science as well as ongoing input into the Centre's research programs.

Members are appointed for an initial term of 2 years, taking into consideration disciplinary balance, spread and continuity. The IAC membership group has changed in line with the Centre's transition from building the fundamental knowledge pool of science towards the use of this knowledge to create high impact outcomes in electrofluidics and diagnostics, soft robotics, synthetic energy systems and synthetic biosystems.

The IAC met twice in 2019, Australia in February and Dublin Ireland in June. The 2019 IAC membership has not changed from that reported in 2018 (p89, ACES annual report 2018).

Following a review of the IAC membership in 2019, by the IAC Chair and ACES Director, invitations were sent to suitable females asking them to join to achieve a greater gender balance on the committee. 2020 will see an increase from 14% to 30% in female membership on the IAC.

OPERATIONS GROUP

The operations group comprises of the DVC (Research) or their appointed proxy from each of the collaborating organisations or an agreed representative. The meetings chaired by Dame Bridget Ogilvie (IAC chair) address cross-institutional matters. The Operations Group met on 20 February in 2019 to be apprised of ACES activities.

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 February and July in 2019, with all the Chief Investigators from all institutions participating.

RESEARCH TRAINING GROUP

The ACES Research Training Group (RTG) is responsible for designing, establishing and implementing an innovative research training and career development/mentoring program, including alerting our members to various industry and web-based programs. 2019 saw a renewed focus on mentor programs and webinars, in addition to the numerous workshops that provide specialist research training for PhD and early career researchers.

The two Masters courses in Biofabrication and Electromaterials continued in 2019 along with the online Graduate Certificate in Biofabrication and Certificate in Entrepreneurship and Innovation.

The Research Training Group (RTG) met four times in 2019 – February, May, September and December.

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 February, May, September and November in 2019 and increased membership to include representation from all nodes including academic, student and administrative members. The group has a membership of 15, including an increase of female participants from 37% to 50%.

2019 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, launch of the new ACES website

and the creation of a Wikipedia page for Electromaterials Science. In addition, the New Dimensions publication was finalised in print. An online interactive version will be available from first quarter 2020.

Quarterly internal newsletters were implemented with encouragement for participation from all Node.

In addition to poster sessions, an inaugural video competition was introduced for the July Full Centre Meeting with over 12 entrants submitting 3-5 minute videos.

EQUITY AND DIVERSITY COMMITTEE

The Equity and Diversity Committee (EDC) is responsible for ACES initiatives and ACES policies that embrace gender equity and diversity.

The Committee met five times in 2019 (February, May, August, September, December) and successfully implemented the ACES Code of Conduct and the ACES Conference Code of Conduct/Policy which sits on the ACES website for public access.

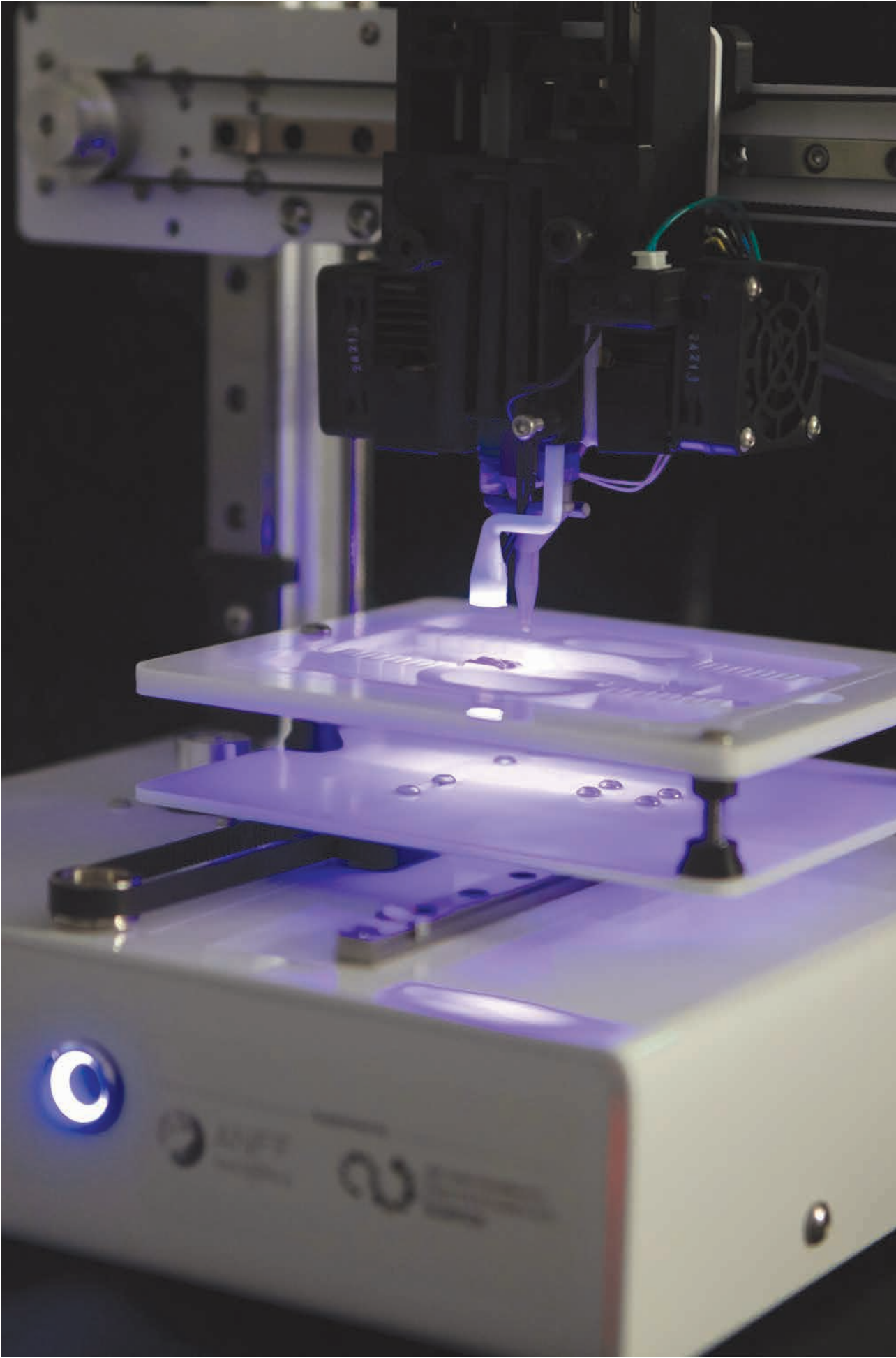
The Committee initiated training activities on equity and diversity and collected gender and diversity related metrics.

The Principal for Culture and Change from Australian Nuclear Science and Technology Organisation (ANSTO) facilitated an Equity and Training workshop for ACES in July.

At the 13th Electromaterials Symposium in 2019, 33% (62) of speakers were female. For the 14th Electromaterials Symposium in 2020 the aim was to have at least 40% of presentations by females.

At the ACES Full Centre meeting an online feedback survey was used to ask members their gender identity. The response rate was < 50. Of the 48 members who responded 65% were male, 33% female and 2% preferred not to say. Following this, as per the ARC directive, a confidential Equity and Diversity metric census was conducted in December 2019 at all nodes for higher degree researchers, postdoctoral, administration and technical staff. The response rate was 91%, with 53% identifying as female and 47% as male.

An analysis of the gender balance on ACES Governance committees was undertaken. All committees had at least a 50:50 female to male ratio, except the RTG (33% female) and the IAC (14% female). From 2020, there will be an increase to 30% in female membership on the IAC.



Financial Statement

STATEMENT OF OPERATING INCOME AND EXPENDITURE FOR YEAR ENDED 31 DECEMBER 2019

INCOME	2019 \$
ARC Centre Grant Funding	3,998,605
Institutional Cash Support	2,265,993
Total income	6,264,598

EXPENDITURE-ARC AND INSTITUTIONAL CASH	2019 \$
Personnel (salaries & stipends)	5,154,178
Equipment	196,183
Travel	452,381
Research maintenance & consumables	461,720
Other (3rd party expert services, administration, dissemination)	72,053
Total Expenditure	6,336,515

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 7.

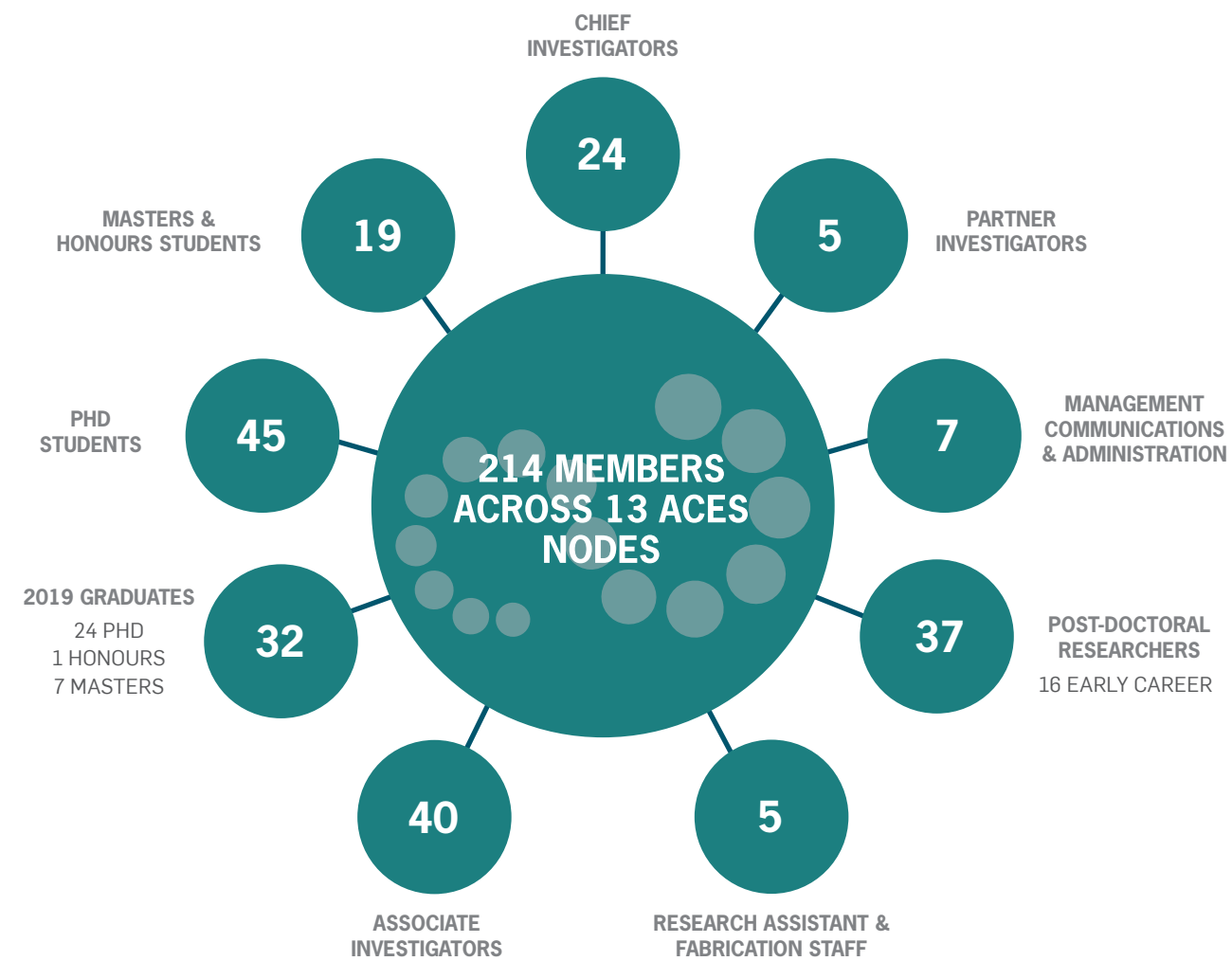
TABLE 7: EXAMPLES OF OTHER FUNDAMENTAL RESEARCH INITIATIVES WHERE ACES MEMBERS ARE INVOLVED

ACES Research Area	Project	Researcher	Funding Body
Materials/Fluidics	2020-2023: 3D printing of multi-level porosity glass. This project aims to explore the fundamentals of 3D printing glass and multi-level porosity structures.	Dr Vipul Gupta	DECRA DE200101733
Energy	2020-2023: Developing sustainable liquid fuels from carbon dioxide conversion	Dr Fengwang Li	DECRA DE200100477
Energy	2020-2023: Sustainable nitrogen chemistry. The goal of this project is to develop sustainable methods to produce nitrates from air and water, using renewable electricity.	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	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	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
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

ACES Research Area	Project	Researcher	Funding Body
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 Terry	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
Biosynthetic Biosystems	Critical Slowing in Epilepsy	Prof Mark Cook (ACES) Grayden D Kuhlmann L Freestone DR D'Souza W Burkitt AN	NHMRC Project 1130468
Chemistry	2017-2021: Controlling chemical reactions via pH-switchable electrostatic catalysis.	Prof Michelle Coote (ACES)	ARC Laureate Fellowship FL170100041
EPPE	2017-2019: Legal and ethical issues in the inheritable genetic modification of humans.	A/Prof Catherine Mills Dr Karinne Ludlow Prof Robert Sparrow (ACES) Dr Narelle Warren	ARC Discovery grant DP 170100919
Materials/ Fabrication	2017-2019: The true potential and limitations of fibres. This project aims to understand the fibre spinning process of nanomaterials to identify their true potential and limitations in wearable applications.	A/Prof Joselito Razal Prof Xungai Wang (ACES) Dr Maryam Naebe	ARC Discovery grant DP 170102859
Materials	2017-2019: Increasing solid electrolyte conductivity through defect design. This project aims to engineer electrolyte materials, based on organic ionic plastic crystals, and use isomeric doping to improve the ionic conductivity.	A/Prof Jennifer Pringle (ACES) Prof Peter Bruce Dr Anthony Hollenkamp	ARC Discovery grant DP 170101087
Materials	2017-2019: A project to develop and apply a highly advanced integrated research package in dynamic electrochemistry to molecules of biological significance and ionic liquids of industrial importance.	Dr Jie Zhang (ACES) Prof Alan Bond (ACES AI) Prof David Gavaghan Dr Alison Parkin	ARC Discovery grant DP 170101535
Ethics	2017-2019: A project to investigate the legal and ethical implications of technologies that allow inheritable modifications of the human genome	A/Prof Catherine Mills Dr Karinne Ludlow Prof Robert Sparrow (ACES) Dr Narelle Warren	ARC Discovery grant DP 170100919

ACES Research Area	Project	Researcher	Funding Body
Materials/ Energy	2017-2019: Efficient ionic liquid-based reduction of nitrogen to ammonia. This project aims to develop a hybrid ionic liquid-nanostructured electrode platform to electrochemically convert nitrogen gas to ammonia.	Prof Douglas MacFarlane (ACES) Dr Xinyi Zhang Prof Jun Chen (ACES) Dr Suojiang Zhang	ARC Discovery grant DP170102267
Materials/ Energy	2017-2019: A project to synthesise flexible redox gel-electrolyte interpenetrated electrodes for an eco-friendly prototype wearable thermo-electrochemical cell that can power body-worn low-power wearable electronics.	A/Prof Jun Chen (ACES) Dr Leigh Aldous	ARC Discovery grant DP170102320
Materials/ Characterisation	2017-2019: On-fibre separation science with ambient ionisation mass spectrometry. This project aims to combine fibre-based electrofluidics and ambient ionisation mass spectrometry.	Prof Brett Paull (ACES) Prof Miroslav Macka Prof Dr Wolfgang Buchberger A/Prof Peter Innis (ACES)	ARC Discovery grant DP 170102572
Materials/ Electrofluidics	2016-2019: A high speed, high fidelity 3D printer for fabricating microfluidic devices. This project aims to develop a novel 3D printer offering the highest resolution available and fastest printing speed for the single-step manufacturing of complex microfluidic devices.	Prof M. Breadmore (ACES AI) Dr Rosanne Guijt Dr Stuart Thickett Prof Brett Paull (ACES) Mrs Celia Lin	ARC Linkage grant LP160101247 with partner Young Optics Inc
Materials/ Energy	2016-2019: Towards high stability, high energy density Na batteries for widespread energy storage	Prof Maria Forsyth (ACES) A/Prof Patrick Howlett (ACES) Dr Alexey Glushenkov Prof Michel Armand	ARC Discovery grant DP160101178
Materials	2014-2019: ARC Research Hub for a World-class Future Fibre Industry. This research hub aims to transform the Australian fibre industry into a dynamic sector focused on high-performance and high-value fibres and fibre-based products.	Prof Xungai Wang (ACES) et al	IH140100018
Materials/Fluidics	2014: ARC Training Centre for Portable Analytical Separation Technologies. The aim is to discover and create new technologies to enable more portable separation science applications.	Prof EF Hilder A/Prof RA Shellie Prof PR Haddad Prof MC Breadmore Prof B Paull (ACES) Prof PN Nesterenko Dr RM Guijt	IC140100022
Materials	2012-2017: Protonic materials for green chemical futures By emulating the structures that nature has evolved this project will create novel materials that will be used to develop new sustainable chemical technologies.	Prof DR MacFarlane (ACES)	ARC Laureate FL120100019

2019 ACES Membership



Lists of ACES members indicating their involvement in the various ACES research themes are below in Tables 8-14.

TABLE 8: A LIST OF ACES CHIEF INVESTIGATORS AND PARTNER INVESTIGATORS 2019

Name	Node	EM	SES	SBS	SR	E&D	EPE
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	✓	✓		✓		

Name	Node	EM	SES	SBS	SR	E&D	EPE
Pringle, Jennifer	Deakin University	✓	✓				
Wang, Xungai	Deakin University	✓					
Hancock, Linda	Deakin University						✓
Paull, Brett	University of Tasmania	✓				✓	
Dodds, Susan	University of NSW January-June La Trobe University June-December						✓
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 2019

Name	Node	EM	SES	SBS	SR	E&D	EPE
Research Fellows							
Kerry Gilmore	University of Wollongong	✓		✓			
Javad Foroughi (May-Oct)	University of Wollongong			✓			
Alex Harris (Sept-Dec)	University of Wollongong	✓		✓			
Chong Yong Lee	University of Wollongong		✓				
Paul Molino (Feb-April)	University of Wollongong			✓			
Anita Quigley (Jan-June)	University of Wollongong	✓		✓			
Eva Tomaskovic-Crook	University of Wollongong	✓		✓			
Pawel Wagner (0.8 FTE)	University of Wollongong	✓					
Caiyun Wang	University of Wollongong	✓	✓				
Klaudia Wagner (0.8 FTE)	University of Wollongong	✓	✓				
Zhilian Yue (July-Dec)	University of Wollongong	✓		✓			
Alexandr (Sasha) Simonov	Monash University	✓	✓				
Irina Simonova (0.8FTE)	Monash University	✓	✓				
Si-Xuan Guo	Monash University	✓	✓				
Mark Howard (July-Dec)	Monash University						✓
James Hatherley (casual)	Monash University						✓
John Newman (casual)	Monash University		✓				

Name	Node	EM	SES	SBS	SR	E&D	EPE
John Taylor (casual)	Monash University		✓				
FangFang Chen (0.5 FTE)	Deakin University	✓	✓				
Cristina Pozo-Gonzalo	Deakin University	✓	✓				
Natalie Ralph	Deakin University						✓
Lijuan Yu	Australian National University	✓					
Saimon Moraes Silva (0.5 FTE, Jul-Dec)	Swinburne University of Technology	✓		✓			
Early Career Researchers							
Zhi Chen (Casual Mar-Aug; 1 FTE Sept-Dec)	University of Wollongong	✓		✓			
Shaikh Nayeem Faisal	University of Wollongong	✓	✓				
Yuqing Liu (0.2 FTE Jan-July)	University of Wollongong		✓				
Andres Ruland	University of Wollongong	✓					
Holly Hunt (Warren)	University of Wollongong	✓		✓	✓		
Hao Zhou	University of Wollongong				✓		
Jaechol Choi (casual January)	University of Wollongong	✓					
Jianfeng Li (casual July-Nov)	University of Wollongong			✓			
Yong Zhao (casual Mar-Apr)	University of Wollongong		✓				
Changchun Yu (casual July-Aug)	University of Wollongong			✓			
Maxime Fournier (Max) (Jan-Mar)	Monash University	✓	✓				
Mary Walker (Jan-June)	Monash University						✓
Federico Maria Ferrero Vallana	Monash University		✓				
Tamas Oncsik	Monash University		✓				
Yan Liang	Deakin University	✓	✓				
Faezeh Makhlooghiazad	Deakin University		✓				
Mary Kalani Erangi Periyapperuma Achchige (Mar-Nov)	Deakin University		✓				
Ruhamah Yunis (0.2 FTE)	Deakin University	✓	✓				
Umme Kalsomme (Jan-Sept)	University of Tasmania	✓				✓	
Vipul Gupta	University of Tasmania	✓				✓	
Eliza Goddard (0.8 FTE)	University of NSW (Jan-Sept) La Trobe University (Oct-Dec)						✓
Justin Bourke	University of Melbourne			✓			
Benjamin Noble	Australian National University	✓					
Professional Service Staff							
Cathal O'Connell Fabrication (0.2 FTE)	University of Wollongong/ACMD St Vincent's Hospital Melbourne	✓		✓			

Name	Node	EM	SES	SBS	SR	E&D	EPE
Higginbottom, Sarah (0.6FTE)	Bionics Research Assistant University of Wollongong			✓			
Richards, Laura (0.6FTE)	Bionics Research Assistant University of Wollongong			✓			
Tangey, Bonnie (0.6FTE, Feb-Dec)	Bionics Research Assistant University of Wollongong			✓			
Kita, Magda (0.4FTE April-Dec)	Senior Research Assistant Bionics University of Wollongong at St Vincent's Hospital Melbourne			✓			

TABLE 10: A LIST OF ACES NON-ACADEMIC POSITIONS 2019

Non-Academic Positions		
Name	Node	Position
Toni Campbell	University of Wollongong	Chief Operations Officer
Vanessa O'Brien (0.6 FTE)	University of Wollongong	Operations Officer
Lauren Hood	University of Wollongong	Communications & Media Officer
Samuel Findlay	University of Wollongong	Communications & Media Officer
Delvene McKenzie (0.6 FTE)	University of Wollongong	Administration
Carin Cinnadaio (0.6 FTE)	University of Wollongong	Administration
Sona Shekibi (0.2 FTE)	Deakin University	Administration
Helen Woodall (0.5 FTE Jan-Aug)	Deakin University	Administration Support
Sofia Georgiadis (0.5 FTE Nov-Dec)	Deakin University	Administration Support
Laura Tedone (0.3 FTE)	University of Tasmania	Administration
Naomi Morter (0.4 FTE)	University of Melbourne	Administration
Rosslyn Ball (0.1 FTE, July-Dec)	La Trobe University	Administration

TABLE 11: A LIST OF ACES POSTGRADUATE STUDENTS WORKING ON CORE CENTRE RESEARCH AND SUPERVISED BY CENTRE STAFF IN 2019

Name (Start Year)	Funding Source	Project Description	Node	Country of Origin	Program Theme
Core Funded PhD					
Sujani Abeywardena (2019)	ACES	Threads in Gels	University of Wollongong	Sri Lanka	EFD
Joshua Brooks (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
Inseong Cho (2017)	ACES	Developing new asymmetric redox mediators with large difference in forward/backward electron transfer rates	University of Wollongong	Korea	EM/SES

Name (Start Year)	Funding Source	Project Description	Node	Country of Origin	Program Theme
Galagedarage Dona Buddhika GAYANI (2019)	ACES	Cell-Cell Adhesion on Materials for Biomedical Applications	University of Wollongong	Sri Lanka	EM/SBS
Kyle Guerrieri-Cortesi (2018) *Withdrew November 2019	ACES	Modelling schizophrenia using 3D bioprinted neural tissues	University of Wollongong	Australia	SBS
Hadis Khakbaz (2016)	UPA	Development of high nanofilled (aspect ratio ordered) bio-thermoplastics as print media for 3D additive fabrication.	University of Wollongong	Iran	EM/EFD
Kyuman Kim (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
Gerardo Montoya Gurrola (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
Aida Shoushtari Zadeh Naseri (2017)	UPA	3D electrical stimulation in hydrogels	University of Wollongong	Iran	EM/SBS
Bijan Shekibi (2017)	ACES	Design of an integrated multi-well cell culture system for functional tissue constructs	University of Wollongong St Vincent's Hospital Melbourne	Australia	SB
Liang Wu (2015)	ACES	Detection systems for diagnostics	University of Wollongong	China	EFD
Shuai Zhang (2018)	ACES	Flexible thermoelectrochemical cells	University of Wollongong	China	SES
Thomas Blesch (2018)	ACES	Non aqueous flow batteries	Monash University	Germany	SES
Shuo Dong (2017)	ACES	Redox couples for flow batteries	Monash University	China	SES
Hoang Long Du (2017)	ACES	Nanostructured catalysts for electrochemical ammonia synthesis	Monash University	Malaysia	EM/SES
Rebecca Hodgetts (2017)	APA	Understanding the mechanism of electrocatalytic nitrogen reduction	Monash University	Australia	SES
Linbo Li (2019)	ACES	2D Catalysts for high performance electrochemical CO ₂ reduction	Monash University		SES
Cuong Ky Nguyen (2018)	ACES	Photoelectrocatalytic produc-tion of ammonia	Monash University	Vietnam	SES
Sam Johnston (2019)	APA- ACES topup	Electrochemical oxidation of ammonia for the sustainable production of nitrates	Monash University	Australia	SES
Karolina Biernacka (2019)	ACES	An Investigation of Novel Solid State membranes for Sodium Batteries	Deakin University	Poland	SES

Name (Start Year)	Funding Source	Project Description	Node	Country of Origin	Program Theme
Mathew Cherian (2015-from 2018 part time)	ACES	Global development, community development and energy	Deakin University	India	EPPE
Ghulam Murtaza Panhwar (2019)	ACES	Development of new thermal energy harvesting devices	Deakin University	Pakistan	SES
Laura Garcia Quintana (2017)	ACES	Enhancement of oxygen reduction mechanism in sodium air batteries	Deakin University	Spain	SES
Dmitrii Rakov (2018)	ACES	Characterisation and modelling electrolytes and interface for Na-Oxygen batteries	Deakin University	Russia	SES
Linda Wollersheim (2018)	ACES	Assessing policy and supply chain aspects of renewable energy	Deakin University	Germany	EPPE
Anna Blum (2016)	ACES	Ethical challenges for electromaterials and neuroscience: the benchtop brain	University of NSW	USA	EPPE
Catherine Simpson (2016-Maternity leave from 2017-Part time)	ACES	Nitroxides for energy	Australian National University	Australia	EM/SES
Nicholas Hill (2017)	ACES	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
Daniela Duc (2015)	ACES	Materials design and fabrication of effective optical and electrical co-stimulation of cells	Swinburne University of Technology	Mauritius	SBS
Shaun Gietman (2015)	ACES	Synthesis of optically active drug delivery systems	Swinburne University of Technology	Australia	EFD/SBS
Alexandre Xavier Mendes (2019)	ACES	Functional hydrogels for 3D Neural Systems	Swinburne University of Technology	Brazil	SBS
Masters Students					
Mehmood, Irfan (2018)	IPTA	MPhil Electromaterials - Photocatalytic water splitting using novel electromaterials	University of Wollongong	Pakistan	EM/SES
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
Chen, Xifang (2016)	UOW-VSS matching	Ulvan fabrication for wound healing	University of Wollongong	China	EM/SBS
Yunfeng Chao (2016)	CSC	Fabrication of graphene-based composites for energy storage application	University of Wollongong	China	EM/SES

Name (Start Year)	Funding Source	Project Description	Node	Country of Origin	Program Theme
Daikuara, Luciana Yumiko (2016)	UOW-IPRI-IHMRI matching	Fabricating delivery system for wound healing- thread based electrofluidics	University of Wollongong	Brazil	EM/SBS
Dhanushka, Nuwan Hegoda Arachchi (2018)	UOW	Plasma Protein Adsorption on Blood Contacting Device Coatings	University of Wollongong		EM
Fan, Yuchao (2017)	UOW-IPRI matching	Hybrid bioprinted cartilage scaffold based on cellulose nanocrystals reinforced GelMA/HAMA hydrogel	University of Wollongong	China	SBS
Hai, Abdul Moqheet (2018)	HEC scholarship with ACES topup	Fabrication of silk-based structures for corneal application	University of Wollongong	Iraq	SBS
Kang, Lingzhi (2016)	UOW-St Vincents Hospital Matching	Biofabricated platforms (based on collagen) for skin repair and regeneration	University of Wollongong	China	EM/SBS
Khan, Jawairia Umar (2017)	Pakistan HEC & IPTA	Fibre electrofluidics for ambient ionisation mass spectrometry	University of Wollongong	Pakistan	EFD
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)	UOW-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 (AG RTP)	Development of 3D printed hybrid structures for cartilage reconstruction	University of Wollongong	Australia	SBS
Qin, Chunyan (2017)	UOW-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
Vijayakumar, Amruthalakshmi (2016)	IPTA	N-doped graphene for electrocatalytic reduction of CO ₂	University of Wollongong	India	EM/SES
Wang, Kezhong (2018)	UOW-IPRI matching	Graphene-based soft electrodes	University of Wollongong	China	EM
Zarghami, Sara (2016)	ARC DP	Development and study of chemopropelled cargo-carrying vehicles in fluids.	University of Wollongong	Iran	EM
Zhou, Ying (2017)	UPA	Development of multifunctional bioinks for 3D printing cellular constructs	University of Wollongong	China	SBS

Name (Start Year)	Funding Source	Project Description	Node	Country of Origin	Program Theme
Zhou, Yuetong (2018)	ARC DP affiliate PhD	The Design and Development of Flexible Redox-Gel Integrated Electrode	University of Wollongong	China	EM/SES
Zou, Jinshuo (2017)	UOW-IPRI matching	Electrocatalytic nitrogen reduction at ambient temperature and pressure	University of Wollongong	China	SES
Desroches, Pauline (2018)	ARC DP affiliate	Ultra-low fouling active surface for bionic implants	Deakin University	France	EM
Hasanpoor, Meisam (Sam) (2018)	UPA affiliate	Investigation of degradation mechanisms in advanced lithium metal batteries	Deakin University	Iran	SES
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
Ha, The An (2017)	AISRF Deakin Affiliate	Na-Air cells	Deakin University	Vietnam	SES
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
Mladenovska, Tajanka (start 2016 maternity leave 2017, part time currently)	UOM	Innovation, commercialisation and regulation of 3D-BioPrinted surgically implantable orthopaedic medical devices	University of Melbourne	Macedonia	SBS/EPE
Affiliated Masters					
Ane Urigoitia Asua	EU-Biofab project	MPhil Biofabrication - Collagen Printing	Utrecht University/UOW	Italy	SBS
Jacopo Bani	EU-Biofab project	MPhil Biofabrication - 3D Co-axial Bioprinting for Cartilage Repair and Regeneration	Utrecht University/UOW	Italy	SBS
Kuan Phang Chan	IPTA	MPhil Biofabrication - 3D Printing for Bone Regeneration	University of Wollongong	Malaysia	SBS
Markus Ebert	EU-Biofab project	MPhil Biofabrication-3D printed graphene-flexible electrodes	Wurzburg University/UOW	Germany	EM/SBS
Narangerel Gantumur	IPTA	MPhil Biofabrication- Encapsulation of VEGF for islet transplantation	University of Wollongong	Mongolia	SBS
Anne Gruska	EU-Biofab project	MPhil Biofabrication- Parameter optimisation of co-axial melt extrusion writing.	Wurzburg University/UOW	Germany	EM
Borja Sanz Gutierrez	EU-Biofab project	MPhil Biofabrication- Evaluation of marine collagen for 3D bioprinting	Utrecht University/UOW	Spain	SBS
Hannah Haag	EU-Biofab project	MPhil Biofabrication-3D printed structures for cartilage growth in predestined shape with high resolution.	Wurzburg University/UOW	Germany	SBS

Name (Start Year)	Funding Source	Project Description	Node	Country of Origin	Program Theme
Sulokshana Marks	IPTA	MPhil Biofabrication- Development of nanostructured cellulosic inks for wound healing application	University of Wollongong	Sri Lanka	SBS
Max Renes	EU-Biofab project	MPhil Biofabrication- Towards the fabrication of pancreatic islet tissue constructs through co-axial bio-printing	Utrecht University/UOW	Netherlands	EM/SBS
Ane Albillos Sanchez	EU-Biofab project	MPhil Biofabrication-Nerve/ muscle cell simulation	Utrecht University/UOW	Spain	SBS
Stefan Zaharievski	EU-Biofab project	MPhil Biofabrication- 3D printed drug delivery systems – towards a dual drug infused membrane for treatment of epilepsy	Utrecht University/UOW	Macadonia	SBS
Gabriel Comeron Castillo	MESC – 6 month project	Harvesting waste heat using thermoelectrochemical cells	Deakin University	Spain	SES
Affiliated Honours					
Emma James	Honours	Direct piezoelectricity for 3D human neural tissue engineering and remodelling	University of Wollongong	Australia	SBS

TABLE 12: ACES WORK SUBMITTED FOR EXAMINATION 2019

Name	Project Description	Node	Country of Origin	Program Theme
Alex Nagle ACES Core PhD	Nano-printing	University of Wollongong	Ireland	EM
Bidita Binte Salahuddin ACES affiliate PhD	Hydrogel McKibben artificial muscles	University of Wollongong	Bangladesh	SR
Stephens-Fripp, Benajmin RTP-ACES affiliate PhD	A minimally invasive interface between a prosthetic hand and its user	University of Wollongong	Australia	SR
Manjunath Chatti ACES Core PhD	Photo-processes-MoS ₂ nanosheets integrated into graphene matrix for enhanced hydrogen evolution	Monash University	India	EM/SES
Colin Kang APA-ACES Affiliate PhD	Electrochemical reduction of nitrogen gas to ammonia	Monash University	Australia	SES
Sidra Waheed ACES Core PhD	3D fabricated micro-fluidic manifolds – design and characterisation	University of Tasmania	Pakistan	EFD
Masters Students				
Karmjeet Kaur Buttar	MPhil Electromaterials	Deakin University	Deakin University	SES
Marius Berthel	MPhil Biofabrication- Dual drug-eluting collagen matrix for epilepsy treatment	Wurzburg University/ University of Wollongong	Germany	SBS
Maxim Brodmerkel	MPhil Biofabrication- 3D printed degradable stents with controlled drug delivery capabilities	Wurzburg University/ University of Wollongong	Germany	SBS
Diego Castaneda Gray	MPhil Biofabrication - 3D printed degradable stents with controlled drug delivery capabilities	Utrecht University/ University of Wollongong	Mexico	SBS

Name	Project Description	Node	Country of Origin	Program Theme
Thomas Robinson	MPhil Biofabrication - Corneal tissue engineering with methacrylated gellan gum	University of Wollongong	Australia	EM/SBS
Gilles van Tienderen	MPhil Biofabrication- Towards an innervated in vitro 3D corneal tissue model	Utrecht University/ University of Wollongong	Netherlands	SBS

TABLE 13: SUCCESSFUL COMPLETIONS ACES 2014-2019

Name	Degree	Project Description	Node	Program Theme	What was next?
Completed 2015					
Keira Grierson	Honours International Bachelor of Science		University of Wollongong	SBS	
Completed 2016					
Benjamin Noble	Affiliate PhD	Study stereoregulation in radical polymerization	ANU	EM	ECR ACES
Richmond Lee	Affiliate PhD	Studying reactive oxygen chemistry and its role in oxidative degradation in materials and biology	ANU	EM	Research Singapore
Completed 2017					
Ken Chun	Core PhD	Develop novel nanoporous metals for electrochemical applications	Monash University	SES	
Shannon Bonke	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
Danah Al-Masri	Core PhD	New redox couples and ionic liquid electrolytes for thermal energy harvesting	Deakin University	SES	ECR Deakin University
Reece Gately	Affiliate PhD	3D printed robotic hand	University of Wollongong	SR	
Qi Gu	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
Xiaoteng Jia	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
Simon Maksour	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	

Name	Degree	Project Description	Node	Program Theme	What was next?
Danial Sangian	Affiliate PhD	Developing a new type of McKibben artificial muscles	University of Wollongong	SR	Alexander von Humboldt Postdoctoral Fellow, Technical University of Berlin, Germany
Completed 2018					
Diogo Cabral	Core PhD	Novel redox couples for redox flow batteries	Monash University	SES	
Ahmed Halima	Monash Scholarship – Affiliate PhD	Novel Si-based photocathode assemblies.	Monash University	SES	
Dijon Hoogveen	Core PhD	Dye-Sensitized photocathodes catalysing light driven reduction	Monash University	EM/SES	
Fengwang Li	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 2019 awarded ARC DECRA
Haitao Li	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	
Jun (Rossie) Rao	Core PhD	3D nanostructured electrolytes	Deakin University	EM	
Mathew Russo	ACES MPhil Electromaterials	Development of quasi-solid state electrolytes for thermal energy harvesting	Deakin University	SES	
Shazed Md Aziz	Affiliate PhD	Polymer fibre artificial muscle	University of Wollongong	EM/SR	
Sarah-Sophia Carter	MPhil Biofabrication masters	Development of bioprinting platforms for bioartificial pancreas constructs	Utretch University/ University of Wollongong	SBS	Uppsala University, Sweden
Syamak Farajikhah	Core PhD	Sensor systems for fluidics	University of Wollongong	EM/EFD	ECR University of Sydney
Yu Ge	UPA–ACES Core funded project PhD	Graphene and its inorganic analogues based materials for energy storage device	University of Wollongong	EM/SES	Postdoctoral China
Charles Hamilton	ACES Masters Cored funded	Printable tough, thermally-active hydrogel actuators	University of Wollongong	SR	Doing medical degree US
Sylvia van Kogelenberg	MPhil Biofabrication masters	Fabrication of ulvan based structures for cell culture in wound healing	Utretch University/ University of Wollongong	SBS	ING Netherlands, Amsterdam
Zan Lu	CSC Scholarship – Affiliate PhD	Carbon nanotube fiber and its application in garment and wearable sensors	University of Wollongong	EM/SES	
Yuqing Liu	Affiliate PhD	Flexible 3D electrodes via extrusion-printing for flexible and wearable device	University of Wollongong	EM	ECR ACES UOW
Sam Rathbone	Honours Bachelor of Science	The stimulating application of nanoparticles in neural stem cells	University of Wollongong	SBS	PhD affiliated to ACES

Name	Degree	Project Description	Node	Program Theme	What was next?
Tian Zheng	UOW matching scholarship -Affiliate PhD	Development of magnetoelectric polymer composites	University of Wollongong	EM/SBS	ECR Melbourne University
Yan Zong	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
Vipul Gupta	Affiliate PhD	New composite and micro/nanostructured materials for chemical analysis	University of Tasmania	EFD	ECR ACES
Feng Li	Affiliate PhD	Microfluidic devices with integrated nanochannels for sample-in/answer-out analysis of pharmaceuticals from body fluids.	University of Tasmania	EFD	
Completed 2019					
Wed Al-Graiti	Iraqi Govt Affiliate PhD	Development of functionalised nanoporous carbon fibre electrodes for probe-sensing technology	University of Wollongong	EM	
Tom Barsby	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
Zhi Chen	ACES core PhD	Bio inks for stem cells	University of Wollongong	EM/SBS	ECR ACES UOW
Jaecheol Choi	ACES core PhD	Electrocatalytic reduction of CO ₂	University of Wollongong	EM/SES	ECR Monash University
Sayed Mohammad Javadi	Affiliate PhD	Developing graphene oxide based composite materials capable of acting as a temperature sensor	University of Wollongong	EM	Aussie Bee
Daniel Reynolds James	Grad Cert Biofabrication		University of Wollongong		
Juliane Kade	EU- MPhil Biofabrication	3D hybrid printed structures for auricular cartilage regeneration	Wurzburg University/UOW	SBS	Functional Materials in Medicine & Dentistry University Hospital, Wurzburg
Jianfeng Li	ACES core PhD	Electrical stimulation cell effects-molecular markers.	University of Wollongong	SBS	Post Doc Max Plank Institute Germany
Declan Maher	Grad Cert Biofabrication		University of Wollongong		
Fahimeh Mehropouya	ACES core PhD	Polymeric nanodispersion and growth factors	University of Wollongong	EM/SB	Postdoctoral Research Associate, School of Physics, University of Sydney

Name	Degree	Project Description	Node	Program Theme	What was next?
Laura Blanco Peña	MPhil Biofabrication	3D printing flexible electrodes	Utrecht University/UOW	EM/SBS	
Christina Puckert	ACES core PhD	Cell-material interactions using Bio-AFM	University of Wollongong	EM/SB	At a company in Germany
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
Farzad Shahangi	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
Charbel Tawk	ACES core PhD	Actuators, sensors and support for robotic hand	University of Wollongong	SR	
Gregor Weisgrab	EU-MPhil Biofabrication	Novel fabrication methods for collagen-based implantables for the cornea	Utrecht University/UOW	EM/SBS	Vienna University of Technology, Vienna
Joanne Williams	MPhil Biofabrication	3D printing controlled drug delivery systems	University of Wollongong	EM/SBS	Systems Manager Peoplecare Health Fund
Cody Wright	ACES core PhD	Electro-printing	University of Wollongong	EM	Compliance Specialist Waters Corporation
Yang Xiao	Affiliate PhD	The synthesis and characterisation of photoactive materials and their use in the chemopropulsion-based fluidic transport systems.	University of Wollongong	EM	
Changchun Yu	PhD CSC with an ACES extension	Functional batteries for cellular communications	University of Wollongong	SBS	Postdoctoral research position Wenzhou Medical University China
Long Zhang	ACES affiliate PhD – matching UOW scholarship	Electrostatic control over radical reactions at solid/ liquid interfaces	University of Wollongong	EM	Post Doctoral research position at Sydney University, Sydney
Yong Zhao	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
Srdjan Begic	ACES core PhD	Characterisation and modelling of 3D electrolytes & active metal interphases	Deakin University	EM/SES	
Karolina Biernacka	European Masters (MESC)	Materials for Energy Storage and Conversion	Deakin University	SES	PhD ACES
Aleksandra Grzelak	European Masters (MESC)	Materials for Energy Storage and Conversion Masters	Deakin University	SES	
Mary Kalani Erangi Periyapperuma Achchige	ACES core PhD	Energy storage for soft robotics	Deakin University	SES/SR	

Name	Degree	Project Description	Node	Program Theme	What was next?
Abuzar Taheri	ACES core PhD	Integrating 3D materials in thermoelectrics-new solid and liquid electrolytes and 3D electrocatalysts for thermal energy harvesting	Deakin University	SES	Research assistant at the University of Melbourne
Changlong Xiao	ACES core PhD	3D structural control of ionic conduction	Monash University	EM/SES	
Ying (Sherry) Zhang	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
Lilith Caballero Aguilar	ACES core PhD	3D printing of drug delivery structures	Swinburne University of Technology	SBS	Univeristy of Melbourne at St Vincent's Hospital Melbourne
Catherine Ngan	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
John Viana	ACES affiliate PhD	Ethical issues involved in recruiting people with dementia for clinical trials	University of Tasmania	EPPE	

TABLE 14: ASSOCIATE INVESTIGATORS 2019 WITH ACES ACKNOWLEDGEMENT OR DEEDS IN PLACE

Name	ACES Node	AI affiliation	Program Theme	AI RF or AI
Ali, Saleem	Center for Energy and Environmental Policy	Newark, USA	EPPE	AI
Beirne, Stephen	University of Wollongong	UOW, Australia	EM-fabrication	AI RF
Chung, Johnson	University of Wollongong	UOW, Australia	EM/SBS	AI RF
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	UOW, Australia	EM	AI RF
Harris, Alex (Jan-June)	University of Wollongong	UOW, Australia	EM/SBS	AI RF
Huang, Xu-Feng	University of Wollongong	UOW, Australia	SBS	AI
Jalili, Rouhollah (Ali)	University of Wollongong	UNSW, Australia	EM	AI RF
Liu, Xiao	University of Wollongong	UOW, Australia	EM/SBS	AI RF
McCaul, Margaret	University of Wollongong	UOW, Australia	EM/SBS	AI RF
Morrin, Aoife	University of Wollongong	Dublin City University, Ireland	EM/SBS/EFD	AI
Mutlu, Rahim	University of Wollongong	UOW, Australia	SR	AI RF

Name	ACES Node	AI affiliation	Program Theme	AI RF or AI
Nattestad, Andrew	University of Wollongong	UOW, Australia	EM/SES	AI RF
Oetomo, Denny	University of Wollongong	University of Melbourne, Australia	SR	AI
Sayyar, Sepidar	University of Wollongong	UOW, Australia	EM	AI RF
Sencadas, Vitor	University of Wollongong	UOW, Australia	SR	AI RF
Sutton, Gerard	University of Wollongong	UOW, Australia	EM/SBS	AI
Yue, Zhilian	University of Wollongong	UOW, Australia	SBS	AI RF
Zhang, Binbin	University of Wollongong	Yokohama National University, Japan	EM/SBS	AI RF
Bond, Alan	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
Greene, Wren (George)	Deakin University	Deakin, Australia	SBS/EFD	AI
Kerr, Robert	Deakin University	Deakin, Australia	SES	AI RF
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
Mecerreyes, David	Deakin University	POLYMAT of the Basque Country, Spain	EM/SES	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
Neilsen, Jan	University of Tasmania	UTAS, Australia	EPPE	AI
Choong, Peter	University of Melbourne, Australia	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
Onofrillo, Carmine	University of Melbourne	St Vincents Hospital, Melbourne, Australia	SBS	AI RF
Quigley, Anita (July-Dec)	University of Melbourne	St Vincents Hospital, Melbourne, Australia	SBS	AI RF
McArthur, Sally	Swinburne University of Technology	Swinburne University of Technology, Australia	EM/SBS	AI
Stoddard, Paul	Swinburne University of Technology	Swinburne University of Technology, Australia	EM/SBS	AI

2020 Activity Plan

RESEARCH

Utilise the knowledge gained in fluidics and diagnostics, synthetic energy systems, synthetic biosystems and soft robotics – specifically to:

- ▶ Develop devices for CO₂/N₂ reduction based on novel electrode configurations and cell designs
- ▶ Develop a sodium-air battery prototype
- ▶ Develop a thermoelectrochemical cell prototype
- ▶ Develop the 'brain on a bench' system specifically targeted at understanding development of schizophrenia and epilepsy and designing novel interventions
- ▶ Develop a soft robotic hand that integrates sensing components and interfaces to the neural system
- ▶ Develop strategies to address ethical, policy and regulatory issues that arise from technical advances in each of these areas

Ongoing activities in the electromaterials theme will ensure modification and supply of material components for the above systems to deliver optimal performance.

High-level performance in manufacturable systems will be delivered using state of the art approaches to fabrication and contactless characterisation.

RESEARCH TRAINING

The emphasis will be on skills for career development, including preparing curriculum vitae (CV), engaging in social media and interview skills. Key research skills training for ACES researchers in research methods, material characterisation, entrepreneurship and innovation and ethics and public engagement will continue.

TRANSLATION COMMERCIALISATION

Utilise translational facilities BatTRIhub, TRICEP and Biofab@ACMD (St Vincents Hospital, Melbourne) to progress commercial readiness in the following selected areas:

- ▶ Soft Robotics: the prosthetic hand
- ▶ Energy: CO₂/N₂ reduction, sodium-air batteries and thermoelectrochemical cells
- ▶ 3D Bioprinting: translational activities, which includes supply of bioinks and customised bioprinters for research and training purposes

GLOBAL ENGAGEMENT

Continue to develop international collaborative research opportunities with newly established international alliances.

COMMUNICATIONS

Continue to communicate the outcomes and achievements of the Centre nationally and internationally through social and mainstream media, ongoing annual events and specific events such as the Biofab 2020 public lecture and New Dimensions magazine launch.

Host events:

- ▶ the annual Bill Wheeler Student Award for 'Bionics' research
- ▶ a Science Week event
- ▶ the annual Leon-Kane Maguire public lecture
- ▶ a public lecture as part of Biofab 2020

Other communication activities will focus on the ACES legacy, including promoting the ACES experience through graduation/exit videos, an Alumni podcast, and translational case studies from TRICEP and BatTRIHub.

Supplementary Information

APPENDIX 1: STAKEHOLDER ENGAGEMENT ACTIVITIES OF THE EPPE TEAM IN 2019

Description of Engagement Activities ACES EPPE Group	
1.	'Just transition and community energy' seminar, Australian-German Climate and Energy College, 14 January 2019.
2.	'Smart Energy & The Climate Emergency' Seminar at Smart Energy Council, 7 March 2019.
3.	Webinar on 'Coal, Climate change mitigation and populism' at Climate and Energy College, Melbourne University, 13 March 2019.
4.	Seminar on 'Achieving Net Zero without carbon taxes' Seminar at Australian-German Climate & Energy College, Melbourne University Campus, 15 March 2019.
5.	Hepburn Wind Board meeting 19 March 2019.
6.	Future for Wind in Australia' at Energy Transitions Hub, Melbourne University Campus, 20 March 2019.
7.	'Utility-Scale Solar' webinar and networking event, Clean Energy Council, 21 March 2019.
8.	'The SDGs: A new politics of transformation?' Lecture, Sussex Development Centre, 28 March 2019 (virtual).
9.	Hepburn wind Future Generation Working Group, 29 March 2019.
10.	'Rocky Hill Coal Project: CC Litigation' at Australian-German Climate & Energy College, Melbourne University, 1 April 2019.
11.	Webinar on 'Coal, Climate change mitigation and populism' at Climate and Energy College, Melbourne University, 13 March 2019.
12.	Seminar on 'MEI Garnaut Lecture: Climate Change Policy in Australia' at Australian-German Climate & Energy College, Melbourne University, 3 April 2019.
13.	Seminar on 'MEI Garnaut Lecture: Climate Change Policy in Australia' at Australian-German Climate & Energy College, Melbourne University, 11 April 2019.
14.	'Climate Justice' lunch seminar and networking event, Brotherhood of St Laurence, Fitzroy, 11 April 2019.
15.	'Radical Collaboration & Blockchain for the Climate & Energy Transition' webinar, Melbourne University, 16 April 2019.
16.	MEI Garnaut Lecture: International & Domestic Economics of CC' at Australian-German Climate & Energy College, Melbourne University, 17 April 2019.
17.	MEI Garnaut Lecture: Climate Change Policy in Australia' at Australian-German Climate & Energy College, Melbourne University, 23 April 2019.
18.	MEI Garnaut Lecture: Decarbonising electricity with security reliability and lower costs' at Australian-German Climate & Energy College, Melbourne University, 24 April 2019.
19.	Hepburn Wind Finance and Risk Committee and board meeting, 29 April 2019.
20.	MEI Garnaut Lecture: Decarbonising electricity with security reliability and lower costs' at Australian-German Climate & Energy College, Melbourne University, 1 May 2019.
21.	Mayday SOS Westernport Flinders Meet the Candidates: 2 May 2019.
22.	'Our Power' Film Screening & Panel Discussion on social impact of Morwell coal fires 2014 at ARENA Project Space, Fitzroy, 3 May 2019.
23.	Webinar 'Laying the foundations today for the grid of tomorrow', Melbourne University, 8 May 2019.
24.	MEI Garnaut Lecture: Transforming Land Use & Food Production' at Australian-German Climate & Energy College, Melbourne University, 8 May 2019.
25.	Skype meeting with Dr Jay Joseph, The American University of Beirut, to discuss collaborations on renewable energy in conflict-affected states (e.g. Iraq), 8 May 2019.
26.	Webinar on 'Laying the foundations today for the grid of tomorrow', Melbourne University, 8 May 2019.
27.	Working Group meeting, Business for Peace PRME/UN Global Compact, to outline promotional plan for outreach on research expertise in B4P and energy, 14 May 2019.
28.	MEI Garnaut Lecture: Australia – Superpower of the Zero Emissions Global Economy' at Australian-German Climate & Energy College, Melbourne University, 15 May 2019.
29.	Webinar on 'Explaining Spatial Variation in Small-Scale Solar Uptake', Melbourne University, 22 May 2019.
30.	Seminar "The Challenge of Extremism", which relates to business and media roles in preventing violent extremism at the Melbourne Press Club, and Australian Intercultural Society, Melbourne, 29 May 2019.
31.	Webinar on 'Aggregation in RE – Themes & Challenges', Melbourne University, 29 May 2019.
32.	Webinar on 'Growing Resilient Coal Regions: The Gippsland Smart Specialisation Strategy', Melbourne University, 3 June 2019.
33.	Webinar on 'The importance of NECPs for the development of prosumers initiatives in the EU', REScoop Europe, 11 June 2019.

Description of Engagement Activities ACES EPPE Group	
34.	Webinar on 'Energy Entrepreneurial Ecosystems' at Australian-German Climate & Energy College, Melbourne University, 12 June 2019.
35.	Participated in the Working Group meeting, Business for Peace PRME/UN Global Compact, 18 June 2019.
36.	Webinar on 'Bridging the divide: uniting regional communities for climate action' at Australian-German Climate & Energy College, Melbourne University, 19 June 2019.
37.	Webinar on 'Australian Battery Performance', Smart Energy Council, 20 June 2019.
38.	Webinar on 'The Energy Transition and the Politics of Coal in Germany', Australian-German Climate & Energy College, Melbourne University, 16 July 2019.
39.	Meeting with Ahmet Keskin from the Australian Intercultural Society to discuss planning of a presentation and panel in Melbourne on business and social cohesion, and inviting small businesses including renewable energy Australian business to participate in a panel discussion, 18 July 2019.
40.	Seminar on 'The Future of RE: Germany's Energy Transition, Australia and the ACT' at Australian-German Climate & Energy College, Melbourne University, 22 July 2019.
41.	Seminar on 'Energy Futures: Australia's Energy Policy over the next 10 years', Melbourne University, 23 July 2019.
42.	Webinar on 'The Europeanization of the RE Directive', Melbourne University, 31 July 2019.
43.	Webinar on 'IoT Utilities & Energy' at EY Headquarter, Melbourne CBD, 8 August 2019.
44.	Seminar on 'The 10GW Vision for NT', Speaker Vanessa Petrie, CEO BZE, at Energy Transition Hub, Australian-German Climate & Energy College, Melbourne University, 21 August 2019.
45.	Cherian, Matthew (2019) ACES PhD Deakin attended a Deakin University reception with the Vice Chancellor Dr Ian Martin and a group of senior heads in Delhi, 2 September 2019.
46.	Interviewed key stakeholder Antje Grothus, Buir, NRW, Germany, 3 September 2019.
47.	Interviewed key stakeholder Prof Felix Ekhardt, Skype for Business, 3 September 2019.
48.	Dr Natalie Ralph, EPPE Research Fellow, moderated panel at In The Zone 2019: Critical Materials: Securing Indo-Pacific Technology Futures, focusing on the sustainability and security challenges facing critical materials industries, September.
49.	Webinar on 'Optimal Hydrogen Supply Chain: Co-Benefits for Integrating RE Sources', Melbourne University, Australian-German Climate & Energy College, 17 September 2019
50.	Webinar on 'Introduction to designing community energy projects with strong community participation', presented by Dr Jarra Hicks, Community Power Agency, 19 September 2019
51.	Guest lecture presentation on 'Germany's Climate Policy Developments' at Deakin Burwood AIP245 Environmental Politics Seminar, 23 September 2019.
52.	Webinar on "To Build Enduring Peace: The Role of SMEs in Conflict Zones", presented by Dr. Jay Joseph, Olayan School of Business, American University of Beirut, organised by the PRME Business for Peace (B4P) Working Group, 24 September 2019.
53.	Webinar on 'Designing Community-Owned Energy Projects with Strong Community Participation', Community Power Hub, 26 September 2019.
54.	Webinar on 'Welfare Consequences of Coal Exit for Coal Workers', Dr Luke Haywood, Energy Transition Hub, Australian-German Climate & Energy College, Melbourne University, 30 September 2019.
55.	Dr Barbara Bierer's discussion of ethical issues arising in multi-regional clinical trials center of Brigham and Women's Hospital, as part of Sydney Health Ethics Conversation, University of Sydney , 1 October 2019.
56.	Sydney Ideas Panel: Precision Medicine – Can it live up to the hype? University of Sydney 2 October 2019.
57.	Skype meeting with colleagues in the UN/PRME Business for Peace Working Group to discuss company engagement strategy, 29 October 2019.
58.	Webinars on 'Community Energy', Community Power Agency, 3, 10 and 17 October 2019.
59.	Policy Pitch Event 'How to manage coal closures', Grattan Institute, State Library Victoria, 8 October 2019.
60.	Webinar on 'The German Energy Transition: Opportunities, Challenges and Collaboration with Australia', Australian-German Climate & Energy College, Melbourne University, 22 November 2019.
61.	Global Climate Strike, 29 November 2019.
62.	Webinar – Madrid - COP25 Half Way Point. This webinar was an update on COP25, 8 December 2019
63.	Melbourne Energy Institute Energy 2019 symposium on Australia's energy market and the role of renewables, 13 December 2019.

APPENDIX 2: ACES RESEARCH TRAINING AND MENTORING EVENTS 2019

Research Training and Mentoring Events/Meetings 2019		Date	Venue	Attendees Registered
1.	Meet the International Researcher for small group discussions. Prof Jurgen Groll from the University of Wurzburg Germany , a pioneer in the development of bioinks for 3D printing was available to discuss issues with designing ink compositions and the characterisation of bioink performance. Prof Groll holds the chair for Functional Materials in Medicine and Dentistry at the University Hospital Wurzburg. Prof Mario Romero-Ortega from University of Texas Dallas US , is at the forefront of advances in electroceuticals. A bioengineer, Mario research interests are on the repair of peripheral nerve gaps and the treatment of spinal cord injuries.	5-6 Feb	iC campus UOW Wollongong	61 registered interest but could only accommodate 16 in small group discussions. Both guests gave seminars and were available for questions post seminar.
2.	Interfacing Sutrode with Nerves and Muscles hands on Workshop with international collaborator Mario Romero-Ortega from University of Texas Dallas. The team from ACES UOW in collaboration with researchers from the University of Texas at Dallas, have developed novel graphene fibres as a new electrical stimulation device that could replace the use of pharmaceuticals to treat a range of medical conditions. Up until recently, implantable electrodes for electroceuticals were created using standard materials, which resulted in some compatibility issues with soft tissue, therefore limiting the effectiveness of the electrical communication with the nerve. To combat this challenge, the ACES team used the traditional wet spinning fabrication method to manufacture a new style of fibre based on graphene to develop the 'sutrode', which combines the electrical properties of an electrode with the mechanical properties of a suture. These sutrodes have demonstrated significantly improved electrochemical activity within nerves, and are stiff enough to penetrate soft nerve tissue, yet flexible enough to accommodate for micro-movements once implanted. You can listen to Prof Wallace and Prof Romero-Ortega's further explanation of this ground-breaking work in a recent interview with ABC Illawarra's Nick Rheinberger. https://soundcloud.com/electromaterials/prof-gordon-wallace-and-prof-mario-romero-ortega-talking-sutrodes-on-abc-illawarra	9 Feb	St Vincent's Hospital Melbourne	12 ► 5 ACES CIs ► 4 ACES RF ► 2 PhD students ► 1 International collaborator
3.	13th Annual International Electromaterials Symposium and associated ACES Showcase. The symposium featured renowned speakers from USA, France, Japan, UK, Spain, India, Korea and Australia. It brought together leading researchers engaged in ground-breaking materials science, presenting an opportunity to review the most recent advances in materials science, new electrochemical applications and fundamental understanding in this important field of electromaterials. Topics covered both the fundamental and applied aspects of electromaterials and new devices across our broad areas of research in Health, Energy and Ethics. Feedback included: Chairs: to allow more time for audience questions rather than offering personal discussions at breaks with the speaker; that is to have more emphasis on open discussions and to keep speakers to their time limits. Speakers: ► Attendees were happy with the background explanations provided by the speakers on the many quite different application areas covered but further work could be done on contextualizing the research problem being addressed. ► The speakers who told a story and explained concepts were far more beneficial to attendees as these provide a platform for cross-disciplinary research discussion than those that presented too much data on their particular topic. Organisers: ► The ability to network was invaluable to many. ► Showcasing the devices was excellent - brought to life the research. ► A few would like multiple sessions to focus further on individual themes. To include more product/commercial development case studies in the translational talks; more topics on entrepreneurship; speakers to articulate the impact of ACES work <i>over the previous year</i> with potential timelines to impact.	11-13 Feb	The Pier Geelong Waterfront, Victoria, Australia	165 academics and 27 industry

Research Training and Mentoring Events/Meetings 2019		Date	Venue	Attendees Registered
4.	ACES Solar Fuels face-to-face meeting for all interested ACES researchers and collaborators. Attendees heard 16 short presentations on current projects, each followed by 5-10 minute discussions and planning.	13 Feb	The Pier Geelong Waterfront, Victoria, Australia	22
5.	Clinical Connections workshop. This event brings together clinicians, scientists and engineers from around Australia to share in the celebration of advances over the past 12 months and to articulate ongoing challenges and plans to tackle those challenges. This year the attendees heard about advances in corneal regeneration, printed ears, treating sleep apnoea, bone and cartilage regeneration as well as customised printers developed for islet cell transplantation, challenges for permanently implantable percutaneous devices and innovations in cardiovascular imaging and modelling.	14 Feb	St Vincent's Hospital Melbourne	40 <ul style="list-style-type: none">▶ 6 ACES CIs▶ 8 ACES RF/ ECR▶ 4 ACES AI▶ 8 industry▶ 4 ACES PhD▶ 13 clinicians
6.	Contactless Characterisation Biosystem Workshop. As ACES forge ahead on tissue regeneration using 3D bioprinting there is a need to develop more rapid, non-destructive characterisation tools that inform researchers on what they have built. This workshop articulated the challenges and explored possible solutions to those challenges. The ability to determine the physical and chemical properties of 3D printed structures as well as ascertain the viability and ongoing ability of cells to proliferate and differentiate in a predetermined manner is critical.	18 Feb	iC campus UOW Wollongong	56 <ul style="list-style-type: none">▶ ACES CIs▶ 1 ACES PI▶ 6 ACES RF/ ECR▶ 5 ANFF▶ 16 ACES PhD or master students▶ 8 external students▶ 3 international academics▶ 1 national academic
7.	3D Printing for Islet Cell Transplantation Workshop. ACES researchers have been working in conjunction with Royal Adelaide Hospital to develop breakthroughs in 3D bioprinting insulin-producing islet cells to overcome some of the critical limitations in current cell transplantation. While pancreatic islet cell transplantations have become a promising treatment for Type 1 diabetes, there can be poor cell survival rates due to a number of factors. This workshop articulated the challenges in current procedures and provided novel approaches to confronting these, utilising our fundamental research in materials science to create tailored solutions to address specific medical challenges.	19 Feb	iC campus UOW Wollongong	28 <ul style="list-style-type: none">▶ 3 ACES CIs▶ 1 ACES PI▶ 1 ACES ECR▶ 8 ANFF▶ 11 ACES PhD or master students▶ 2 international academics▶ 2 clinical collaborators
8.	Materials in Medicine: ACES/IHMRI Joint Workshop. In conjunction with IHMRI ACES hosted this workshop to facilitate further collaboration between researchers. Attendees were given the opportunity to discover the opportunities available for academic and clinician researchers to utilise the ACES internationally recognised expertise in bionics, electromaterials and 3D structures in their own research programs. 31 of the attendees toured TRICEP. TRICEP is facilitating the development of commercial opportunities in 3D Bioprinting supported by ACES and ANFF materials node.	26 Feb	iC campus UOW Wollongong.	61 <ul style="list-style-type: none">▶ 12 ACES ECR, RF, CIs▶ 17 ACES PhD or affiliate PhD▶ 7 ACES AIs UTAS or UOW▶ 19 IHMRI members▶ 6 ANFF

Research Training and Mentoring Events/Meetings 2019		Date	Venue	Attendees Registered
9.	Biomedical Futures 2 : Values, responsibility, critical engagement in nanotechnology and electromaterials This was a research symposium co-sponsored by the ARC Centre of Excellence in Convergent Bio-Nano Science and Technology (CBNS) & ARC Centre of Excellence for Electromaterials Science (ACES). Why a Symposium? Advances at the interface between the material and biological sciences, in fields such as bio-nano science and electromaterials, will pose profound ethical and social challenges for societies. At the same time, these techno-sciences are being shaped by social institutions in law, culture, healthcare, and politics. How should scientists understand how their fields are both shaped by and shaping society today? This symposium brought together collaborative innovations in biomedical research, which address this shaping in disciplines of bioethics, science and technology studies (STS) and science communication. Focusing on research in nanotechnology and electromaterials – with an emphasis on the development of biomedical technologies, therapies and devices – the aim was to foster careful dialogue about the social, political, and ethical dynamics of technosciences by enabling interdisciplinary exchange between social science, humanities and laboratory practitioners. Who is it for? The research symposium was designed for ECRs and PhDs in the ARC Centre of Excellence in Convergent Bio-Nano Science and Technology (CBNS) & ARC Centre of Excellence for Electromaterials Science (ACES) and collaborative partners. The focus was on three core themes: Values, responsibility, critical engagement in nanotechnology and electromaterials. Through a series of presentations and panel discussions, the workshop explored innovations in biomedical research and the potential offered by early critical engagement for translation. Feedback from attendees stated overwhelmingly that they had a new awareness of the importance of ethical considerations in every aspect of the research pathway. Quite a few also said they took away from this event ideas about how to approach collaboration and how to consider end-users as collaborators. One suggestion was to include some case studies rather than to always talk subjectively.	7 Mar	UNSW Sydney	38
10.	Webinar – Grant Writing for Success. This session was run by Robin Taylor, Deakin's Institute for Frontier Materials' Marketing and Communications Manager and Grant Officer, who has a wealth of experience in writing grant applications. The interactive webinar included tips and tricks on writing a successful grant proposal including: <ul style="list-style-type: none">▶ Types of grants available▶ How to target the correct audience▶ What to include and what not to include in your application▶ Appropriate writing style and language pointers	11 Mar	Virtual	18 <ul style="list-style-type: none">▶ 7 ACES ECR▶ 4 ACES RF▶ 3 ACES PhD▶ 1 ACES AI▶ 1 ACES CI
11.	NSW Chief Scientist and Engineer Address. Prof Hugh Durrant-Whyte. The NSW Chief Scientist and Engineer consults widely with academia, industry and government to ensure scientific knowledge and research can be adapted and used to benefit NSW, and drive innovation in the state. Researchers had the opportunity to hear from Prof Hugh Durrant-Whyte on the work of the Office of the NSW Chief Scientist and the various funding and support mechanisms the office has in place.	13 Mar	iC campus UOW Wollongong	35 <ul style="list-style-type: none">▶ 2 ACES ECR▶ 3 ACES RF▶ 11 ACES PhD▶ 2 Biofab masters▶ 4 ACES AI▶ 4 ACES CI▶ 2 ANFF▶ 7 external to ACES

Research Training and Mentoring Events/Meetings 2019		Date	Venue	Attendees Registered
12.	3D Bioprinting for Wound Healing and Artificial Skin Workshop. Discoveries in the area of biomaterials and advanced fabrication technologies are having a profound effect on how we think about wound healing strategies and the creation of artificial skin. In this workshop, we explored recent advances and the challenges that remain to be addressed to ensure practical applications in a clinical environment emerge. Former Australian of the Year Dr Fiona Woods from the Fiona Woods Foundation was the plenary speaker.	6 May	iC campus UOW Wollongong	30 <ul style="list-style-type: none"> ▶ 1 ACES ECR ▶ 4 ACES RF ▶ 10 ACES PhD or affiliated PhD ▶ 6 Biofab masters ▶ 3 ACES AI ▶ 4 ACES CI ▶ 2 ANFF
13.	Webinar –Writing a Great Paper. The session was run by the ACES communications director Prof Douglas MacFarlane who broke down the process for producing quality publications. Paper writing is an important part of every researcher career. Producing quality publications is essential to keeping a quality academic career on track and excelling in the field. The webinar covered: <ul style="list-style-type: none"> ▶ Defining the story of your paper ▶ Breaking down the writing process into digestible steps ▶ Constructing a great paper ▶ Tips to ensure you achieve your highest possible standard of writing. 	2 Apr	Virtual	57 <ul style="list-style-type: none"> ▶ 4 ACES RF ▶ 16 ACES PhD or affiliated PhD ▶ 3 masters ▶ 34 external to ACES
14.	ACES Electrofluidics & Diagnostics planning, progress and educational meeting for all interested ACES researchers and collaborators.	15 April	Virtual	
15.	ACES Synthetic Biosystems planning, progress and educational meeting for all interested ACES researchers and collaborators.	24 April	Virtual	
16.	ACES Synthetic Biosystems planning, progress and educational meeting for all interested ACES researchers and collaborators.	22 May	Virtual	
17.	28th Workshop of the NSW Stem Cell Network. ACES was a silver sponsor of this regional workshop that was put together to in-service researchers and others in the Wollongong area on the latest developments in stem cells and regenerative medicine. Keynote speakers included ACES RF Anita Quigley who spoke on 'on development of 3D scaffolds for tissue regeneration and interfacing with bionic devices' and ACES AI Dr Serena Duchi telling the attendees about bone and cartilage repair to treat osteosarcoma and rebuild compromised cartilage to prevent osteoarthritis. Other ACES members, RF and students, contributed talks whilst ACES CI Jeremy Crook was a co-organiser. The conference code of conduct for this event was derived by organisers from the ACES conference code of conduct.	11 June 2019	UOW, Wollongong	
18.	ACES @ DCU workshop – Storing, Converting and Transporting Energy. Advances in materials and fabrication technologies have had a profound effect on our ability to convert renewable energy sources into practically useful forms. Recent attention has turned to the storage and transportation of energy generated from renewable sources, in order to account for the temporal and geographical dimensions associated with energy from renewables. The symposium explored recent advances in addressing all of these challenges.	20 June	DCU, Dublin	64 <ul style="list-style-type: none"> ▶ 5 ACES CI ▶ 1 ACES ECR ▶ 1 ACES PhD ▶ 2 ACES AI ▶ 1 ACES PI ▶ 4 industry ▶ 50 academics external to ACES
19.	ACES @ DCU workshop – Advances in Materials for Medicine. Advances in materials and fabrication technologies have had a dramatic impact on fields such as tissue engineering, cell therapy and medical bionics. Clinical challenges such as bone and cartilage regeneration, development of more effective islet cell transplantation therapies and neural connectivity to electrodes for disease monitoring and control have been addressed. The symposium highlighted advances in a number of clinical areas and discussed the implementation of a translational environment that ensures delivery to patients in need.	21 June	DCU, Dublin	81 <ul style="list-style-type: none"> ▶ 8 ACES CI ▶ 1 ACES ECR ▶ 1 ACES PhD ▶ 4 ACES AI ▶ 1 ACES PI ▶ 6 Industry or clinician end-user ▶ 60 academics external to ACES

Research Training and Mentoring Events/Meetings 2019		Date	Venue	Attendees Registered
20.	Face to Face ACES Soft Robotics Planning and Progress Meeting.	3 July	iC campus Wollongong	
21.	Face to Face ACES Ethics, Public Policy and Engagement Planning and Progress Meeting.	3 July	iC campus Wollongong	
22.	ACES Full Centre Meeting “Boot Camp: Training for Translation”. This meeting included sessions given by external experts. A student lead committee, with representatives from each node, assisted in the design of the program and chaired sessions. Sessions included: <ul style="list-style-type: none"> ▶ ‘Equity and Diversity training session by Joanne Bartley, Principal for Culture and Change, ANSTO; ▶ Science communications session run at and by Wollongong Science Centre; ▶ ‘how to create an effective video’ by our ACES communications and media team; ▶ APR Intern program overview with Mark Ovens on how to join this service and potential outcomes; ▶ networking for building and maintaining research collaborations and social media by Katrina Robinson, Professional Development Consultant UOW; ▶ translating research training by Johnny Mang, Chief Venture Officer Med Tech Actuator – a startup; ▶ Translating research Q&A session run by Tillman Boehme, our ACES end-user engagement officer, with special guests Cameron Ferris, Inventia Life Science; Pia Winberg, Venus Shell systems; Johnny Mang, Chief Venture Officer Med Tech Actuator and Maria Forsyth, BatTRiHub. In addition, 13 theme ‘burst’ talks were given with representation from across all the ACES Themes and Nodes. In conjunction with the ACES FCM our communications team put together the top tips in a short video on how to make a video. An ACES video competition, designed to give all members the opportunity to learn some basic skills on video making, was run.	3-4 July	iC campus Wollongong	95 All ACES members or affiliates
23.	Face to Face Biosystems Planning and Progress Meeting.	4 July	iC campus Wollongong	12
24.	Face to Face ACES Electrofluidics & Diagnostics Planning and Progress Meeting.	4 July	iC campus Wollongong	
25.	Face to Face ACES BioSystems Planning and Progress Meeting. Members from ACES nodes of UOW, UOM and Swinburne were in attendance.	22 July	BioFab3D@ ACMD, St Vincent's Hospital Melbourne	19 <ul style="list-style-type: none"> ▶ 6 ACES CI ▶ 2 ACES RF ▶ 1 ACES ECR ▶ 4 ACES PhD ▶ 5 ACES AI ▶ 1 ACES end-user engagement officer
26.	Entrepreneurship and Innovation Certificate Course. This intensive week of lectures and coursework kicked off the 2018 program. Over the next nine months the teams refine their project and pitch culminating in a presentation to a panel of experts.	29 July- 2 Aug	Sydney Business School Sydney	17 All ACES PhD or affiliated PhD students
27.	2019 ACMD Research Week at St Vincent's Hospital. This ACES sponsored event brings together researchers, clinicians, nurses and other end-users to review the latest research activities.	5-8 Aug	St Vincent's Hospital Melbourne	
28.	Face to Face ACES BioSystems Planning and Progress Meeting.	9 Aug	St Vincent's Hospital Melbourne	

Research Training and Mentoring Events/Meetings 2019		Date	Venue	Attendees Registered
29.	Address by Prof Peter Choong titled 'What's New in 3D Printing - Patient Specific Solutions - Neurally Driven Prosthetics'. This was an opportunity to explore how discoveries in biomaterials and advanced fabrication technologies are having a profound effect on how we think about designing and personalising solutions for reconstructing bone and joint defects. Prof Peter Choong is the Sir Hugh Devine Professor of Surgery, Head of Department of Surgery University of Melbourne at St Vincent's Hospital Melbourne, and Director of Orthopaedics at St Vincent's Hospital Melbourne. Peter is also Chair of the Bone and Soft Tissue Sarcoma Service at the Peter MacCallum Cancer Centre. Peter has served continuously at the Australian Orthopaedic Association since 1996 and is the current Chair of the Research Committee and the recent past President of the AOA. Peter's research has received grant funding of over \$25 million (NHMRC, ARC, RACS, AOA, Cancer Australia, CRC, MRFF, NGO) and focuses on improving outcomes of arthritis surgery, studying the treatment of bone tumours and advanced limb reconstruction.	13 Aug	iC campus Wollongong	73
30.	Antifouling Coatings Workshop. Across ACES we are developing new materials with fascinating properties. There have been parallel developments in establishing an end-user network interested in the application of antifouling coatings. In this workshop we discussed where the opportunities may lie in building a strong fundamental research program, and associated translational activities in this area, in the remaining years of ACES.	2 Sept	iC campus Wollongong	27
31.	Webinar: Writing a Great Paper – Part 2. Following on from Part 1 held in April, ACES communications Director Doug MacFarlane provided insight into producing quality publications to keep students and academics career on track and to excel in your chosen fields. Included was: ► How to get the story clear and straight ► Intelligent use of supporting information ► Impactful use of graphics and figures ► Making it readable: traps and styles to avoid ► Editing for success: we will work through the example distributed in advance.	24 Sept	Virtual	63
32.	Address by Professor James Yoo 'Bioprinting for Translational Applications'. Tissue engineering and regenerative medicine has emerged as an innovative scientific field that focuses on developing new approaches to repairing cells, tissues and organs. Challenges still exist in developing complex tissue systems. In recent years, 3D bioprinting has emerged as an innovative tool that enables rapid construction of complex 3D tissue structures with precision and reproducibility. In this session novel and versatile approaches to building tissue structures using 3D printing technology were discussed. Clinical perspectives unique to 3D printed structures was also discussed. Dr Yoo is Professor and Associate Director of the Wake Forest Institute for Regenerative Medicine (WFIRM), with a cross-appointment to the Departments of Urology, Physiology and Pharmacology, and the Virginia Tech-Wake Forest School of Biomedical Engineering and Sciences. Dr Yoo's research efforts have been directed toward the clinical translation of tissue engineering technologies and cell-based therapies. Dr Yoo's background in cell biology and medicine has facilitated the transfer of several cell-based technologies from the bench-top to the bedside-examples include successful clinical translation include the bladder, urethra, vagina, and muscle cell therapy for incontinence.	10 Oct	iC campus Wollongong	57
33.	ACES Ionic Liquids Workshop for all interested ACES researchers and collaborators.	24 April	Monash University	
34.	Webinar: Visuals in Science, presented by Patton'd studios. Knowing what to include in scientific visuals can be confusing. Graphics are different abstracts, which are different to journal covers. This webinar was hosted by Patton'd studios, a creative agency dedicated to scientific communication. In the webinar the different types of visuals in science, were discussed along with their function and how to use them effectively.	4 Nov	Virtual	49

Research Training and Mentoring Events/Meetings 2019		Date	Venue	Attendees Registered
35.	Wireless Communication – Enabling Electroceuticals with Biosystems: An ACES Workshop. The use of electrical conduits to interrogate and regulate biological entities stems from the amazing work of Luigi Galvani and Alessandra Volta. One can only imagine that Galvani and Volta would be dancing with excitement were they to appear in today's world where we have a plethora of choices in terms of electromaterials and electronic devices to facilitate these communications. Welcome to the new frontier of electroceuticals where bioelectronics are being explored for healthcare to diagnose and treat disease. A foremost area of research for electroceuticals is wireless bioelectronics, which this workshop explored. Discussion centred on the use of: ► <i>RF Communications</i> – wherein stimulation is provided by wirelessly coupled antennas ► <i>Ultrasound</i> - to drive piezoelectric transducers for targeted and remote, low-intensity electric stimulation of cells and tissues; ► <i>Magnetoelectric composites</i> - to deliver targeted and remote stimulation via clinically approved magnetic coils; ► <i>Bipolar electrochem</i> – wherein we are able to induce redox reactions in an electric field, and ► <i>Transient power sources</i> – systems designed to “degrade” and produce power to influence biological processes featuring a complete disappearance in a controlled manner after their operation.	13 Nov	iC campus Wollongong	29
36.	Poster design workshop	15 Nov	Deakin University, Geelong	22
37.	Career Development Workshop. Students and researchers were invited to attend a full day of workshops and panel discussions on career paths and options. The event included: ► Q&A on career paths with Prof Peter Hodgson (IFM), Murray Height (HeiQ), Dr Emma Prime and Dr Jinfeng Wang (IFM) ► Interview techniques and other career related topics. ► careers beyond academia, a session presented by Deakin Talent ► An overview of relevant grants and application tips given by Robin Taylor (IFM) ► “metrics for grant applications” covering web of science, Scopus/SciVal metrics, including benchmarking for FOR codes, and an overview of Elements/DRO presented by staff from Deakin University library	29 Nov	Waurm Ponds Deakin University	40 ► 10 ACES ► 30 external ACES
38.	Symposium SB04 Hydrogel Materials—From Theory to Applications via 3D and 4D Printing at the 2019 Materials Research Society MRS Fall Meeting. ACES was strongly represented at this symposium within the MRS meeting. ACES CI in het Panhuis was a co-organiser. The symposium brought together experts from diverse and multidisciplinary research areas with a strong interest in synthetic and/or biopolymer hydrogels to cover the complete range of hydrogel research, from theoretical fundamental aspects to application areas. The invited presentations were given by leading researchers from academia, government laboratories, and industry and the audience included scientists and engineers, whose research involves hydrogels to exchange ideas and promote collaboration.	1-6 Dec 2019	Boston, USA	

APPENDIX 3: ACES CROSS NODAL INTERACTIONS 2019

X-Nodal visits/Interactions 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.

ACES Cross Nodal Interactions 2019	
1.	Wallace Gordon (2019) ACES CI UOW visited ACES CI Xungai Wang at ACES Deakin, Geelong, 4 January.
2.	Wallace Gordon (2019) ACES CI UOW visited ACES AI Cathal O'Connell at ACES Melbourne at St Vincent's hospital re bioprinting optimisation, 7 January.
3.	Garcia-Quintana, Laura (2019) ACES PhD Deakin, visited Monash University to meet with ACES AI Prof Alan Bond to discuss PhD project results, 4 February, 18 March, 18 April, 13 May, 17 September, 29 October, 18 November

ACES Cross Nodal Interactions 2019	
4.	Guo, Si-Xuan (2019) ACES RF Monash visited Deakin University in Geelong to discuss collaborative research with Dr Jian Fang, 12 February.
5.	Crook, Jeremy (2019) ACES CI UOW visited ACES CI Robert Kapsa at Biofabrication Centre, St Vincent's Hospital, Melbourne, to discuss collaborative research opportunities and review facilities, 14 February.
6.	Diamond, Dermot (2019) ACES PI DCU Dublin visited ACES UOW to progress collaborative research projects, 15 February.
7.	Fukuda, J (2019) ACES AI Yokohama National University, Japan, visited ACES UOW to progress collaborative research projects four times throughout 2019 - 18-22 February; 12-13 August; 28 October and 19 December.
8.	Officer, D.L. (2019) ACES CI UOW visited ACES CIs Maria Forsyth, Patrick Howlett and ACES AI Dr Robert Kerr at the BatTRIHub, Melbourne to discuss use of edge functionalised graphene nanoplatelets (EFGNPs) in batteries, 22 February.
9.	Coote, M and Xiao, Pu (2019) ACES CI ANU and Prof ANU visited ACES UOW to discuss a potential collaboration, 22 February.
10.	Adesanya, Olumayowa (2019) ACES Affiliate PhD UTAS, visited ACES at UOW to participate in a joint ACES-IHMRI collaborative workshop “materials in medicine”, 26 February.
11.	Bourke, Justin (2019) ACES RF UOM, visited Prof Maria Forsyth at Deakin University, 27 February.
12.	Faisal, S.N (2019) ACES ECR UOW visited Deakin University to take graphene material samples to the node and to discuss exploration of energy storage properties, 22 February.
13.	Faisal, S.N (2019) ACES RF UOW visited Monash University to take graphene material samples to the node for use in nitrogen reduction reaction, 22 February.
14.	Goddard, Eliza (2019) ACES ECR UNSW visited ACES UOW to discuss end-user engagement in the soft robotic prosthetic design, 9 March.
15.	Guldi, Dirk (2019) ACES PI FAU, Erlangen, Germany visited ACES UOW to progress research engagement, 11-14 March.
16.	Khan, Jawairia (2019) ACES affiliate PhD UOW visited ACES UTAS to progress work on ARC discovery project and share research insights with ACES colleagues, 7-20 April.
17.	Ruland, Andres (2019) ACES ECR UOW visited ACES at University of Melbourne at St Vincent's to give a presentation on ultrasound imaging for evaluation of artificial cartilage as well as hold collaborative discussions, Melbourne, 17 April.
18.	Lee, CY (2019) ACES RF UOW visited ACES Monash to attend the ARENA Nitrogen Reduction project meeting, Melbourne, 17 April.
19.	Wallace, Gordon (2019) ACES CI UOW visited and gave a seminar ‘Advances in Materials and Fabrication enhance our ability to communicate with and within living systems’ at Deakin Waurm Ponds campus, 29 April.
20.	Bourke, Justin (2019) ACES RF with the University of Melbourne at St Vincent’s Hospital Melbourne visited ACES at UOW to update and progress the research into electrophysiology methods for <i>in vitro</i> and <i>in vivo</i> systems, 17 May.
21.	Wagner, Pawel (2019) ACES SRF UOW visited Dr Paul Molino ACES RF on a placement at Yokohama National University in Japan to progress work on two photon printing processes, 22-29 May.
22.	Quigley, Anita (2019) ACES SRF UOW at St Vincent's Hospital Melbourne, visited the ACES UOW Wollongong node and gave a seminar ‘Modelling Epilepsy Ex Vivo: Organoids and 3D Cultures’, 31 May.
23.	Shekibi, Bijan (2019) ACES PhD UOW at St Vincent’s Hospital Melbourne, visited the ACES UOW Wollongong node and gave a seminar ‘Modelling a Functional Prosthetic Hand Using in vitro Cell Studies’, 31 May.
24.	Gambhir, Sanjeev (2019) ACES AI UOW visited ACES PI Kim at the Department of biomedical engineering, Hanyang University, Seoul, Korea to update them on the range of bioinks available, May 2019.
25.	Qin, Chunyan (2019), ACES Affiliate PhD UOW visited the National Centre for Sensor Research (NCSR) at Dublin City University (DCU) for 6 weeks working with Professor Robert Foster's group to reinforce the collaboration on wireless stimulation using biopolar electrochemistry in both neural and cardiac tissue engineering, 7 June-22 July.
26.	Chen, Xifang (2019) UOW affiliate PhD student, visited St Vincent's Hospital Melbourne, for one week to work with ACES AIs Serena Duchi and Carmine Onofrillo to expand the application of ulvan to cartilage repair and regeneration, 17- 21 June.
27.	Kalsoom, Umme (2019) ACES ECR UTAS was working with collaborators at Dublin City University, Ireland, on the Development of 3D printed active sampling membranes from 17-27 June.
28.	Kapsa, Robert (2019) ACES CI UOW at St Vincent’s Melbourne, visited ACES partner organisation Dublin City University (DCU), Ireland, 18-23 June.
29.	Walker, Mary (2019) ACES ECR Monash meeting with ACES AI Jane Neilsen from UTAS to discuss contribution to paper on iPSC system research ethics, 21 June.
30.	Wallace, Gordon (2019) ACES CI UOW visited ACES AI Prof Peter Choong, University of Melbourne, to give a progress report on MTPConnect and to progress a MRFF grant application, 1 July.

ACES Cross Nodal Interactions 2019	
31.	Zhang, Jie (2019) ACES CI Monash gave an invited seminar ‘Formation of advanced 2D materials by electrochemical exfoliation for electrocatalytic reduction of CO ₂ ’ and visited ACES PI Patrick Unwin and ACES AI Julie Macpherson at the University of Warwick, UK, to further collaborative research projects, 8-12 July.
32.	Wallace, Gordon and Gambhir, Sanjeev (2019) ACES CI and ACES AI UOW visited AI Prof Peter Choong at the University of Melbourne, for a translational 'Axcelda' technology workshop, 17 July.
33.	Ruland, Andres (2019) ACES ECR UOW visited St Vincent's Hospital Melbourne to meet with ACES collaborators and members of the ACES SBS theme where he presented his work on “Using 3D ultrasound imaging” in ACES research activities, 22 July.
34.	Findlay, Sam (2019) ACES communications and media officer visited ACES nodes at Deakin and Monash for website updates and stories, 22 July.
35.	Wang, Kezhong (2019) ACES affiliate PhD UOW visited ACES at University of Melbourne, St Vincent's hospital Melbourne, to progress research on graphene fibres, 22-23 July.
36.	Lee, Chong Yong (2019) ACES RF UOW visited ACES CI Patrick Howlett at ACES Deakin to review ACES MPhil student project, 23 August.
37.	Hai, Abdul Moqeen (2019) ACES Affiliate PhD UOW visited ACES Deakin labs, August.
38.	Gupta, Vipul (2019) ACES ECR UTAS worked at ACES UOW with researchers to progress SBS and EFD project milestones, specifically the development of 3D printed microfluidic platforms for 3D cell cultures, 5-20 September 2019.
39.	Coote, Michelle (2019) ACES CI ANU presented an invited lecture at Monash University Melbourne, 23 September.
40.	Harris, Alexander (2019) ACES SRF UOW at St Vincent's Hospital Melbourne, visited ACES UOW node to progress ON PRIME project work, 29 September-1 October.
41.	Harris, Alexander (2019) ACES SRF UOW at St Vincent's Hospital Melbourne, visited ACES UOW node to progress ON PRIME project work, 16-17 October.
42.	Harris, Alexander (2019) ACES SRF UOW at St Vincent's Hospital Melbourne, visited ACES UOW node to progress ON PRIME project work, 6-7 November.
43.	Sugiyama, Ellen (2019) PhD student Yokohama National University visited ACES UOW to tour the facilities and plan for a 6 month research visit in 2020, 28 October.
44.	Pozo-Gonzalo, Cristina (2019) ACES RF Deakin visited ACES AI Prof Alan Bond at Monash University to discuss the electrochemical mechanism of sodium-oxygen batteries, 29 October.
45.	Makhlooghiyazad, Faezeh (2019) ACES ECR Deakin visited Prof MacFarlane Monash ACES node to participate in an ionic liquid workshop, 30 October.
46.	Choi, Junghi (2019) PhD from ACES partner organisation Hanyang University visiting ACES UOW to prepare a sinking/ floating gel to control a submarine, 4-30 November.
47.	Cook, Mark (2019) ACES CI University of Melbourne, visited ACES UOW to progress collaborative research projects and give a seminar 'Developing an Implantable Epilepsy Device', 6 November.
48.	Panhwar, Ghulam Murtaza (2019) ACES PhD Deakin visited ACES UOW to progress research activities, 10-15 November.
49.	Wallace, Gordon (2019) ACES CI UOW visited Yokohama National University, Japan and gave a seminar 'Graphene and 3D Fabrication – Implications for Energy and Medical Applications' and progressed collaborative research projects, 25 November.
50.	Harris, Alexander (2019) ACES SRF UOW at St Vincent's Hospital Melbourne, visited ACES UOW node to progress ON PRIME project work, 25-26 November.
51.	Harris, Alexander (2019) ACES SRF UOW at St Vincent's Hospital Melbourne, visited ACES UOW node to progress ON PRIME project work, 9-10 December.

APPENDIX 4: END-USER VISITS TO ACES 2019

End-User and Industry Visits to ACES in 2019	
1.	Peter Masterson and ACT/Southern Inland Regional Manager, Regional Manager – Illawarra & South Coast, NSW AusIndustry, Australia to tour TRICEP facilities, 17 January 2019.
2.	A/Professor Konrad Walus, Co-Founder and Member of Board of Directors Aspect Biosystems & academic at University of British Columbia visited ACES at UOW to tour TRICEP as he had already visited ACES previously in 2018, 23 January 2019.
3.	Dr Ravi Kumar Cherukuri, an Illawarra Neurosurgeon visited ACES at UOW and toured TRICEP, 25 January 2019.
4.	Julia Frith and Zahra Shahbazian, Marketing Managers with UOW Innovation & Commercial Research, videoed the case study of research with collaborators Bluey Merino, in the ACES/IPRI labs, 29 January 2019.

End-User and Industry Visits to ACES in 2019	
5.	Tunde Fasheun, Director MicroNano Pty Ltd, Australia visited ACES UOW and toured TRICEP to view the facilities as interested in the advanced materials produced, 29 January 2019.
6.	Dr Walter Minnella, Elvesys Microfluidic Innovation Centre, France visited ACES UOW and toured TRICEP to look at the research in microfluidics being undertaken in the Centre and the capabilities available, 29 January 2019.
7.	James Zealey and Brendon Costa from Dolby Digital Australia accompanied A/Prof Raad Radd, UOW Deputy Head of School, School of Electrical, Computer and Telecommunications Engineering on a visit to ACES UOW to view the facilities in AIIM and TRICEP, 31 January 2019.
8.	Anna Le Huynh, Junior Biomedical Engineer in Health NSW from Children's Hospital Westmead, visited ACES at UOW to tour both AIIM and TRICEP and to hold collaborative discussions on how to develop a 3D Printer to print silicone, 1 February 2019.
9.	Anthony Harrington (CEO) and Dr William Parr (CTO) at 3D Morphic Australia visited ACES at UOW to tour TRICEP and discuss translational opportunities around laser metal printing, 12 February 2019.
10.	Prof Hwan Kyu Kim from Global GET (Green Energy Technology) in Korea, visited ACES at UOW to hold collaborative research discussions on porphyrin solar cells and tour the ACES facilities at AIIM and TRICEP, 14-15 February 2019.
11.	Omar Khalifa, CEO iAccelerate at UOW, visited ACES at UOW to discuss potential translational opportunities and toured the facilities at AIIM and TRICEP, 25 February 2019.
12.	Dr Greg Moloney, ophthalmologist at the Sydney Eye Hospital visited ACES at UOW to tour both AIIM and TRICEP and to hold translational discussions, 27 February 2019.
13.	Sam Vial, Director & Business Development, APAC, Motherson Innovations Australia visited ACES at UOW to discuss translational opportunities and tour the facilities at AIIM and TRICEP to scope for future project development, 28 February 2019.
14.	Simon Belcher, Project Manager Motherson Innovations Australia visited ACES at UOW to discuss translational opportunities and tour the facilities at AIIM and TRICEP to scope for future project development, 28 February 2019.
15.	Nicole Ryan, Bluescope Steel Australia, visited ACES at UOW to tour the facilities at AIIM and TRICEP as a prospective future student, 5 March 2019.
16.	Matthew Wolstenholme and James Xi from Enware visited ACES UOW for a technical update on the collaborative project, 12 March 2019.
17.	Peter Webster, Executive Director of the Industry Collab Network visited ACES at UOW to gain an oversight of the additive manufacturing capabilities, including 3D printing at TRICEP, 13 March 2019.
18.	Michael Burton, CEO Binary Beer (iAccelerate Company), and Scott Morgan, Marketing and Sales Binary Beer, toured TRICEP to get an oversight of the additive manufacturing capabilities, 14 March 2019.
19.	A/Prof John McGhee, a UNSW Scientia Fellow and Director of the 3D Visualisation Aesthetics Lab at UNSW visited ACES at UOW to give a seminar "The Fantastic Voyage: Visualising the Invisible in VR" and tour the facilities at AIIM and TRICEP, 22 March 2019.
20.	Tony Dyer, Industry Development Manager at UOW toured TRICEP to get an oversight of the additive manufacturing capabilities, 28 March 2019.
21.	John Kerr, Program Manager at iAccelerate toured TRICEP to get an oversight of the additive manufacturing capabilities, 28 March 2019.
22.	Adam Gilchrist, UOW ambassador to India, toured TRICEP to get an oversight of the additive manufacturing capabilities, 29 March 2019.
23.	Jason Hinds, Enware visited ACES at UOW to update on progress of collaborative project, 29 March 2019.
24.	Ray Lee, Rotary West Wollongong toured TRICEP to get an oversight of the additive manufacturing capabilities, 2 April 2019.
25.	Bruce Thomson, Innovation Facilitator with Innovation Connections toured TRICEP to get an oversight of the additive manufacturing capabilities and discuss a potential joint grant application, 8 April 2019.
26.	Sebastian Braat, General Manager Rotadyne, toured TRICEP to get an oversight of the additive manufacturing capabilities, 8 April 2019.
27.	Terry O'Riordan and Christie Davidson, Business Advisors with the NSW Business Chamber, toured TRICEP to get an oversight of the additive manufacturing capabilities, 11 April 2019.
28.	Nick and William Crothers, CEO and chairman of Biorevive, visited ACES at UOW to discuss investment potential. They toured facilities at AIIM and TRICEP with collaborator Pia Winberg from Venus Shell Systems, 12 April 2019.
29.	Selwyn Holland, 3D Printed Radio Yachts, toured TRICEP to get an oversight of the additive manufacturing capabilities, 12 April 2019.
30.	Jonas Marcelo, Commercial Development Manager at Innovation Campus at UOW, toured TRICEP to get an oversight of the additive manufacturing capabilities, 16 April 2019.

End-User and Industry Visits to ACES in 2019	
31.	Dan Henricson, Board Member i3 Net in Wollongong, toured TRICEP to get an oversight of the additive manufacturing capabilities, 2 May 2019.
32.	Dr Ravi Kumar Cherukuri, Illawarra Neurosurgeon, returned to ACES at UOW to give a seminar and discuss potential projects with TRICEP managers, 3 May 2019.
33.	Julian King, resident at iAccelerate toured TRICEP to get an oversight of the additive manufacturing capabilities, 6 May 2019.
34.	Prof Fiona Wood, University of Western Australia and the Burns Service of Western Australia, visited ACES at UOW for collaborative discussions for potential research projects, to give a public seminar on her work with burns patients and to tour the facilities at AIIM and TRICEP, 8 May 2019.
35.	Ryan Kafoure, Business Development Director with Marken, toured TRICEP to get an oversight of the additive manufacturing capabilities, 15 May 2019.
36.	Dr Paul Di Pietro, Lead for Intelligent Fabrication (FIF) and Industry Engagement, visited ACES at UOW to tour the facilities at AIIM and TRICEP, 17 May 2019.
37.	Diann Rodgers Healey, Director Illawarra Centre for Enablement visited ACES at UOW to discuss the ambassador role for Illawarra Centre for Enablement, 20 May 2019.
38.	Prof Inkyong Shim, from the ASAN Medical Center in South Korea visited ACES at UOW to discuss potential collaborative projects and learn more about the capabilities at AIIM and TRICEP with special interest in the 3D printing, 20-24 May 2019.
39.	Greg Roger, CEO Vestech, visited ACES at UOW to tour the facilities at TRICEP, 22 May 2019.
40.	Aaron Neary and 2 co-workers from X-Tremity Prosthetics and Orthotics visited ACES UOW to explore potential collaborations in prosthetic research, 23 May 2019.
41.	Pierre and Vero Erwes, BioMarine in France visited ACES at UOW accompanied by ACES collaborator and AI Prof Pia Winberg to discuss research possibilities and to tour the facilities at AIIM and TRICEP, 24 May 2019.
42.	Ron Selkirk, Owner Selkirk Bricks, visited ACES at UOW to tour the facilities at TRICEP, 28 May 2019.
43.	Andrew Whittle and Jude Doherty, Engineers at Southern Prosthetics & Orthotics, visited ACES at UOW to tour the facilities available at TRICEP, 28 May 2019.
44.	Dr Shinji Hasegawa and Mr Nakajima from Asahi Kasei in Japan, visited ACES at UOW to demonstrate work on bubble free electrolysis with ACES members, 28 and 29 May 2019.
45.	Melville McNair & Kevin Cullen, Breseight, visited ACES at UOW to tour the facilities at TRICEP, 30 May 2019.
46.	Brendan Gell, Owner Booma RC, visited ACES at UOW to tour the facilities at TRICEP, 31 May 2019.
47.	Enware CEO and 2 Enware colleagues visited ACES at UOW to discuss progress on their project and toured both AIIM and TRICEP, 3 June 2019.
48.	Dr Tom McGregor, General Manager and Dr Jen Song R&D Manager at MOS TECHNOLOGIES PTY LTD, visited ACES at UOW to discuss potential collaboration projects and access to ANFF equipment and expertise, 18 June 2019.
49.	Dolby Digital, Michael Smithers (Senior Member Research Staff) and David Cooper (Sound Technology Research), visited ACES UOW to tour facilities and discuss future industry engagement on the potential of ACES edge functionalised graphene, 23 July.
50.	Stryker, Dr Lewis Mullen, visited ACES UOW to tour ACES and TRICEP facilities and discuss ACES research activities, 25 July.
51.	Stemmatters Prof Rui Amandi de Sousa visited ACES UOW from 29-31 July. Stemmatters originated as a spin-off from University of Minho (3B's Research Group). Since its creation, Stemmatters strives to create meaningful value from applied biomedical research through developing novel medical technology that provides more safe and effective regenerative medicine. Rui was a guest presenter at the ACES Entrepreneurship and Innovation course run in Sydney 31 July.
52.	Sophie Fleming, Prosthetic Art Technology visited ACES UOW to tour ACES and TRICEP facilities, 16 August.
53.	Rachel Doyle, Woodside visited ACES Monash node for planning workshop on a collaborative project in water electrolysis, 19 September.
54.	Delegation from German Industry Federation (BDI) visited ACES Monash node to discuss possible collaborations in water electrolysis and ammonia electrosynthesis, 20 September 2019.
55.	Sangeetha Krishnamoorthy (Austrade), Alok Medikepura Anil (Next Big Innovation Labs India) and Amit Shrivastava (AMTZ, India) visited ACES UOW to tour facilities and understand further the additive manufacturing research projects, 3-5 November 2019.
56.	BK21PLUS (Brain Korea 21 Program for Leading Universities and Students) team members (Mr Junyoung Choi, Mr Jeonghun Oh, Mr Byeolhee Yoon, Ms Hearin Jo, Mr Hyeonsu Bae, Mr Myungkeun Oh, Mr Donghan Yoon, Ms Dahye Jung and Prof Myung-Hyun Ryou) visited ACES UOW to discuss mutual research interests and possible research collaboration in the area of advanced energy devices from 4-9 October 2019. BK21PLUS is a human resource development program initiated by the Korean government.

End-User and Industry Visits to ACES in 2019	
57.	Kim Chant, Development Manager at Ramsay Health Care, visited ACES UOW to tour the facilities and how ACES have been working with clinicians in getting customised printers and protocols into hospitals, 8 November 2019.
58.	A delegation from NSW Department of Planning, Industry and Environment (DPIE) team visited ACES UOW to tour the facilities, 12 November 2019.
59.	Dolby Digital, Michael Smithers (Senior Member Research Staff) and Mark Gerard (Consumer Electronics business group), visited ACES UOW to continue discussions on the potential of ACES edge functionalised graphene, 20 November.

APPENDIX 5: GOVERNMENT AND NON-GOVERNMENT ORGANISATION INTERACTIONS 2019

Government and Non-Government Organisation Interactions 2019	
1.	Helen Dorsett, Associate Director, Defence Innovation Network NSW Department of Defence, visited ACES UOW to tour facilities, 8 January 2019. Webinars of research and facilities would be of interest to DST scientists and other defence innovation experts, and Helen is willing to work with Industry NSW to help improve outreach.
2.	Prof Hwan Kyu Kim, Global GET Future laboratory, visited ACES UOW to discuss future research collaboration opportunities, 14-15 February. The Green Technology Center-Korea (GTC-K) is a government-funded think-tank that coordinates and supports national green technology R&D policies in collaboration with Korea's ministries and agencies. GTC-K serves as Korea's gateway for global green technology cooperation, as it connects developed and developing countries for growth and diffusion of green technology and strategies. GTC-K is partnered with UNDP, UNESCAP, UNIDO and World Bank, and its mission is to lead green technology innovation and create a new growth engine for the developing countries in the world.
3.	Sandy Haig, Industry Liason Manager at ANSTO, Sydney toured TRICEP to get an oversight of the additive manufacturing capabilities, 11 March 2019.
4.	Prof Hugh Durrant-Whyte, NSW Chief Scientist, visited ACES at UOW to give a seminar and to tour the facilities at AIIM and TRICEP, 13 March 2019.
5.	Robert Newton, CEO Energy Pipelines CRC visited ACES at UOW and toured the facilities at AIIM and TRICEP, 23 April 2019.
6.	Dr Jie Ding, ACES alumni and Research Scientist at Department of Defence (DSTG) in Melbourne, visited ACES at UOW to discuss our current collaborative projects and possible future collaboration for a joint grant application, 27 May 2019.
7.	Dr Alfredo Martinez-Coll, General Manager, Stakeholder Engagement MTPConnect, visited ACES UOW for further discussions on TRICEP, 7 August 2019.
8.	Margaret Ward and Manfred Scriba from the South African Department of Science & Technology visited ACES UOW for a tour of our facilities and collaborative research talks, 9 August 2019. In South Africa (SA) the Government Department of Science and Technology (DST) has launched a SA Research Infrastructure Roadmap, which aims to the establishment of a Nano-Micro Manufacturing Facility so they were interested in the ANFF materials node arrangements at UOW.
9.	A government delegation toured the facilities at ACES UOW and TRICEP, 6 September 2019. <ul style="list-style-type: none">► Elizabeth Kelly Deputy Secretary► Tim Edwards Science Commercialisation Policy Division, International Science and Innovation Branch► Angus Robertson Science Commercialisation Policy Division, Collaboration Policy► Frank Tonkin Science Commercialisation Policy Division, Collaboration Policy► Ali Farquhar Industry Growth Division, Sectoral and Place Based Policy► Kिरrily Peters Industry Growth Division, Business Facilitation and Food Policy► Brett Yeomans Strategic Policy Division, Business Environment► Naomi Walden Strategic Policy Division, Strategic Policy Branch► Jennifer Kay General Manager, AusIndustry - Support for Business, National Outreach and External► Noel Taloni NSW/ACT State Manager, AusIndustry - Support for Business► Shane Long Business Development Manager, AusIndustry - Support for Business► Peter Masterson AusIndustry, Regional Manager, Wollongong
10.	Ottobock's R&D staff from German headquarters held and online meeting with the ACES soft robotic team members to discuss a potential collaboration, September 2019.
11.	DSTG members – Dr Jie Ding, Dr Choi Chang-Hoi and Mr Tim Bussell visited ACES UOW to tour facilities and discuss collaborative research activities and a potential grant application for the Next Generation Technologies Fund, 9 October 2019.
12.	Sangeetha Krishnamoorthy (Austrade), Alok Medikepura Anil (Next Big Innovation Labs India) and Amit Shrivastava (AMTZ, India) visited ACES UOW to tour facilities and understand further the additive manufacturing research projects, 3-5 November 2019.
13.	Prof Maria Kavallaris head of the Tumour Biology and Targeting program at the Children's Cancer Institute, visited ACES UOW to give a seminar and tour the additive manufacturing facilities especially the 3D printing activities, 8 November 2019.
14.	Korea Standard Association (KSU) delegation (8 members) visit to ACES UOW to tour facilities and understand more about the advanced materials and printing facilities developed, 12 November 2019.

Government and Non-Government Organisation Interactions 2019	
15.	Dr Armand Atanacio, Senior Accelerator Scientist ANSTO, visited ACES UOW to progress a collaborative research project, 15 November 2019.
16.	Office of the NSW Chief Scientist & Engineer visited ACES UOW to talk about ACES Research Impact and Ecosystem Creation, 27 November 2019.
17.	ANFF members Ian Griffiths and Chris Fell visited ACES UOW and TRICEP 27 November 2019.

APPENDIX 6: ACES OUT AND ABOUT WITH STAKEHOLDERS 2019

ACES Out and About Interacting with Stakeholders in 2019	
1.	Wallace Gordon (2019) ACES CI UOW visited Manisha Senadeera, Deakin University and Melissa Little, Royal Children's Hospital Melbourne, re bioprinting optimisation, 7 January.
2.	Yue, Zhilian (2019) ACES SRF UOW accompanied ACES affiliate PhD students Xifang Chen, Luciana Daikuara and Lingzhi Kang to visit Dr Zhe Li Burns Unit at Concord Hospital, Sydney to discuss a potential collaboration in wound healing, 10 January.
3.	Forsyth, Maria (2019) ACES CI Deakin met with Mark Sceats and Matt Boot-Handford from Calix Ltd a number of times throughout 2019 to discuss possible collaborative projects.
4.	Forsyth, Maria (2019) ACES CI Deakin attended a PMB Defence R&D opportunities forum in Adelaide, 30 January. PMB Defence is a leading supplier of high quality energy and specialised engineering solutions for submarine platforms.
5.	Wallace, Gordon (2019) ACES CI UOW visited clinical collaborator Prof Gerard Sutton, NSW Lions Eye Bank, Sydney, 2 February.
6.	Forsyth, Maria (2019) ACES CI Deakin visited Prof Jacques Eksteen from Future Battery Industry CRC, 6 February.
7.	Chung, Johnson and Wallace, Gordon (2019) ACES AI UOW and ACES CI UOW participated in Filming by Channel 10 at RPA Sydney that was focusing on collaborative research, ear cartilage regeneration, undertaken as part of a Garnett Passe grant with clinical collaborators, 21 February 2019.
8.	Forsyth, Maria (2019) ACES CI Deakin visited Katie Donaldson, Managing Director Praxis Aeronautics, and Cameron Donaldson to discuss solid state batteries, 25 February.
9.	Wang, Xungai (2019) ACES CI Deakin talk on fibre/textile/fashion sustainability and circular economy at Cotton Converts, UTS Sydney, with industry and industry associations, research groups in attendance, 28 February.
10.	Hancock, Linda (2019) CI ACES Deakin visited RMIT Melbourne to attend the RENEW Electric vehicle expo and test the latest battery electric vehicles, 16 March 2019.
11.	Hancock, Linda (2019) CI ACES Deakin visited Melbourne University to visit Nicholas Alberle from Environment Victoria and Brett Harper from Reputex Energy to discuss climate policy and the 2019 federal election, 16 March 2019.
12.	Molino, Paul (2019) ACES RF UOW visited Defence Science and Technology (DSTG) Laboratories Melbourne, to progress collaborative research opportunities, 16-24 March 2019.
13.	Gabriel Comeron Castillo (2019) ACES PhD student Deakin visited BatTRI hub to understand the prototyping facilities available, 22 March 2019.
14.	Forsyth, Maria (2019) ACES CI Deakin visited Alistair Wilson (NZ) – Director, Danny Mills (AU) – BDM, Australian Rep, Leigh Newbery – Director of Switch Company, an Australian engineering company working with Wind Farm Developments to assist deliver projects, 24 March.
15.	Wallace, Gordon (2019) ACES CI UOW gave an invited seminar '3D Bioprinting' at the New and Emerging Technologies Information Session at RPA Institute of Academic Surgery, Sydney, 25 March.
16.	Howlett, Patrick (2019) ACES CI Deakin took part in a meeting on Fluence R&D opportunities, Melbourne 26 March. Fluence is the result of two industry players in energy storage joining together to form a new company dedicated to innovating modern electric infrastructure. In January 2018, Siemens and AES launched Fluence, uniting the scale, experience, breadth, and financial backing of the two most experienced icons in energy storage.
17.	Zhou, Hao and Stephens-Fripp, Benjamin (2019) ACES UOW ECR and affiliate PhD visited Dr Greg Bowring, Melissa Leong occupational therapist and three amputee participants at Prince of Wales Hospital, to undertake testing of the ACES soft robotic hand, 28 March and 1 April.
18.	Wallace, Gordon (2019) ACES CI UOW gave an invited seminar '3D Bioprinting-Printing Parts for Bodies 'at the Hunter New England Local Health District 3D Printing Forum, John Hunter Campus, Newcastle, 30 March.
19.	Wallace, Gordon (2019) ACES CI UOW gave an invited talk 'Research commercialization: The Scientist's experience' at the Surgical Innovation Workshop, RACS NSW Office, Sydney, 31 March.
20.	Howlett, Patrick (2019) ACES CI Deakin joined the Fluence microgrid battery discussion, Melbourne, 4 April.
21.	Zhou, Hao, (2019) ACES UOW ECR, visited Dr Greg Bowring and Dr Boone of the Prince of Wales Hospital, to provide an update on ACES robotic research activities and discuss potential projects, 2 May 2019.

ACES Out and About Interacting with Stakeholders in 2019	
22.	Zhou, Hao, (2019) ACES UOW ECR, visited Johan Du Plessis and his team at AbilityMade, a for-purpose technology company that develops products to promote mobility and accessibility for people of all abilities, to discuss potential collaborative projects in prosthetics, 2 May 2019.
23.	Warren, Holly ACES ECR UOW visited Pia Winberg at Venus Shell Systems in the Shoalhaven to tour the facilities and progress collaborative research in 3D printing of Ulvan, 8 May 2019.
24.	Wallace, Gordon (2019) ACES CI UOW gave a presentation '3D Bioprinting history' at AusINO Vex, Kalam Convention Center, AMTZ, Visakhapatnam, India, 10 May.
25.	Higgins, Michael (2019) ACES CI UOW visited Boris Martinec at the Victor Chang Institute, Sydney, 10 May.
26.	Kalsoon, Umme (2019) ACES ECR UTAS worked at TE laboratories, Tullow Ireland from 3-14 June. Tellab is a chemistry company active in Irish/UK and European marketplace. Operations are conducted from a new purpose built laboratory complex. Company specialties are environmental and drinking water analysis, lubricating and transformer oil analysis, fuel analysis, marker dye production, custom laboratory analysis, laboratory chemicals and reagents, environmental research and development, FP7 and other international collaborative projects.
27.	Wallace, Gordon (2019) ACES CI UOW gave a presentation 'New Biocommunication systems enabled by advances in materials and 3D biofabrication' at BCMaterials (Basque Center for Materials, Applications and Nanostructures), Bizkaia Science and Technology Park, Derio, Spain, 7 June.
28.	Kalsoon, Umme (2019) ACES UTAS RF work in TE Laboratories in Tullow Ireland to develop 3D printed passive samplers, 3-14 June.
29.	Zhou, Hao (2019) ACES UOW ECR, visited Dr Greg Bowring and Melissa Leong occupational therapist of the Prince of Wales Hospital, to provide an update on ACES robotic research activities, 20 June 2019.
30.	Forsyth, Maria (2019) ACES CI Deakin visited Mark Winfield, CEO of BNNT Technology Limited, and Australian Innovation Centre Pty Ltd to discuss Lithium Sulphur BNNT batteries, 10 July.
31.	Howlett, Patrick and Forsyth, Maria (2019) ACES CIs Deakin visited John Gertsakis and Will Le Messurier from MRI E-Waste Watch, to discuss innovative methods to ensure minimal impact on our natural environment when looing a battery waste management options, 23 August.
32.	Cherian, Matthew (2019) ACES PhD Deakin met with Niti Aayog from the Indian planning body in the ministry of environment of forests, Government of India, to study off grid energy, 26 August.
33.	Zhou, Hao and Stephens-Fripp, Benjamin, ACES UOW ECR and affiliate PhD visited Dr Greg Bowring, and Melissa Leong occupational therapist at Prince of Wales Hospital, to conduct impact of sensory feedback on controlling grip in two myoelectric prosthetic users, 29 August 2019.
34.	Zhou, Hao (2019) ACES UOW ECR visited Oapl Office in Sydney to attend the Australian launch of COAPT's pattern recognition product, 22 August. COAPT was founded on focused and dedicated research to deliver modern myoelectric control for the benefit of users and clinicians alike.
35.	Officer, David and Faisal, SN (2019) ACES CI and ECR UOW visited Warren King and Dr Alex Bilyk (Vice President Research), CAP-XX Ltd, Sydney to discuss industrial potential in using ACES edge functionalised graphene, 26 September.
36.	Li, Jianfeng (2019) ACES PhD UOW visited ANSTO to undertake testing and for collaboration studies as part of a UOW-ANSTO grant, 11 September.
37.	Faisal, SN (2019) ACES UOW ECR was invited to attend the networking event for CSIRO ON PRIME and ON ACCELERATOR programs, Melbourne 11-12 September.
38.	Tomaskovic-Crook Eva (2019) ACES RF UOW and Crook, Jeremy ACES CI UOW visited Anai Gonzalez-Cordero, CMRI at Westmead hospital, Sydney for a collaborative discussion on organoids, 23 September.
39.	Alici, Gursel (2019) visited Barber Prosthetics in Vancouver Canada to review their facilities and to explore if there could be a translational research collaboration on 'sensory feedback for prosthetic hands', 24 September. They are a small company with little prospect for progressing a long distance collaboration.
40.	Alici, Gursel and Zhou, Hao (2019) ACES CI UOW and ACES ECR WebEx meeting with Ottobock researchers, Janos Kalmar and Dr Sebastian Amsuess in Austria for a discussion on possible collaboration on pattern recognition for transradial prosthetic hands, 26 September.
41.	Ruland Palaia, Andres (2019) ACES UOW ECR visited Ravi Cherukuri at Wollongong Private Hospital to discuss collaborative opportunities in ultrasound, 27 September.
42.	Cherian, Matthew (2019) ACES PhD Deakin visited Puri district of Orissa with the National Disaster Management Agency studying damage by cyclone on energy storage and renewable energy, 12 October.
43.	Simonov, Alexandr (2019) ACES SRF Monash had a meeting with the Polish science-government-industry delegation, October.
44.	Boehme, Tillmann (2019) ACES End-User Engagement Officer attended MTP Connect Event to share information on the "TRICEP commercialisation pipeline" in Melbourne, 27-29 October.

ACES Out and About Interacting with Stakeholders in 2019	
45.	Alici, Gursel (2019) ACES CI UOW introduced ACES and presented ACES research as part of a focus group meeting between researchers and industry representatives from Plantiga Technologies, XCo Tech, LifeLabs, Xerus Medical, Telus, Careteam Technologies, Dragonfly MedTech and Lululemon on wearables, in Vancouver, Canada, 1 November.
46.	Higgins, Michael (2019) ACES CI UOW attended Japanese Society for Promotion of Science (JSPS) Fellow Meeting and Dinner in Canberra, 7 November.
47.	Forsyth, Maria (2019) ACES CI Deakin met with Tim Shanhan, Board chairman of Future Battery Industry CRC, and Prof Jacques Eksteen, FBICRC, for discussions on the StorEnergy project, 8 November.
48.	Howlett, Patrick (2109) ACES CI Deakin along with ACES AI Rob Kerr attended the launch of Calix BatMn reactor at their Bacchus Marsh facility. This reactor is a unique facility dedicated to the production of battery electrode materials, 21 November.
49.	Chung, Johnson and Wallace, Gordon (2019) ACES AI and CI UOW held a meeting with potential end-users from Kaohsiung Medical University Hospital, Taiwan 21 November.
50.	Faisal, SN (2019) ACES UOW ECR visited Dr Andrew Cornejo, CTO Hazer Group Ltd and their R&D team in Sydney to discuss material transfer research, 27 November.
51.	Wallace, Gordon (2019) ACES CI UOW gave an invited seminar '3D Bioprinting' at BioPrinting - Clinicians and Researchers Roundtable, Randwick, Sydney, 16 December.
52.	Alici, Gursel (2019) ACES CI UOW introduced ACES and presented ACES research as part of a focus group meeting with the Canary Medical Inc. team, including Dr William L. Hunter (CEO) and Dr Jeff Gross (CTO), to explore collaborative projects on smart medical devices for vascular disease, urinary voiding, coronary disease, dialysis and vascular graft patency monitoring in Vancouver, Canada on 18 December

APPENDIX 7: ACES END-USER EVENTS 2019

A list of events where in 2019 members from the ACES-ANFF partnership raised awareness of the facilities and research activities amongst end-users.

End-User Event description		Date	Venue
1.	ACES Showcase and demonstration booths at the 13th Annual International Electromaterials Symposium. The symposium featured renowned speakers from USA, France, Japan, UK, Spain, India, Korea and Australia. It brought together leading researchers engaged in ground-breaking materials science, presenting an opportunity to review the most recent advances in materials science, new electrochemical applications and fundamental understanding in this important field of electromaterials.	11-13 February 2019	The Pier, Geelong
2.	Clinical Connections workshop. This event brought together clinicians, scientists and engineers from around Australia to share in the celebration of advances over the past 12 months and to articulate ongoing challenges and plans to tackle those challenges. This year the attendees heard about advances in corneal regeneration, printed ears, treating sleep apnoea, bone and cartilage regeneration as well as customised printers developed for islet cell transplantation, challenges for permanently implantable percutaneous devices and innovations in cardiovascular imaging and modelling.	14 Feb 2019	St Vincent's Hospital Melbourne
3.	New and Emerging Technologies Information Session by RPA Institute of Academic Surgery. The program covered the implementation of emerging technologies in surgery, ethics and use of medical devices including customised vs off-shelf implants, the new definition of medical device and regulations around their use and the significance for having bioprinting at a referral public hospital. There have been significant changes in the control, use and regulation of medical devices including 3D printing and 3D bioprinting. This information session brought the experts in these areas together, including ACES Director Gordon Wallace, ACES CI Prof Susan Dodds and ACES AI Prof Gerard Sutton, to help give clarity as well as facilitate discussion around new technologies and medical devices.	25 March 2019	Royal Prince Alfred (RPA) Hospital, Sydney
4.	3D Bioprint Translational Workshop. In brief, the program for this workshop series (5 in total – Wollongong, Adelaide, Melbourne, Brisbane and Perth) covered materials sourcing, materials science development, engineering new hardware, the use of stem cells (focusing on clinical applications in islet cell transplantation for this workshop) and regulatory and commercial issues. 65 attendees at this workshop.	11 April 2019	QUT, Brisbane

End-User Event description		Date	Venue
5.	Organ Bioprinting Workshop at Andhra Pradesh MedTech Zone Limited (popularly known as AMTZ). The workshop explored 3D printing, an innovative technology that covers all medical disciplines, offers new opportunities in diagnostics and therapy. From diagnostic visualisation to surgical planning, patient-specific models provide an added value for patients and physicians. The aim of the workshop, organised by AMTZ, was to strengthen Indo-Australian cooperation and achieve development of 3D printing industry in both the countries. (https://www.expresshealthcare.in/news/organ-bio-printing-workshop-organised-in-visakhapatnam/411555/)	8 May 2019	Visakhapatnam India
6.	Australian Research and Development Commercialisation Mission to Korea. The mission, organised by Austrade Korea, provided a platform for ACES to showcase our R&D capabilities to the global market by engaging directly with leading Korean conglomerates. The ACES technologies packaged for the mission were: ► TRICEP ► Edge Functionalised Graphene ► UltralImage - Quantitative Ultrasound Imaging of Cellular Constructs ► PanCure - Controlled Drug Delivery for the treatment of Pancreatic Cancer ► Soft Robotic Hand	15-16 May 2019	Seoul, Korea
7.	28th Workshop of the NSW Stem Cell Network. ACES was a silver sponsor of this regional workshop that was put together to in-service researchers and others in the Wollongong area on the latest developments in stem cells and regenerative medicine. Keynote speakers included ACES RF Anita Quigley who spoke on 'on development of 3D scaffolds for tissue regeneration and interfacing with bionic devices' and ACES AI Dr Serena Duchi telling the attendees about bone and cartilage repair to treat osteosarcoma and rebuild compromised cartilage to prevent osteoarthritis. Other ACES members, RF and students, contributed talks whilst ACES CI Jeremy Crook was a co-organiser. The conference code of conduct for this event was derived by organisers from the ACES conference code of conduct.	11 June 2019	UOW, Wollongong
8.	Soft Robotics Workshop for Endusers. The ACES team ran a workshop for HETI Orthotists and Prosthetiests updating them on fabrication technologies for orthoses.	13 June 2019	UOW, Wollongong
9.	ACES @ DCU workshop – Storing, Converting and Transporting Energy. Advances in materials and fabrication technologies have had a profound effect on our ability to convert renewable energy sources into practically useful forms. Recent attention has turned to the storage and transportation of energy generated from renewable sources, in order to account for the temporal and geographical dimensions associated with energy from renewables. The symposium explored recent advances in addressing all of these challenges.	20 June 2019	DCU, Dublin Ireland
10.	ACES @ DCU workshop – Advances in Materials for Medicine. Advances in materials and fabrication technologies have had a dramatic impact on fields such as tissue engineering, cell therapy and medical bionics. Clinical challenges such as bone and cartilage regeneration, development of more effective islet cell transplantation therapies and neural connectivity to electrodes for disease monitoring and control have been addressed. The symposium highlighted advances in a number of clinical areas and discussed the implementation of a translational environment that ensures delivery to patients in need.	21 June 2019	DCU, Dublin Ireland
11.	2019 Graeme Clark Biomedical Innovation Showcase. The exhibition space/trade space featured many displays from leading research institutions and start-ups and companies, including the TRICEP (Translational Research Initiative for Cellular Engineering and Printing) initiative. The ACES-ANFF team showcased a suite of next generation 'smart devices' that have resulted from our research collaborations with clinicians. The suite included: the Biopen (to repair damaged cartilage), the iFix Pen (to treat corneal ulcerations), and 3D Alek (to treat microtia), as well as a range of polymer and metal 3D printed parts. In addition, delegates were able to learn about our ability to synthesise advanced materials and supply customised bioinks for each of the hardware applications. The inventory of bioinks included: ► gelatin methacrylamide (GelMA) based inks for adipose stem cells for cartilage regeneration ► alginate based inks for muscle cells ► collagen based inks for nerve cells ► multi-material inks for human neural stem cells and induced pluripotent stem cells ► alginate/GelMA based inks for pancreatic islet cells.	22 July 2019	Melbourne Convention and Exhibition Centre, Melbourne.

End-User Event description		Date	Venue
12.	Building Effective Translational Facilities Workshop. Fundamental discoveries are often left languishing in research and development labs across Australia. This is despite the fact there is a growing desire from producers and users of research to make more of commercial opportunities that might arise. Of course, desire, even passion, is not enough. We need an infrastructure that facilitates the identification and realisation of such opportunities. Here we brought together speakers from different backgrounds to provide their insights into how this transition is best navigated to maximise the chance of success. The 34 attendees then contributed to breakout group discussions.	30 July 2019	iC campus Wollongong
13.	2019 ACMD Research Week at St Vincent's Hospital. This ACES sponsored event brings together researchers, clinicians, nurses and other end-users to review the latest research activities.	5-8 August 2019	St Vincent's Hospital Melbourne
14.	'Ammonia = Hydrogen 2.0 Conference'. This ACES sponsored event that focused on building an energy export industry using green ammonia.	22-23 August 2019	CSIRO Clayton Victoria
15.	Antifouling Coatings Workshop. Across ACES we are developing new materials with fascinating properties. There have been parallel developments in establishing an end-user network interested in the application of antifouling coatings. In this workshop, the 25 attendees discussed where the opportunities may lie in building a strong fundamental research program, and associated translational activities in this area, in the remaining years of ACES.	2 September 2019	iC campus Wollongong
16.	3D Bioprinting workshop. This highly successful workshop was hosted by our colleagues at the Andhra Pradesh Medtech Zone (AMTZ). Orchestrated by Ear, Nose and Throat Surgeon A/Prof Payal Mukherjee (Royal Prince Alfred Hospital (RPAH), Sydney) and colleagues in India, the event attracted researchers and clinicians from a number of cities across the country. The most recent advances in 3D printing for medical applications were discussed, as was the need for innovative deployment programs and engagement with regulators to ensure widespread access to these emerging technologies.	8 September 2019	Vizag, India
17.	2019 Monash Energy Conference. With more than 250 academics and 3 Australian Research Council Centres of Excellence involved in energy research, this workshop was to unite the teams to enable the transition towards a sustainable and equitable energy future. This two-day conference showcased Monash academics and experts from industry and government across a range of energy-related disciplines. The ACES half day workshop was a forum for discussion of hydrogen-related initiatives at Monash, CSIRO and local industry. This event was aimed at leaders and representatives from the hydrogen energy sector. The event was free and open to Monash staff, students, government and industry professionals, consultants and NGOs.	18 September 2019	Green Chemical Futures, Clayton
18.	Trade exhibit at Tissue Engineering and Regenerative Medicine International Society – AP Chapter and the 7th Asian Biomaterials Congress (TERMIS + AP7). ACES/ANFF/TRICEP initiative had a booth featuring the latest developments at this international event. The Congress was held at the Brisbane Convention & Exhibition Centre with the trade exhibit situated to provide maximum networking opportunities for delegates and exhibitors.	14-17 October 2019	Brisbane
19.	Trade exhibit at the International Conference on Biofabrication 2019. ACES/ANFF/TRICEP initiative had a booth featuring the latest developments at this international event. ACES also held a cocktail reception for delegates to introduce them to the BIOFAB2020 conference to be hosted by ACES at Wollongong in September 2020.	21-22 October 2019	Ohio, USA
20.	Raw Assembly 2019. ACES CI Xungai Wang, from ACES Deakin, gave an address on 'cotton fibre and textile sustainability' to the audience that was made up of industry, research and community members. RawAssembly is a Sustainable Raw Materials, Circular Design and Ethical Manufacturing event, where Industry come to source the latest innovative fibres, fabrics and materials for their fashion supply chain and retail environments.	29 October 2019	Melbourne
21.	3rd Australia Corneal Bioengineering Working Group/1st ANZ Corneal Bioengineering Working Group meeting. ACES members presented at this meeting along with our clinical collaborators.	7 November 2019	Sydney

End-User Event description		Date	Venue
22.	Trade exhibit at 2019 Materials Research Society MRS Fall Meeting. ACES/ANFF/TRICEP initiative exhibited at this large international conference. The meeting brought together experts from diverse and multidisciplinary research areas with a strong interest in synthetic and/or biopolymer hydrogels to cover the complete range of hydrogel research, from theoretical fundamental aspects to application areas. The purpose of the symposium is to bring together scientists and engineers, whose research involves hydrogels to exchange ideas and promote collaboration. The invited presentations will be given by leading researchers from academia, government laboratories, and industry	1-6 December 2019	Boston, USA
23.	3D Bioprint Translational Workshop. In brief, the program for this workshop series (5 in total – Wollongong, Adelaide, Melbourne, Brisbane and Perth) covered materials sourcing, materials science development, engineering new hardware, the use of stem cells (focusing on clinical applications in islet cell transplantation for this workshop) and regulatory and commercial issues. 52 attendees at this workshop where the program was designed to highlight the clinical and commercial opportunities emerging from the rapid development of 3D Bioprinting. From primary sourcing of components for bioinks, to software and hardware developments, through to the provision of clinically relevant protocols, Australia is well placed to make a significant contribution. At present, commercial activity in this area is almost non-existent, yet in Australia we have all of the commercial and manufacturing skills needed to contribute. To support this, ACES has an integrated research and development infrastructure that is recognised as one of the best of the world in this area. ACES has also developed globally recognised innovative research training programs in the area.	12 December 2019	Harry Perkins Institute of Medical Research, Nedlands, Perth
24.	Bio Printing: Clinicians and Researchers Roundtable with guest speaker ACES CI Prof Gordon Wallace. The track of the Tissue Engineering & Bioprinting: Research to Commercialisation focuses upon the emerging themes and innovative technologies in these two fields as they evolve and demonstrate clinical utility and applications in patient care. The potential to “3D-print” tissues and organs is gaining extensive interest and this workshop brought together clinicians and academics. This roundtable was organised by Strategic Partnerships Manager Life Sciences in the Division of Enterprise at UNSW. Agenda topics included: ► Bioprinting setup ► Ethics ► Hurdles to overcome ► Biofabrication and Bioprinting Technologies and Tools ► Bioprinters, Bioinks, and Substrates for Bioprinting/3D-Printing ► Bioprinting Application Areas in Various Disease Classes ► Medical and Non-Medical Applications of Bio printed Products ► Tissue Engineering: Disease Areas Impacted, Technologies, and Products both Commercialised and in Development	16 December 2019	Prince of Wales Hospital, Sydney

APPENDIX 8: ACES PLENARY AND KEYNOTE ADDRESSES 2019

Plenary and Keynote Addresses given by ACES members in 2019	
1.	Wallace, Gordon (2019) ACES CI UOW plenary talk 'Building better bionic interfaces using advanced materials and 3D bioprinting' at the International Symposium on Future Materials, Wollongong, 30 January-1 February.
2.	Fang F, Wang X (2019) ACES RF Deakin keynote 'From natural cellulose textiles to free-standing electrocatalytic electrodes' at the 2019 International Symposium on Future Materials, Wollongong, Australia, 1 February.
3.	MacFarlane, Douglas (2019) ACES CI Monash plenary talk 'Electroactive Materials for Energy Storage as Hydrogen and Ammonia' at the International Conference on Electroactive Polymers, Udaipur, 4-7 February.
4.	Coote, M.L. (2019) ACES CI ANU plenary lecture 'Electrostatic Catalysis of Chemical Reactions' at RACI PhysChem2019, Perth, 11-14 February.
5.	Forsyth, Maria (2019) ACES CI Deakin keynote speaker 'Ionic liquids, mixed electrolytes and their iongels for stable Na metal devices' at IBA2019, San Diego, CA, US, 3-8 March.
6.	Gilbert, Frederic (2019) ACES AI UTAS gave keynote address “Me, Myself and e-I: Ethics of Artificially Intelligent Brain-Computer Interfaces, Technology & Wellbeing Roundtable” to the Telstra Foundation Melbourne, 5 March.
7.	Wallace, Gordon (2019) ACES CI UOW gave a keynote talk 'Nanotechnologies and the Importance of Collaboration' at the Brisbane Catholic Education Stem Symposium, Brisbane, 11-12 March.

Plenary and Keynote Addresses given by ACES members in 2019	
8.	Walker, Mary (2019) ACES AI and former ACES RF gave a keynote presentation 'Narrative, person-centred care, and personalised medicine', in workshop on 'What is narrative? Ethical and epistemic insights' at the University of Lausanne, Switzerland, 20 March.
9.	Wang, Xungai (2019), ACES CI Deakin plenary talk 'Recent Research on Fibres and Textiles in Australia' at 2nd International Congress of Innovative Textiles, Corlu, Turkey, 17-19 April.
10.	MacFarlane, Douglas (2019) ACES CI Monash gave a plenary talk 'Chemical Energy Storage Applications of Ionic Liquids – From Hydrogen to Ammonia' at the 8th International Congress on Ionic Liquids (COIL), Beijing, 14-18 May.
11.	Pringle, Jennifer (2019) ACES CI Deakin gave a keynote talk 'Development of Organic Ionic Plastic Crystals as Solid State Electrolytes for Energy Applications' at the 8th International Congress on Ionic Liquids (COIL), Beijing, 14-18 May.
12.	Coote, M.L. (2019) ACES CI ANU plenary lecture 'Generating Reactive Intermediates Electrochemically: A New In Situ Methylation Procedure' at Heron8 Reactive Intermediates Conference, Uluru, Australia, 16-22 June.
13.	Forsyth, Maria (2019) ACES CI Deakin keynote 'Ionomers, poly(ionic liquids) and their composites in next generation solid state batteries' at the 10th International Conference on Materials for Advanced Technologies (ICMAT2019), Singapore 23 -28 June.
14.	MacFarlane, Douglas (2019) ACES CI Monash keynote talk 'Sustainable N ₂ reduction to ammonia: First steps towards a sustainable and circular N-economy' at the Centre for Sustainable Chemical Technologies Summer Showcase, Bath, UK 1-2 July.
15.	Wang, Xungai (2019) ACES CI Deakin Plenary talk 'Functionality and Sustainability of Natural Fibre Materials' at the 4th International Conference on Natural Fibres, Porto, 1-3 July.
16.	Forsyth, Maria (2019) ACES CI Deakin plenary 'Electrochemical Energy Storage – beyond 2020' at the SoERC Conference, Canberra, 3-4 July.
17.	Wallace, Gordon (2019) ACES CI UOW plenary talk 'Biographene' at the RACI Carbon Innovation Conference 2019, Swinburne University, Hawthorn, 8 July.
18.	MacFarlane, Douglas (2019) Keynote talk 'Chemical Energy Storage Applications of Ionic Liquids – from Hydrogen to Ammonia' at the 14th Conference on Materials Chemistry, Birmingham, UK, 8-11 July.
19.	Forsyth, Maria (2019) ACES CI Deakin keynote 'Ionic liquid electrolytes and ionogel composites that enable high capacity anodes for lithium and sodium batteries' at the ISE meeting, Durban, South Africa, 4-9 August.
20.	Wallace, Gordon (2019) ACES CI UOW keynote talk 'New Materials and Advanced Fabrication – A Convergence Enabling Biomedical Applications' at Twentieth ISCLR Symposium, Park Royal Hotel, Singapore, 19-23 August.
21.	Forsyth, Maria (2019) ACES CI Deakin plenary 'Ionic Liquid and Plastic Crystal Based Electrolytes for Advanced Batteries - From Fundamentals to Applications' at IUMRS-ICA conference, Perth, 22-26 September.
22.	Wallace, Gordon (2019) ACES CI UOW keynote '3D Printing with Living Cells' at the International Society for Biofabrication's Annual Meeting (ISBF), Columbus, Ohio, USA, 20-22 October.
23.	Coote, M.L. (2019) ACES CI ANU keynote lecture 'Coming Full Circle: Adapting Controlled Radical Polymerization for Organic Synthesis' at the 37APS Pre-conference symposium, UNSW, Sydney, 8 November.
24.	Coote, M.L. (2019) ACES CI ANU keynote lecture 'Electrochemical Alkoxyamine Cleavage' at the 37th Australasian Polymer Symposium, Sunshine Coast, Queensland, 10-13 November.
25.	Hancock, Linda (2019) ACES CI Deakin plenary talk 'Cleaner Production in Oceania last 40 years and today' at the 8th International Workshop on Cleaner Production [IWCP]: Coupling Green to Blue Economies-How are Cleaner Production and Cities leading the next Sustainable Development? Sanya, China, 13-15 November.
26.	Wallace, Gordon (2019) ACES CI UOW keynote 'Bioprinting' at the 3DMed19, the 5th Annual Australian 3D in Medicine Conference, Melbourne, 14-16 November.*The objective is to bring together strong collaboration and cross-disciplinary discussion from patient, doctor, engineer, bio-ethicist, nurse, scientist, designer, student, physiotherapist, regulator, librarian or astronaut.
27.	Cook, Mark (2019) ACES CI UOM plenary talk 'Epilepsy: New Approaches to Management', Australian Biomedical Engineering Conference, Melbourne, 17-20 November.
28.	Wang, Xungai (2019) ACES CI Deakin keynote address 'The sustainability challenge for the fibre and textile industries', at the 9th International Conference on Advanced Fibers and Polymer Materials, Shanghai, 19-22 November.
29.	Alici, Gursel (2019) ACES CI UOW keynote 'Soft robotics for prosthetic devices; can soft robotics bring prosthetic devices one-step closer to their natural counterparts?' at the International conference on Orthotics and Prosthotics (iCOP2019), Malaysia, 20 November.
30.	Wallace, Gordon (2019) ACES CI UOW keynote '3D Printing with Living Cells -Tackling Medical Challenges' at the 10th tutorial symposium of KTERM, St Mary hospital, Seoul, Korea, 22 November.
31.	Coote, M.L. (2019) ACES CI ANU keynote lecture 'Generating Reactive Intermediates Electrochemically: A New In Situ Methylation Procedure' at the NZIC 2019 Conference, Christchurch, NZ, 24-28 November.

Plenary and Keynote Addresses given by ACES members in 2019	
32.	MacFarlane, Douglas (2019) ACES CI Monash keynote talk 'Sustainable N ₂ reduction to ammonia: First steps towards a sustainable and circular N-economy' at Green Chemistry, Auckland, New Zealand, 2-5 December.
33.	MacFarlane, Douglas (2019) ACES CI Monash keynote talk 'Sustainable N ₂ reduction to ammonia: First steps towards a sustainable and circular N-economy' at Frontiers in Renewable Energy Storage & Harvesting workshop, Suwon, Korea, 11-12 December.

APPENDIX 9: ACES INVITED TALKS 2019

Invited Talks or Panels by ACES members in 2019	
1.	Wang, Caiyun (2019) ACES SRF UOW gave an invited talk on CO ₂ reduction at the 2019 International Symposium on Future Materials, Wollongong, 31 January-2 February.
2.	Pringle, Jennifer (2019) ACES CI Deakin invited talk 'Ionic liquid-based redox electrolytes for thermal energy harvesting' at the 2019 International Symposium on Future Materials, Wollongong, 31 January-2 February.
3.	Officer, D. L. (2019) invited talk 'Scalable graphene chemistries for processing and fabrication', 9th Australian Colloid and Interface Symposium, Hobart, Tasmania, 3-7 February.
4.	In het Panhuis, Marc (2019) ACES CI UOW invited talk '3D printing, IoT, Big Data and Machine Learning for surfboards', Sports Innovation Conference, Eindhoven, Netherlands, 13 February.
5.	Alici, Gursel (2019) ACES CI UOW invited talk 'Soft robotics for prosthetic devices: how dependent it is on smart materials?' at the SPIE Smart Structures + Nondestructive Evaluation, (EAPAD) XXI (Conference 10966), Denver, USA, 3-7 March.
6.	Wollersheim, Linda (2019) ACES PhD Deakin presented for the POLIS Panel Discussion on Climate Policy and the 2019 Federal Election, Deakin University, 29 March.
7.	Coote, M.L. (2019) ACES CI ANU invited talk 'ATRP-inspired carbon-halogen activation in organic synthesis' at the ACS Spring National Meeting, Orlando Florida, 31 March-4 April.
8.	Coote, M.L. (2019) ACES CI ANU invited talk 'Publishing in JACS' at the ACS Spring National Meeting, Orlando Florida, 31 March-4 April.
9.	Coote, M.L. (2019) ACES CI ANU invited talk 'When electrochemistry meets electrostatics: implications and applications' at the ACS Spring National Meeting, Orlando Florida, 31 March-4 April.
10.	Cook, Mark (2019) ACES CI UOM invited talk 'Circadian and Circaseptan Rhythms Characterise Human Epilepsy', 6th BRAINN Congress, Campinas, SP, Brazil, 1-3 April.
11.	Gilbert, Frederic (2019) ACES AI UTAS invited talk "Unprecedented Risk of Irreversible Harms? Military Experimental Research Using Implantable Brain-Computer Interfaces" at the 9th ICMM Workshop on Military Medical Ethics, Basel, Switzerland 19-24 May.
12.	Officer, David (2019) ACES UOW CI gave invited talk 'Porphyrin and Phthalocyanine Graphene Assemblies as Electrocatalysts for CO ₂ Reduction' at the 235th ECS (Electrochemical Society) Meeting, Dallas, Texas, 26-30 May.
13.	Pringle, Jennifer (2019) ACES CI Deakin invited talk 'Supporting sustainability through electrochemical energy storage' at the Science and the Shine Dome 2019 Symposium – 'Power up Australia, the sustainable way', hosted by the Australian Academy of Science, Canberra, 28 May.
14.	Gilbert, Frederic (2019) ACES AI UTAS invited talk 'Dementia and assistive brain technologies' at CAVE workshop on dementia care and moral theory, Macquarie University, Sydney 29-30 May.
15.	Officer, D. L. (2019) ACES CI UOW invited talk 'Molecular Catalysts for CO ₂ Reduction' at the Symposium in Honor of Prof Leslie Dutton: The Structure and Function of Natural Proteins and Maquettes, University of Pennsylvania, Philadelphia, USA, 31 May-1 June.
16.	Forsyth, Maria (2019) ACES CI Deakin invited talk on 'Ionomers, poly(ionic liquids) and their composites in next generation solid state batteries' at the European Polymer Congress in Crete, Greece, 9-14 June.
17.	Tomaskovic-Crook, Eva (2019) ACES RF UOW gave an invited talk 'Human Neural Tissues from Neural Stem Cells Using Conductive Biogel and Printed Polymer Microelectrode Arrays for 3D Electrical Stimulation' at the Bioengineering session of the 28th NSW Stem cell Network Workshop, Wollongong, 11 June.
18.	Pozo-Gonzalo, Cristina (2019) ACES RF Deakin invited talk 'Enabling Circular Economy Recovery to bring spent battery components back to life', Annual Jornadas CICECO 2019, Aveiro, Portugal, 11-12 June.
19.	Chen, Jun (2019) ACES CI UOW invited talk 'Bipolar Electrostimulation – A Wireless Platform for Cell Stimulation' at the 10th International Conference on Materials for Advanced Technologies, Singapore, 23-28 June.
20.	Hancock and Ralph (2019) ACES CI and SRF Deakin were co-convenors of two panels: (i) Understanding Power in Energy Policymaking and (ii) Business and Countering Violent Extremism at the International Conference on Public Policy (ICPP) in Montreal, Canada, 26-28 June 2019.

Invited Talks or Panels by ACES members in 2019	
21.	Officer, D. L. (2019) ACES CI UOW invited talk 'Charge Transfer and Energy Conversion Using Synthetic Protein/Porphyrin Ensembles', 6th IC4N2019, Corfu Island, Greece, 30 June-3 July.
22.	Innis, Peter (2019) ACES CI UOW invited talk 'Tunable Flow Rate in Textile-based Microfluidics Utilizing Composite Fibers', 10th Australian and New Zealand Nano and Microfluidics Symposium, Wollongong, 1-3 July.
23.	Pozo-Gonzalo, Cristina (2019) ACES RF Deakin invited talk 'Controlling the three phase boundary in Na-oxygen batteries' Power our Futures conference organised by CIC Energigune, Spain, 2-5 July.
24.	Zhang, Jie (2019) ACES CI Monash invited talk 'Formation of lattice-dislocated bismuth nanowires on copper foam for enhanced electrocatalytic CO ₂ reduction at low overpotential' at the International Conference on Nanomaterials & Atomaterials Science and Applications, Swinburne University, Melbourne, 5 July.
25.	Coote, M.L. (2019) ACES CI ANU Invited talk 'Electrostatic Catalysis of Chemical Reactions' at 10th Congress of the International Society of Theoretical Chemical Physics, in Tromsø, 11-17 July.
26.	Goddard, Eliza (2019) ACES RF UNSW was an invited Speaker presenting on "Technology and Identity: Ethical grounds for innovation in emerging health technologies" at the Future Thinking 2019 Preshil Philosophy Conference, Victoria, 21 July. *Open to the Public– primary audience: students, teachers, interested community members.
27.	Forsyth, Maria (2019) ACES CI Deakin gave an invited talk 'Ionic liquid electrolytes and ionogel composites that enable high capacity anodes for lithium and sodium batteries' at the (ECS) Electrochemical Conference on Energy and the Environment, Bioelectrochemistry and Energy Storage, Glasgow, Scotland, 21-26 July.
28.	Goddard, Eliza (2019) ACES ECR UNSW, invited participant in interdisciplinary, multi-stakeholder workshop 'Building our 3D printed future: Backcasting device-based precision medicine', Deakin Downtown Melbourne, 23 July.
29.	An Ha, The; Pozo-Gonzalo, Cristina; Forsyth, Maria; Howlett, Patrick (2019) The An Ha ACES affiliate PhD Deakin gave an invited talk "Air cathodes for ionic liquids based Na-O ₂ batteries" at the International Symposium on Energy Conversion and Storage Materials, Brisbane, 30 July-2 August.
30.	Chen, Jun (2019) ACES CI UOW invited talk 'Defective and Atomic-dopant 2D Materials for Catalytic Reactions" at the 2019 International Conference on Electrochemical Energy, Sydney, 4-8 August.
31.	Wallace, Gordon (2019) ACES CI UOW invited talk 'Printing with Living Cells. Why? When? Where?' at the 1st Australian Workshop on 3D Bio-Printing, University of Technology Sydney, Sydney, 8 August.
32.	Duc, Daniela (2019) ACES PhD Swinburne invited oral 'Fabrication of electrode interface for NIR and electrical neuronal cell co-stimulation' at the Australian National Fabrication Facility (ANFF) Nanofabulous Winter Workshop, Clayton, Victoria, 19-20 August.
33.	Officer, D. L. (2019) ACES CI UOW invited talk 'Developing Dye Sensitised Solar Cell Rechargeable Batteries', International Workshop on Next Generation Solar Cells and Convergence Technology (IWNWSC & CT 2019), Sejong, Korea, 25-27 August.
34.	Shaikh, F., Ryder, G., Wallace, G. G., Officer, D. L. (2019) ACES ECR and CIs UOW invted talk given by Officer on 'Developing Developing Processable Graphenes for Electronic Applications' at the KJF International Conference on Organic Materials for Electronics and Photonics (KJF-ICOMEF 2019), Jeju, Korea, 27-29 August.
35.	Cook, Mark (2019) ACES CI UOM invited talk 'Slave to the Rhythm' at the International Conference for Technology and Analysis of Seizures, Exeter, United Kingdom, 2-5 September.
36.	Cook, Mark (2019) ACES CI UOM invited talk 'Detecting/prediciting seizures with intracerebral EEG', 2nd International Congress on Mobile Devices and Seizure Detection in Epilepsy, Lausanne, Switzerland, 6-7 September.
37.	Wallace, Gordon (2019) ACES CI UOW invited talk '3D Printing Challenges' at AUSINOVEX 2019, Kalam Convention Center, AMTZ, Visakhapatnam, India, 8 September. *AusInoVex was to gain insights into different stakeholders' perspective and expert views on theoretical and practical challenges in the fields of 3D Bioprinting and an update on 3D bioprinting in medical applications.
38.	Sparrow, Robert (2019) ACES CI Monash was an invited panelist for "Technology that serves society – the ethical foundations of the data age", at the IFA+Summit – The next level of thinking, Berlin, 8-9 September. *IFA+Summit brings together the world's leading thinkers, global trendsetters and creative visionaries, who share their new ideas of our digital future with academics, artists, developers, researchers and digital pioneers.
39.	E Goddard and S Dodds (2019) invited talk 'Minding the gap: Ethical questions raised by the 'brain on a bench' at La Trobe University Philosophy colloquium, Melbourne, 18 September.
40.	Wang, Caiyun (2019) ACES SRF UOW was co-chair of Symposium B - Energy and Environment Materials at the 20th International Union of Materials Research Societies Conference – International Conference in Asia (IUMRS-ICA-2019), 22-26 September.
41.	Pringle Jennifer (2019) ACES CI Deakin invited talk 'Ionic liquid-based redox electrolytes for thermal energy harvesting', IUMRS-ICA 2019, 20th International Union of Materials Research Societies Conference, Perth, 22-26 September.
42.	Coote, M.L. (2019) ACES CI ANU invited talk 'Electrostatic Catalysis of Chemical Reactions' at Australasian Conference on Theoretical and Computational Chemistry, Sydney, 30 September-3 October.
43.	Lee, Chong Yong (2019) ACES RF UOW invited talk '3D printing and nanomaterials' at the International Conference on Nanospace Materials (ICNM 2019), Brisbane, Queensland, 1-4 October.

Invited Talks or Panels by ACES members in 2019	
44.	Ralph, Natalie (2019) ACES SRF Deakin Panel moderator regarding issues surrounding critical materials, security and sustainability at 'In The Zone 2019': Critical Materials: Securing Indo-Pacific Technology Futures, 8 October.
45.	Ralph, N (2019) invited talk 'Sustainability and Security Regarding 'Critical Materials'', at the 'In the Zone' conference, US-Asia Centre, Perth, 8 October.
46.	Cook, Mark (2019) ACES CI UOM invited talk 'Detecting/Predicting Seizures with Intracerebral EEG – therapeutic opportunities, Basic and Translational Research' in Epilepsy Symposium, Fukuoka, Japan, 11-13 October.
47.	Pozo-Gonazalo, Cristina(2019) ACES SRF Deakin on organising committee in session E03 Ionic Liquids as Reactive Media for Electrodeposition Processes a the 236th ECS (The Electrochemical Society) meeting, Atlanta US, 13-17 October.
48.	Wallace, Gordon (2019) ACES CI UOW invited talk '3D Printing with Living Cells – Tackling Medical Challenges' at Tissue Engineering & Regenerative Medicine International Society (TERMIS) 2019 congress, Brisbane, 14-17 October.
49.	Goddard, Eliza (2019) ACES RF La Trobe University invited talk 'A survey on what Australians with upper limb difference want in a prosthesis' at The Australian Orthotic Prosthetic Congress (AOPA), Melbourne, 24 October.
50.	Sparrow, Robert (2019) ACES CI Monash, invited talk 'Love and Robots, Human Robot Interaction between Trust and Deception', Scuola Superiore Sant'Anna, Pisa, Italy, 31 October.
51.	Howlett, Patrick (2019) ACES CI Deakin invited talk 'Sodium electrodes and interphases in superconcentrated Ionic Liquid electrolytes: Tuning interfacial structure and using additives' at the 6th International Sodium Battery Conference, Chicago USA, 4-7 November.
52.	Chen, Fangfang (2019) ACES RF Deakin invited talk 'Computational Investigation of New Strategies in the Design of Polymer Electrolytes' at the Emerging Polymer Technologies Summit 2019, Melbourne, 6-8 November.
53.	Pringle, Jennifer (2019) ACES CI Deakin invited talk 'The development of quasi-solid state thermoelectrochemical cells for harvesting waste heat', 37th Australasian Polymer Symposium, Sunshine Coast, 10-13 November.
54.	Hancock, Linda (2019) ACES CI Deakin invited talk 'Aligning governance of renewable energy 'technology minerals' with circular economy principles for sustainable, ethical and just, energy transitions' at the 8th International Workshop on Cleaner Production [IWCP], Sanya, China, 14 November. *Awarded best oral presentation.
55.	Howlett, Patrick (2019) ACES CI Deakin invited talk 'Alkali electrodes and interphases in superconcentrated Ionic Liquid electrolytes and the role of interfacial structure' at the 2019 International Symposium on Frontier Materials, Sydney, 17-18 November.
56.	Wallace, Gordon (2019) ACES CI UOW invited talk '3D Bioprinting - Engaging for Translation - Don't wait to the end to start', at the 3D Bio-printing and Cell stimulation/Sensing workshop, National Chiao Tung Univerity, Hsinchu City, Taiwan, 19 November.
57.	Hancock, Linda (2019) ACES CI Deakin invited talk 'Climate change resilient energy systems across disasters types and zones' at the Environmental Disasters 2019 Symposium, Sydney, 21 November. *sponsored by University of Sydney Social Sciences and Humanities Advanced Research Centre (SSSHARC) and the Office of Global Engagement.
58.	Hancock, Linda (2019) ACES CI Deakin invited public lecture 'Who should govern disasters and why?' as part of the University of Sydney: Sydney Ideas: Public Talks Program, 21 November. Televised Sky News Xtra 22 November.
59.	Sparrow, R. (2019) ACES CI Monash, invited talk 'Ethical issues of social robots in medicine', Australasian Association of Bioethics and Health Law Conference, Dunedin, New Zealand, 21-23 November.
60.	Wallace, Gordon (2019) ACES CI UOW invited talk '3D Bioprinting – The Importance of Clinical Connections Translation Begins at the start – not at the end of a project!' at the Korean 3D Medical Printing Association Fall meeting, St Mary hospital, EungPyung, Seoul, 22 November.
61.	Haddad, Paul R; Coates Lewellwyn; Lam Shing; Hemida, Mohamed; Abuzeid, Mostafa Adel Atia; Paull, Brett; Breadmore, Michael; Thickett, Stuart; Gooley, Andrew; Wirth, Hans-Jürgen (2019) ACES Als and ACES CI invited talk 'Portable HPLC and electrophoretic systems for applications in the pharmaceutical industry' at the 49th International Symposium on High Performance Liquid Phase Separations and Related Techniques, Kyoto, Japan, 1-5 December.
62.	in het Panhuis, Marc (2019) ACES CI UOW invited talk '3D printing of soft (hydrogels) and hard (surfboard fins) materials', Materials Research Society (MRS) Fall Meeting, Boston, USA, 1-6 December.
63.	In het Panhuis, Marc (2019) ACES CI UOW lead organiser with Dr F. Horkay (NIH, USA), Prof Juergen Groll (University of Wurzburg, Germany), Prof Namita Choudhury (RMIT, Australia) of the Symposium "Hydrogel Materials: from theory to applications via 3D and 4D printing" at the 2019 Materials Research Society (MRS) Fall Meeting conference, Boston, USA, 1-6 December.
64.	Wallace, Gordon (2019) ACES CI UOW invited talk 'Gels for Bioprinting: Finding, Functionalising, Formulating, Printing and Characterising' at the 2019 Materials Research Society (MRS) Fall Meeting conference, Boston, USA, 1-6 December.
65.	Wallace, Gordon (2019) ACES CI UOW invited talk 'Biographene and Neural Communications' at the 2019 Materials Research Society (MRS) Fall Meeting conference, Boston, USA, 1-6 December.
66.	Tomaskovic-Crook, E., Zhang, P., Higginbottom, S., Lee, C.Y., Travas-Sedic, J., Wallace, G.G., Crook, J.M. (2019) invited talk 'Human neural tissues from induced pluripotent stem cells using conductive biogel and printed polymer microelectrode arrays for 3D electrical stimulation' at the Australasian Neuroscience Society 2019 Annual Scientific Meeting, Adelaide, Australia, 2-5 December.

Invited Talks or Panels by ACES members in 2019	
67.	Spinks, Geoffrey (2019) ACES CI UOW invited talk 'Artificial Muscles Inspired by Nature's Motors', Pacific Polymer Congress, Singapore, 8 December.
68.	Coote, M.L. (2019) ACES CI ANU invited talk 'Improved ATRP Catalysts and Their Applications in Synthesis', 16th Pacific Polymer Conference, Singapore 8-12 December.
69.	in het Panhuis, Marc (2019) ACES CI UOW invited talk 'Surfing equipment and materials testing', Surf Science Symposium, Banzaii Pipeline, Hawaii, USA, 9 December. *Open to public

APPENDIX 10: 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 2019	
1.	Officer, D., Xiao, Y., Zarghami, S., Wagner, K., Wagner, P. (2019) ACES CI UOW Officer gave the oral 'Moving microdroplets in 3D with light' at the 9th Australian Colloid and Interface Symposium, Hobart, Tasmania, 3-7 February.
2.	Wagner, Pawel (2019) ACES SRF UOW oral 'Developing Photosensitive Droplets for Chemopropulsion' at the International Conference on Advanced Materials AMN-9, Wellington, New Zealand, 9-15 February.
3.	Simpson, Catherine (2019) ACES PhD ANU poster 'Static Electricity Activates a Non-redox Isomerization in Solution' at the Royal Australian Chemical Institute (RACI) PhysChem, 11 February.
4.	Noble, Ben (2019) ACES ECR ANU poster 'The Mechanism of Oxidative Alkoxyamine Cleavage: The Surprising Role of Solvent and Supporting Electrolyte' at the Royal Australian Chemical Institute (RACI) PhysChem, 11 February.
5.	Hill N. (2019) ACES PhD ANU poster 'Multihydroxy Anthraquinones for Visible Light Photoinitiation: Insights from Quantum Chemistry' at RACI PhysChem, 11 February.
6.	Xiao, Y., Zarghami, S., Wagner, P., Wagner, K., Gordon, K. C., Florea, L., Diamond, D., Officer, D. L. (2019) ACES CI UOW Officer gave the oral 'Photocontrolled movement of droplets in 3D' at PhysChem2019, Perth, Australia 11-14 February.
7.	Zarghami, S., Xiao, Y., Wagner, K., Wagner, P., Florea, L., Diamond, D., Officer, D. L. (2019) oral 'Dual droplet functionality: phototaxis and photopolymerization', PhysChem2019, Perth, Australia 11-14 February.
8.	Crook, Jeremy (2019) ACES CI UOW oral 'Synthetic biology for systems bioengineering' at the Materials in Medicine: Joint ACES and Illawarra Health and Medical Research Institute (IHMRI) Workshop, Wollongong, 26 February.
9.	Spinks, Geoffrey (2019) ACES CI UOW oral 'Double helix artificial muscles', SPIE Smart Structures + Nondestructive Evaluation, Denver, Colorado, United States, 3-7 March.
10.	Spinks, Geoffrey (2019) ACES CI UOW oral 'A standard testing method for tensile actuators', SPIE Smart Structures + Nondestructive Evaluation, Denver, Colorado, United States, 3-7 March.
11.	Lee, Chong-Yong (2019) ACES RF UOW oral "CO ₂ Electrolysis in Seawater" at the 7th UK Solar Fuels Symposium, Cambridge, United Kingdom, 28-29 March.
12.	Crook, Jeremy (2019) ACES CI UOW oral "Cell processing for translational 3D bioprinting" at the 3D Bioprint Translational Workshop, The University of Queensland, Brisbane, 11 April.
13.	Noble, Ben (2019) ACES ECR ANU oral 'The Mechanism of Oxidative Alkoxyamine Cleavage: an 'on-demand' source of radicals and cations for synthesis' at the ChemComm Symposia 2019, 12 April.
14.	Brooks, J. (2019) ACES PhD UOW poster "The Development of Nano-composite FDM Filament by Syringe Pumping of Nano-fillers during Extrusion", at the Materials Research Society Spring Exhibit Phoenix, USA, 21-26 April.
15.	Garcia-Quintana, Laura (2019) ACES Deakin PhD gave an oral "Ionic Liquids Electrolyte composition Influence in the Oxygen Reduction Reaction Mechanism" at the ISE Student Symposium on Electrochemistry (AES) in Brisbane, 29-30 April.
16.	Gilbert Frederic, (2019) ACES AI UTAS peer reviewed conference presentation "Implantable Brain-Computer Interfaces" at Neurotechnology meets AI, Munich, 8-9 May.
17.	Dong, Shou (2019) ACES PhD Monash poster "Fe(II) mixed ligand complexes for high energy density non-aqueous redox flow batteries " at the 25th Topical Meeting of the International Society of Electrochemistry, Toledo, Spain, 12 May.
18.	Hancock, Linda and Ralph, Natalie (2019) ACES CI and SRF Deakin participated in a workshop organised by Dr Gordon Leslie from the Monash business school on 'Energy Storage & Demand Response for a high renewables future', 14 May 2019.
19.	Gilbert Frederic, (2019) peer reviewed conference presentation "Cyborging Human Control: supplementing or Supplanting Human Agency?" at The future of Neuroethics, Vita-Salute San Raffaele University, Milan, 15-17 May.
20.	Vijayakumar, Amruthalakshmi (2019) ACES affiliate PhD UOW oral "A gold-polyaniline nanocomposites catalyst with a posy bouquet structure for efficient electrocatalytic reduction of CO ₂ " at the 235th ECS meeting in Dallas, 26-30 May.

Conference Presentations by ACES members in 2019	
21.	Kalsoom, Umme (2019) ACES ECR UTAS oral “3D printable electrically conducting boron-doped diamond polymer composite for humidity sensing” at the 2019 Spring Meeting of the European Materials Research Society (E-MRS), Nice, France, 27-31 May.
22.	Khakbaz, Hadis (2019) ACES PhD UOW oral "3D printing of highly flexible, thermal conductive and biocompatible boron nitride nanocomposites for bioelectronics" in "Dielectric nanocomposites for energy, environment and health: from fundamental to devices" at the European Materials Research Society (EMRS) spring meeting Nice, France, 27-31 May.
23.	Kalsoom, Umme (2019) ACES ECR UTAS poster “3D printable integrated porous membranes for passive sampling devices” at the 2019 Spring Meeting of the European Materials Research Society (E-MRS), Nice, France, 27-31 May.
24.	Kalsoom, Umme (2019) ACES ECR UTAS oral “3D printable electrically conducting boron-doped diamond polymer composite for humidity sensing” at the 2019 Spring Meeting of the European Materials Research Society (E-MRS), Nice, France, 27-31 May.
25.	Hancock, Linda and Ralph, Natalie (2019) ACES CI and SRF Deakin gave a paper “Coal at any cost? Australia’s export of coal-generated H2 for Japan’s “green” H ₂ economy” at Energy and Society in Transition conference, Arizona, 28-31 May.
26.	Wollershieim, Linda (2019) ACES PhD Deakin oral “Framing just transitions: discourses as facilitators and barriers of low-carbon energy transitions in Germany and Australia” for RSA Annual Conference, Spain, 3-5 June.
27.	Li, Jianfeng (2019) ACES PhD UOW oral “Graphene Based Structures for Bone Tissue Engineering” at the 28th NSW Stem Cell Network Workshop; Stem Cell Innovative Technologies, 11 June.
28.	Simonov, Alexandr (2019) ACES SRF Monash oral “Low-temperature Solution Processed Bismuth-based Thin Film Solar Cells” at Photovoltaics Workshop, Georgia Tech, 13-14 June.
29.	Zarghami, S., Xiao, Y., Wagner, K., Wagner, P., Florea, L., Diamond, D., Officer, D. L. (2019) ACES affiliate PhD Zargami oral ‘Dual droplet functionality: phototaxis and photopolymerization’ at the 9th International Colloids Conference, Sitges, Barcelona, Spain 16-19 June.
30.	Foroughi, Javad (2019) ACES AI UOW gave an oral “novel super-elastic hybrid CNT/graphene fibres for wearable supercapacitors” at 6th Nano Today Conference, Lisbon, Portugal, 16-20 June.
31.	Paull, B., Chen, L., Cabot, J., Wallace, G., Daikuara, L., and Yue, Z. (2019), oral by ACES CI UTAS Paull at the 48th International Symposium on High-Performance Liquid Phase Separations And Related Techniques, Milano, Italy, 16-20 June.
32.	Hemida, M., Lam, S., Li, Y., Gooley, A., Paull, B., Haddad, P., and Macka, M. (2019) oral by ACES CI UTAS Paull at the 48th International Symposium on High-Performance Liquid Phase Separations And Related Techniques, Milano, Italy, 16-20 June.
33.	Rodriguez, E., Perron, M., Proemse, B., Bowie, A., Paull, B., (2019) at the 48th International Symposium on High-Performance Liquid Phase Separations and Related Techniques, Milano, Italy, 16-20 June.
34.	Wu, Liang (2019) ACES PhD UOW poster ‘FDM-3D printed electroosmotic pumps’ at the 2019 lab-on-a ship and microfluidics Europe 2019 conference, Rotterdam, Netherland, 17-19 June.
35.	Moraes Silva, Saimon (2019) ACES RF SUT oral “Development of Antifouling Surfaces for Bionic Implants” at 10th International Nanomedicine Conference, Sydney, Australia, 24-26 June.
36.	Higgins, Michael (2019) ACES CI UOW oral ‘Watching’ Single Protein Interactions on Nanoparticle and Polymer Surfaces in Liquid using High-Speed Atomic Force Microscopy” at 10th International Nanomedicine Conference, Sydney, 24-26 June.
37.	Ralph and Hancock (2019) ACES RF and CI Deakin presented “Conflict and critical materials in Solar PV supply chains: embedding ethical materials choices in research, design and product lifecycle of solar PV (presented by L. Hancock)” at International Conference on Public Policy, Montreal, 26-28 June.
38.	Hancock (2019) ACES CI Deakin presented “Big Energy (Coal) and India’s 2-percent CSR under the Companies Act 2013” at International Conference on Public Policy, Montreal, 26-28 June.
39.	Ralph, N (2019) ACES RF Deakin Business oral “Preventing Violent Extremism: Cases, Proposed Practice and an Agenda for Research”, International Conference on Public Policy (ICPP), Montreal, Canada, 26-28 June.
40.	Khan, Jawairia Umar (2019) ACES affiliate PhD UOW oral ‘Development of 3D textile based microfluidic devices for electrophoretic separation’ at 10th Australia and New Zealand Nano and Microfluidics Symposium (ANZMNF 2019), 1-3 July.
41.	Duc, Daniela (2019) ACES PhD Swinburne poster “Electrode Interface for Electrical and Near-Infrared Co-Stimulation of Neurons”, RACI Carbon Innovation Conference, Swinburne University of Technology, Victoria, 8 July.
42.	The An Ha, Cristina Pozo-Gonzalo, Jian Fang, Maria Forsyth, Patrick C. Howlett (2019) poster presented by The An Ha ACES affiliate PhD Deakin “Towards an understanding of the discharge products formation in ionic liquids based Na-O ₂ batteries: A case study of carbon nanofiber” RACI Carbon Innovation Conference, Swinburne University of Technology, Victoria, 8 July.

Conference Presentations by ACES members in 2019	
43.	Pringle, Jennifer (2019) ACES CI Deakin oral ‘Ionic liquid-based redox electrolytes for thermal energy harvesting’, at the 14th International conference on materials chemistry (MC14), Birmingham, UK, 8-11 July.
44.	Hill, Nicholas (2019) ACES PhD ANU poster ‘Internal Electric Fields as a Strategy for Modifying Photochemistry’ at Triennial Congress of the International Society for Theoretical Chemical Physics (ISTCP2019), Norway, 11-17 July.
45.	Noble, Ben (2019) ACES ECR ANU oral ‘The Mechanism of Oxidative Alkoxyamine Cleavage: an ‘on-demand’ source of radicals and cations for synthesis’ at the RACI NSW Polymer Symposium, 15 July.
46.	Blesch, Thomas (2019) ACES PhD Monash poster ‘Electrolyte Solvent Mixtures for a Redox Flow Battery based on [Fe(bpy) ₃][FSI] ₂ ’ at the Electrochemical Conference on Energy & the Environment (ECEE 2019), Glasgow, 21-26 July.
47.	Pringle, Jennifer (2019) ACES CI Deakin oral ‘Development of Organic Ionic Plastic Crystals As Solid-State Electrolytes’ at The Electrochemical Conference on Energy and the Environment (ECEE 2019): Bioelectrochemistry and Energy Storage, Glasgow, 21-26 July.
48.	Mudiyanselage, Isuru Eranda Gunathilaka Adikari (2019) ACES affiliate PhD Deakin poster ‘NMR and MRI studies of cobalt redox active ionic liquids for thermo-electrochemical cells’ at The Electrochemical Conference on Energy and the Environment (ECEE 2019): Bioelectrochemistry and Energy Storage, Glasgow, Scotland, 21-26 July.
49.	Makhlooghi Azad, Faezeh (2019) ACES ECR Deakin oral “Novel solid state electrolyte based on organic ionic plastic crystals for sodium batteries” at the 70th Annual meeting of the International Society of Electrochemistry (ISE-219), Durban, South Africa, 4-9 August.
50.	Silva, Saimon Moraes (2019) ACES RF Swinburne oral “Antifouling surfaces” at the 70th Annual meeting of the International Society of Electrochemistry (ISE-219), Durban, South Africa, 4-9 August.
51.	Duc, Daniela (2019) ACES PhD Swinburne poster “Fabrication of Electrode Interface for Electrical and Near-Infrared and electrical neuronal cell co-stimulation”, at Aikenhead Centre for Medical Discovery (ACMD) Research Week, Fitzroy, Victoria, 5-9 August.
52.	Brooks, Joshua (2019) ACES PhD UOW poster “Creating Extruded FDM Composite Filament by Syringe Pumping of Nano-fillers” at 22nd International Conference on Composite Materials (ICCM22), Melbourne, 11-16 August.
53.	Duc, Daniela (2019) ACES PhD Swinburne oral “Electrode Interface for Electrical and Near-Infrared Co-Stimulation of Neurons”, at the Australian National Fabrication Facility (ANFF) Nanofabulous Winter Workshop, The Melbourne Centre for Nanofabrication, Clayton Victoria, 19-20 August.
54.	Hodgetts, Rebecca (2019) ACES PhD Monash poster “Universal quantification of ammonium by rapid 1H NMR Analysis for Nitrogen reduction studies” at the Ammonia = Hydrogen 2.0 Conference, Ammonia Energy Association, Clayton, Victoria, 22-23 August. *First Prize.
55.	Wollershieim, Linda (2019) ACES PhD Deakin oral ‘Framing just transitions: discourses as facilitators and barriers of low-carbon energy transitions in Germany and Australia’ at KOSMOS Sustainability Conference, Berlin, Germany, 28-30 August.
56.	Kalsoom, U., Paull, B. (2019) ACES ECR UOW oral at the 11th International Passive Sampling Workshop and Symposium, Boston, 11-13 September.
57.	Goddard, Eliza (2019) ACES ECR UNSW presented a paper on ‘Minding the Gap: Ethical questions raised by the “brain on a bench”’, La Trobe University Philosophy Seminar Series, 18 September.
58.	Simonov, A (2019) ACES SRF Monash oral “Green H ₂ at Monash and ACES”, Monash Energy Conference, Monash University Clayton campus, Victoria, Australia, 19 September.
59.	Tomaskovic-Crook E.(2019) ACES RF UOW oral “Materials mediated gene transfection to temporarily control human stem cells and their neural differentiation”, AIIM for Gold Day, UOW, September.
60.	Drouyer M, Tomaskovic-Crook E, et al (2019) ACES RF UOW was co-author of poster “Development of novel AAV variants using an advanced clinically-relevant 3D human neural tissue model”, Westmead Hospital Research Day, Sydney, 23 September.
61.	Wang, Caiyun (2019) ACES SRF UOW oral “Interfacial Engineering of Metal Catalysts with Functional Supports for Efficient Electrochemical CO ₂ Reduction” at the 20th International Union of Materials Research Societies Conference – International Conference in Asia (IUMRS-ICA-2019), 22-26 September.
62.	Simpson, Catherine (2019) ACES PhD ANU poster ‘Activation of a Non-Redox Isomerisation Using Static Electricity’, at the Asia-Pacific Association of Theoretical and Computational Chemists (APATCC) 2019, 30 September.
63.	Hill, Nicholas (2019) ACES PhD ANU poster ‘Internal Electric Fields as Strategy for Altering Photochemistry’ at the Asia-Pacific Association of Theoretical and Computational Chemists Conference 2019, 1 October.
64.	Yu, Lijuan (2019) ACES RF ANU poster ‘Re-examination of Proline-catalyzed intermolecular Aldol Reactions: An Ab Initio Kinetic Modelling Study” at Asia-Pacific Association of Theoretical and Computational Chemists Conference (APATCC2019) conference, Sydney, 30 September to 4 October.

Conference Presentations by ACES members in 2019	
65.	Noble, B. (2019) ACES RF ANU 'The Mechanism of Oxidative Alkoxyamine Cleavage; an 'on-demand' source of radicals and cations for synthesis' at Asia-Pacific Association of Theoretical and Computational Chemists Conference (APATCC2019), Sydney, 1 October.
66.	Faisal, S.N. (2019) ACES ECR UOW oral 'Additive-free Graphene formulations for Moldable Energy and Composite Materials' at the International Conference on Nanospace Materials (ICNM), University of Queensland, Brisbane, 1-5 October.
67.	Gayani, Buddhika (2019) ACES PhD UOW 'Single-cell analysis of cell-material interactions for the discovery of phenotypic disease biomarkers', NSW Meeting 2019 of Matrix Biology Society of Australia and New Zealand, Sydney, 11 October.
68.	Chen, Xifang (2019) ACES PhD UOW Poster "3D printing ulvan-84-based structures for wound healing" at the Tissue Engineering & Regenerative Medicine International Society – Asia Pacific Chapter and the Australasian Society for Biomaterials and Tissue Engineering Congress (TERMIS-AP), Brisbane, Australia, 14-17 October.
69.	Dinoro, Jeremy (2019) ACES affiliate PhD UOW poster "Bone regeneration using Porestar" at the Tissue Engineering & Regenerative Medicine International Society – Asia Pacific Chapter and the Australasian Society for Biomaterials and Tissue Engineering Congress (TERMIS-AP), Brisbane, Australia, 14-17 October.
70.	Posniak, Stephen (2019) ACES affiliate PhD UOW poster '3D-Printing Cell-Laden Scaffolds to Regenerate Cartilage for Craniofacial Reconstruction', at Tissue Engineering & Regenerative Medicine International Society – Asia Pacific Chapter and the Australasian Society for Biomaterials and Tissue Engineering Congress (TERMIS-AP), Brisbane, Australia, 14-17 October.
71.	Shekibi, Bijan (2019) ACES PhD UOW poster "Modelling motor neuron functionality using neuronal cell lines" at Tissue Engineering & Regenerative Medicine International Society – Asia Pacific Chapter and the Australasian Society for Biomaterials and Tissue Engineering Congress (TERMIS-AP), Brisbane, Australia, 14-17 October.
72.	Ruland, Andres (2019) ACES ECR UOW oral "Quantitative Ultrasound Imaging of Cell-laden Hydrogels and Printed Constructs" at the Tissue Engineering & Regenerative Medicine International Society – Asia Pacific Chapter and the Australasian Society for Biomaterials and Tissue Engineering Congress (TERMIS-AP), Brisbane, Australia, 14-17 October. *Best oral presentation overall finalist.
73.	Pozo-Gonazalo, Cristina(2019) ACES SRF Deakin on organising committee in session E03 Ionic Liquids as Reactive Media for Electrodeposition Processes a the 236th ECS (The Electrochemical Society) meeting, Atlanta US, 13-17 October.
74.	Goddard, Eliza (2019) ACES ECR UNSW oral 'A survey on what Australians with upper limb difference want in a prosthesis' at the Australian Orthotic Prosthetic Congress (AOPA), 24 October.
75.	Chen, Zhi (2019) ACES ECR UOW oral 'Building biomimetic human cornea using electro-compacted collagen' at the 3rd Australia Corneal Bioengineering Working Group/1st ANZ Corneal Bioengineering Working Group meeting, Sydney Business School, 7 November.
76.	Warren, Holly (2019) ACES ECR UOW oral 'Design and Development of Bioink Formulations' at the 3rd Australia Corneal Bioengineering Working Group/1st ANZ Corneal Bioengineering Working Group meeting, Sydney Business School, 7 November.
77.	Noble, Ben (2019) ACES RF ANU 'The Mechanism of Oxidative Alkoxyamine Cleavage; an 'on-demand' source of radicals and cations for synthesis' at the 37th Australasian Polymer Symposium, 12 November.
78.	Simonov, Alexandr (2019) ACES SRF Monash poster N. Pai, J.-F. Lu, P. C. Andrews, U. Bach, A. N. Simonov of 'Tuning the optoelectronic properties of bismuth-based halides via anionic substitution for the enhanced photovoltaic performance' at the Cell-iChEM Symposia: Next Generation Materials for Energy Applications, Xiamen, China, 16-19 November.
79.	Simonov, Alexandr (2019) ACES SRF Monash oral on work M. Chatti, J. L. Gardiner, S. Luke, M. Fournier, D. R. MacFarlane, R. K. Hocking, A. N. Simonov on 'Self-healing electrocatalysts for stable oxidation of hot acidic water' at the Cell-iChEM Symposia: Next Generation Materials for Energy Applications, Xiamen, China, 16-19 November.
80.	Wollersheim, Linda (2019) ACES PhD Deakin oral 'The Rise of Resilience and the Crisis of Global Climate Governance' at Alfred Deakin Institute Flagship Conference after Liberalism: Populism and the Future of Democracy, Melbourne, 20 -22 November.
81.	Gunathilaka, Isuru (2019) ACES Affiliate PhD Deakin oral 'Investigating the internal processes of thermos-electrochemical cells using in-situ magnetic resonance imaging' at the 12th Australian and New Zealand Society for Magnetic Resonance Conference, 25- 28 November.
82.	Haddad, Paul; Coates, Lewellwyn; Lam, Shing; Hemida, Mohamed; Abuzeid, Mostafa Adel Atia; Paull, Brett; Breadmore, Michael; Thickett, Stuart; Gooley, Andrew; Wirth, Hans-Jürgen (2019) oral 'Portable HPLC and electrophoretic systems for applications in the pharmaceutical industry' at the 49th International Symposium on High Performance Liquid Phase Separations and Related Techniques, Katsura, Kyoto, Japan, 1-5 December.
83.	Tomaskovic-Crook Eva, et al (2019) ACES RF UOW oral 'Human Neural Tissues from Induced Pluripotent Stem Cells Using Conductive Biogel and Printed Polymer Microelectrode Arrays for 3D Electrical Stimulation', Australasian Neuroscience Society, Adelaide, 2-5 December.

Conference Presentations by ACES members in 2019	
84.	Rathbone S, et al (2019) ACES PhD UOW poster 'Ultrasound Mediated Piezoelectric Stimulation of Human Neural Stem Cells', Australasian Neuroscience Society, Adelaide, 2-5 December.

APPENDIX 11: ACES INVITED SEMINARS/COLLABORATIVE RESEARCH VISITS

ACES Invited Seminars/Collaborative visits showcasing research activities 2019	
Collaboration Visits	
1.	Fay, Cormac (2019) ACES UOW RF visited Sydney University to discuss collaborative project with Dr Sina Naficy, 8 January.
2.	Yue, Zhilian (2019) ACES SRF UOW accompanied ACES affiliate PhD students Xifang Chen, Luciana Daikuara and Lingzhi Kang to visit Dr Zhe Li Burns Unit at Concord Hospital, Sydney to discuss a potential collaboration in wound healing, 10 January.
3.	Wallace, Gordon (2019) ACES CI UOW visited collaborators at Tampere University Finland then Prof Rui de Sousa at Stemmatters in Portugal, to progress research activities, 12-22 January.
4.	Wang, Caiyun (2019) ACES UOW RF visited A/Prof Zongyou Yin at School of Chemistry at ANU, Canberra to tour the facilities and hold collaborative research discussions, 18 January.
5.	Wollersheim, Linda, (2019) ACES Deakin PhD, participated in meeting for European Consortium for Political Research (ECPR) Standing Group on Environmental Politics, 22 January.
6.	Li, Jianfang (2019) ACES UOW PhD worked with ANSTO collaborators to elucidate the effect of distributed 3D mechanical properties on cell behavior and the impact of electromaterial distribution in scaffolds on cell behavior, January.
7.	Tomaskovic-Crook, Eva (2019) ACES UOW RF worked with ANSTO colleagues on in vivo imaging of engrafted 3D human neural microtissue constructs, January.
8.	Tomaskovic-Crook, Eva (2019) ACES UOW RF worked with IHMRI colleagues on 3D models of Alzheimer's disease using hNSC encapsulated Al-CMC-Ag constructs, January.
9.	Coote, Michelle (2019) ACES CI ANU visited University of Georgia, Athens Georgia, to present the Schleyer Lectureship and discuss collaborative opportunities, 3-6 February.
10.	Walker, Mary (2019) ACES AI and former RF did a 2 month residency at the Brocher Foundation, Hermance Switzerland to work alongside other scholars working in ethical, legal and social implications of new health technologies, 7 February - 29 March.
11.	Gilbert, Frederic (2019) ACES AI UTAS visited Merlin Bittlinger at the Berlin School of Mind and Brain, Humboldt University where he gave a seminar and discussed collaborative opportunities, 21-25 February.
12.	Chen, Jun (2019) ACES CI UOW visited ACES alumni A/Prof Joselito Razal at Deakin University Geelong campus to discuss potential collaborative research, February.
13.	Wagner, Pawel and Mozer, Attila (2019) ACES SRF UOW and ACES CI UOW visited Prof Keith Gordon at Otago University, New Zealand, to work on the collaborative project of novel conjugated molecules, 5-10 March 2019.
14.	Walker, Mary (2019) ACES AI and former RF visited Emeritus Prof Lazare Benaroyo, Faculty of Medicine and Biology and Dr Gilles Merminod, Centre for Linguistics and Language Sciences at University of Lausanne, Switzerland to plan a research workshop, 6 March.
15.	Garcia-Quintana, Laura (2019) ACES PhD Deakin visited Prof Michel Armand CIC Energigune to discuss research results, 7 March.
16.	Coote, Michelle (2019) ACES CI ANU visited Huazhong University of Science and Technology, Wuhan China to present the Huayuan Lectureship and discuss collaborative opportunities, 12-16 March.
17.	Zhang, Jie (2019) ACES CI Monash visited Prof Dan Luo, Department of Chemical Engineering, Sichuan University, Chengdu, China, to discuss collaborative research opportunities, 21-22 March.
18.	Zhang, Jie (2019) ACES CI Monash visited Prof Jiantai Ma, College of Chemistry, Lanzhou University, Lanzhou, China, to discuss collaborative research opportunities, 25-27 March.
19.	Zhang, Jie (2019) ACES CI Monash visited Prof Xiaomin Sun, College of Chemistry, Beijing University of Chemical Technology, Beijing China, to discuss collaborative research opportunities, 28 March.
20.	Higgins, Michael (2019) ACES CI UOW visited Irene Yarovsky at RMIT, Melbourne to progress collaborative research, 28-31 March.
21.	Forsyth, Maria (2019) ACES CI Deakin visited Prof Teo Rojo, Dr Heng Zheng and Dr Nagore Ortiz-Vitoriano at CIC Energigune, Vitoria-Gasteiz Spain, to progress collaborative projects, March.
22.	Forsyth, Maria (2019) ACES CI Deakin visited Prof David Mecerreyes at Polymat, Basque Center for Macromolecular Design and Engineering, POLYMAT Fundazioa, to progress collaborative projects, March and April.

ACES Invited Seminars/Collaborative visits showcasing research activities 2019	
23.	Zhang, Jie (2019) ACES CI Monash visited Prof Yuanhui Zheng, College of Chemistry, Fuzhou University, Fuzhou, China, to present a lecture and discuss collaborative research opportunities, 1 April.
24.	Zhang, Jie (2019) ACES CI Monash visited Prof Lilong Jiang, Director of the National Engineering Research Center for Chemical Fertilizer Catalyst, Fuzhou, China, to present a lecture and discuss collaborative research opportunities, 2-4 April.
25.	Rakov, Dmitrii (2019) ACES PhD Deakin visited Prof Rob Atkin at the University of Sydney to undertake AFM force- curve measurements of ionic liquids on gold polarised surfaces, 3 April.
26.	Wagner, Pawel (2019) visited Dr Pu Xiao at ANU, Canberra to discuss photosynthesisers, 5 April.
27.	Gilbert, Frederic (2019) ACES AI UTAS visited Mathilde Lancelot to work on an article and gave a presentation “Ce que souleve un vecu chronique avec accompagnement neurotechnologique- L'exemple des technologies invasives du cerveau” at SPHERE, CNRS, Institut de Recherche en Santé Publique, Universite Paris, France, 9 April.
28.	Zarghami, Sara (2019) ACES affiliate PhD UOW visited Max Planck Institute Germany to carry out collaborative research, 14 April - 6 June.
29.	Wagner, Klaudia (2019) ACES RF UOW visited Corinna Maas at the Max Planck Institute, Germany, to work on an Australia-Germany grant project, 15-19 April 2019.
30.	Wagner, Pawel (2019) ACES SRF UOW visited Dr Pu Xiao at ANU, to deliver dye samples and discuss further syntheses as well as check ANU two-photon system, 17 April.
31.	Arachchi, Nuwan Hegoda (2019) ACES affiliate PhD UOW visited Professor Takayuki Uchihashi at Nagoya University in Japan to undertake high speed AFM measurements, 21 April to 31 May.
32.	Mozer, Attila (2019) ACES CI UOW visited Dr Janaky Csaba at Szeged Hungary, to give an invited seminar 'Exploiting intermolecular interactions between alkyl-functionalised electron donor–acceptor pairs to enhance interfacial electron transfer rates' and discuss collaborative research, 21-23 April.
33.	Wang, Xungai (2019) ACES CI Deakin visited Profs Budamir Mijovic and Zenun Skenderi at the Faculty of Textile Technology, University of Zagreb, Croatia, to present a seminar and discuss collaborative opportunities, 23-24 April.
34.	Mozer, Attila (2019) ACES CI UOW visited Dr Lukacs Andras at Pecs Hungary, to discuss collaborative research and review their facilities, 26 April.
35.	Forsyth, Maria (2019) ACES CI Deakin visited Dr Laura Sanchez Cupido, Dr Amal Siriwardana and Dr Ainhoa Unzurrunzaga at Technalia Spain to review facilities and progress collaborative projects, April.
36.	Zhou, Hao, (2019) ACES RF UOW, visited Dr Greg and Dr Boone of the Prince of Wales Hospital, to provide an update on ACES robotic research activities and discuss potential projects, 2 May.
37.	Higgins, Michael (2019) ACES CI UOW visited Boris Martinec at the Victor Chang Institute, Sydney to review the facilities, 10 May.
38.	Higgins, Michael (2019) ACES CI UOW visited Inke Muir at CSL Limited, Bio21, Melbourne to discuss collaborative research opportunities, 17 May.
39.	Higgins, Michael (2019) ACES CI UOW visited Luciano Martelotto at Peter MacCallum Cancer Centre, Melbourne to discuss collaborative research opportunities, 17 May.
40.	Higgins, Michael (2019) ACES CI UOW visited Shalin Naik at Walter and Eliza Hall Institute of Medical Research, Melbourne to discuss collaborative research opportunities and review the facilities, 17 May.
41.	Officer, David (2019) ACES CI UOW visited Dr Damia Mawad at UNSW to progress an ARC discovery research project, 22 May.
42.	Wagner, Pawel (2019) ACES SRF UOW visited Prof S Mori and Prof M Kimura at Shinshu University in Japan to progress work on photosynthesisers and printing MOFs, 22-29 May.
43.	Wagner, Pawel (2019) ACES SRF UOW visited Dr Molino at Yokohama National University in Japan to progress work on two photon printing processed, 22-29 May.
44.	Wang, Xungai (2019) ACES CI Deakin visited Prof Jinlian Hu at Hong Kong Polytechnic University, Hong Kong, to discuss collaborative opportunities, 24 May.
45.	Forsyth, Maria (2019) ACES CI Deakin visited Prof Lianzhou Wang lab at University of Queensland, to discuss collaborative research opportunities, 29 May.
46.	Officer, D.L. (2019) ACES CI UOW visited Prof Ray Baughman, University of Texas Dallas, USA where he presented a research lecture and discussed collaborative research opportunities for graphene use, 29 May.
47.	Wagner, Klaudia (2019) ACES SRF UOW visited Dr Larisa Florea at Trinity College, Dublin, Ireland to progress research activities, 29 May-3 June.
48.	Hancock, Linda (2019) ACES CI Deakin visited Arizona State University (Tempe) to meet Prof Benjamin Sovacool, Sussex University UK, to discuss the 10th International Workshop for Cleaner Production, 30 May.

ACES Invited Seminars/Collaborative visits showcasing research activities 2019	
49.	Kalsoon, Umme (2019) ACES UTAS RF visited TE Laboratories in Tullow Ireland to develop 3D printed passive samplers, 3-14 June.
50.	Wollershien, Linda (2019) ACES PhD Deakin oral “Framing just transitions: discourses as facilitators and barriers of low-carbon energy transitions in Germany and Australia” for RSA Annual Conference, Spain, 3-5 June.
51.	Wollershien, Linda (2019) ACES PhD Deakin research engagement meeting with Prof Dr Jannika Mattes and Dr Camilla Chlebna at the Universidad de Santiago de Compostela, Spain, 6-7 June.
52.	Wollershien, Linda (2019) ACES PhD Deakin research engagement meeting with guided tour of Hambach Forest by Michael Zobel from NRW.EnergieAgentur, Dusseldorf, Germany, 9 June.
53.	Higgins, Michael (2019) ACES CI UOW visited Paul Dalton at Wurzburg, Germany to discuss collaborative research opportunities and progress of the MPhil Biofabrication course, 10 June.
54.	Higgins, Michael (2019) ACES CI UOW visited Christine Kranz, Mika Lindén and Marcus Fändrich at Ulm, Germany to give a lecture and discuss collaborative research opportunities, 11 June.
55.	Simonov, Alexandr (2019) ACES SRF Monash visited A/Prof Shery Chang at Arizona State University to discuss the possibilities for in situ electrochemical TEM experiments, 12 June.
56.	Higgins, Michael (2019) ACES CI UOW visited Bas Groen at Amsterdam, Netherlands to discuss a large instrument acquisition, 12 June.
57.	Higgins, Michael (2019) ACES CI UOW visited Adrian Lee at Newcastle University, UK to discuss collaborative research opportunities, 13 June.
58.	MacFarlane, Douglas (2019) ACES CI Monash visited Prof Antonio Benedetto at University College Dublin, to present a lecture and review their facilities, 13 June.
59.	Simonov, Alexandr (2019) ACES SRF Monash visited Profs Seth Marder, Pelsa Reichmanis and Jean-Luc Brédas at Georgia Tech to discuss possibilities for future joint grant applications and extended collaborations in photovoltaics, 13-14 June.
60.	Higgins, Michael (2019) ACES CI UOW visited Michael Nugent at Athlone, Ireland to discuss collaborative research opportunities, 18 June.
61.	Higgins, Michael (2019) ACES CI UOW visited Donal Leech at Galway, Ireland to give a lecture and discuss collaborative research opportunities, 18 June.
62.	Higgins, Michael (2019) ACES CI UOW visited Brian Rodriguez and Suzi Jarvis at Dublin City University to discuss collaborative research opportunities, 19 June.
63.	Zhou, Hao, (2019) ACES UOW ECR, visited Dr Greg and Melissa Leong of the Prince of Wales Hospital, to provide an update on ACES robotic research activities and discuss potential projects, 20 June.
64.	Kalsoon, Umme (2019) ACES UTAS ECR visited Dublin City University, Ireland to conduct research, 17-27 June.
65.	Hill, Nicholas (2019) ACES PhD ANU visited Yohann Guillianeuf at Aix-Marseille University, France to work with experimental collaborators that complement his modelling work on photonitroxide-mediated polymerisation for a month from 22 June.
66.	Wu, Liang (2019) ACES PhD UOW visited Utrecht University, Netherlands where he gave a seminar on FDM-3D printed electroosmotic pumps to tissue engineering researchers with the view to initiate collaborations, 24-26 June.
67.	Chen, Jun (2019) ACES CI UOW visited ACES alumni Dr Carol Crean at Surrey University, UK to discuss progress on collaborative projects, 30 June – 5 July.
68.	Zhang, Jie (2019) ACES CI Monash visited Prof Frank Marken and Dr Ulrich Hintermair, Bath University, UK, to discuss collaborative research opportunities, 1-2 July.
69.	Hill, Nicholas (2019) ACES PhD ANU visited University of Provence- Aix – Marseilles, Marseilles France, to undertake a collaborative research project, 1-10 July.
70.	Pozo-Gonzalo, Cristina (2019) ACES RF Deakin visited Prof Rojo and Dr Ortiz-Vitoriano at CIC EnergiGUNE for ongoing discussions on sodium-air battery joint research activities, 2-5 July.
71.	Simonov, Alexandr (Sasha) (2019) ACES RF Monash visited Dr Thomas Götsch and Dr Juan J. Velasco Vélez at the Fritz Haber Institute, Berlin to discuss and prepare for upcoming in situ XPS beamtime at BESSYII, 5 July.
72.	Simonov, Alexandr (Sasha) (2019) ACES RF Monash did operando XAS/RIXS electrochemical analysis of the CoOOH water oxidation catalysts at BESSYII synchrotron facility in Berlin (photograph) with ACES alumni Dr S. Bonke and Dr M Tesch from CEC MPI, July.
73.	Fay, Cormac (2019) ACES UOW RF visited Sydney University to discuss collaborative project with Dr Sina Naficy, 8 January.
74.	Chen, Jun (2019) ACES CI UOW visited A/Prof Terry Steele at Nanyang Technological University, Singapore to discuss progress on collaborative projects, 7-13 July.

ACES Invited Seminars/Collaborative visits showcasing research activities 2019	
75.	Pozo-Gonzalo, Cristina (2019) ACES RF Deakin visited Prof David Mecerreyes at Polymat Spain for joint project discussions on the use of polymers in metal air batteries, 8 July.
76.	Simonov, Alexandr (Sasha) (2019) ACES RF Monash visited Prof Matthias Dreiss at Technical University Berlin where he gave a seminar and progressed collaborative research discussions, 9 July.
77.	Mudiyanselage , Isuru Eranda Gunathilaka Adikari (2019) ACES affiliate PhD Deakin visited Dr Melanie Britton at the University of Birmingham, UK to undertake magnetic resonance imaging techniques, 12 July – 30 August.
78.	Simonov, Alexandr (Sasha) (2019) ACES RF Monash visited Profs Christina Roth, Roland Marschall and Mukundan Thellakat at Bayreuth University, where he gave a seminar and progressed collaborative research discussions that included a possible joint PhD project, 14 July.
79.	Wagner, Pawel (2019) ACES SRF UOW visited Prof Pu Xiao at ANU to progress collaborative research, 15 July.
80.	Ralph, Natalie (2019) ACES RF Deakin visited Jay Joseph, Assistant Professor Enterprise and Development, American University of Beirut and Fahrettin Sumer, American University of Iraq to discuss research on renewable energy in conflict affected areas (e.g. Iraq) and developing theory, 16 July.
81.	Simonov, Alexandr (Sasha) (2019) ACES RF Monash visited Prof Elena Savinova at Strasbourg University, where he gave a seminar and discussed possible collaboration in the field of electrocatalysis, 16 July.
82.	Higgins, Michael (2019) ACES CI UOW visited Clive Prestige at University South Australia to discuss collaborative research opportunities, 19 July.
83.	Mudiyanselage , Isuru Eranda Gunathilaka Adikari (2019) ACES affiliate PhD Deakin worked with Dr Galina Pavlovskaya at the University of Nottingham, UK on sodium imaging, 18, 19 and 24 July.
84.	Sparrow, Robert (2019) ACES CI Monash visited Prof Julian Savulescu, Oxford Uehiro Centre for Practical Ethics, Oxford, UK where he gave a seminar 'Robotics has a race problem' and held collaborative research discussions, 18 July.
85	Simonov, Alexandr (Sasha) (2019) ACES RF Monash visited Prof Antoni Liobet at ICIQ, Tarragona, to discuss possible collaboration in the field of electrocatalysis, 21 July.
86	Chen, Zhi (2019) ACES PhD UOW visited Sydney Eye Bank, University of Sydney, to discuss research material requirements and progress research activities, 25 July, 29 August.
87	Simonov, Alexandr (Sasha) (2019) ACES RF Monash visited Prof David Gavaghan and Dr Alison Parkin at Oxford University, UK, to discuss the ongoing work and future directions of research on automated electrokinetic data analysis, 26 July.
88	Simonov, Alexandr (Sasha) (2019) ACES RF Monash visited ACES alumni Dr Luis Azofra in Barcelona to discuss the ongoing work and future projects on DFT modelling of electrocatalytic mechanisms, 30 July.
89	Faisal, S.N. (2019) ACES ECR UOW visited Prof Marcela Bilek at University of Sydney, for the plasma treatment of edge-functionalised graphene, 20 August.
90	Gayani, Buddhika and Higgins, Michael (2019) ACES PhD and CI UOW visited Prof Marie Ranson, Cancer group at IHMRI UOW group, to discuss possible joint research activities, 27 August.
91	Faisal, S.N. (2019) ACES ECR UOW visited Prof Chris Garvey ANSTO, for SANS study of edge-functionalised graphene, August.
92	Chen, Jun (2019) ACES CI UOW visited Prof Quoxiu Wang at University of Technology Sydney to discuss potential collaborative projects, August.
93	Simonov, Alexandr (Sasha) (2019) ACES RF Monash completed operando XAS electrochemical analysis of the self-healing Co-Fe-Pb acidic water oxidation catalysts at Australian Synchrotron with Mr J Gardiner, ACES alumni Dr Dijon Hoogeveen, ACES alumni Dr M Chatti (Monash), Ms H King and Dr R Hocking (Swinburne), August.
94	Cook, Mark (2019) ACES CI UOM visited Aleksander Sobolewski, Staff Neuroscientist, Wyss Center for Bio and Neuroengineering, Geneva Switzerland to review their facilities, 5 September.
95	Cook, Mark (2019) ACES CI UOM visited Steen Hesthaven, Chief Commercial Officer, UNEEG medical A/S, Lyngø Denmark to discuss collaborative research opportunities, 10 September.
96	Qin, Chunyan (2019) ACES UOW PhD gave an oral at the IHMRI-ACES networking workshop with the purpose of identifying those with interest and skills relevant to cardiovascular and other NSW research priorities, 17 September. The idea was to prepare to take advantage of the NSW Office of Health and Medical Research (OHMR) funding opportunities with investment of \$150 million in cardiovascular research over the next 10 years as well as identify those most likely to be eligible for fellowships.
97	Innis, Peter (2019) ACES CI UOW visited Marcela Bilek, University of Sydney to present a seminar 'Novel microfluidic structures from textiles and 3D printed capillary structures' and to develop collaborative links in the area of plasma coating of textile substrates for electrofluidic applications, 17 September.
98	Higgins, Michael (2019) ACES CI UOW visited Inke Muir at CSL Limited, Bio21, Melbourne to follow up on collaborative research opportunities held in May, 18 September.

ACES Invited Seminars/Collaborative visits showcasing research activities 2019	
99	Higgins, Michael (2019) ACES CI UOW visited John Sader at University of Melbourne, Melbourne to discuss collaborative research opportunities, 18 September.
100	Higgins, Michael (2019) ACES CI UOW visited Drew Berry at Walter and Eliza Hall Institute of Medical Research, Melbourne, to review their facilities, 18 September.
101	Wollersheim, Linda (2019) ACES PhD Deakin co-organiser and gave an oral "Framing just transitions: discourses as facilitators and barriers of low-carbon energy transitions in Germany and Australia" at POLIS HDR Student Workshop on 'New Research in Politics and IR', Deakin Burwood Corporate Centre, Melbourne, 20 September.
102	Crook, Jeremy and Tomaskovic-Crook Eva (2019) visited Dr Anai Gonzalez Cordero, Stem Cell Medicine Group Leader, at Children's Medical Research Institute Westmead, Sydney to discuss collaborative research opportunities and review facilities, 23 September.
103	Wang, Caiyun (2019) ACES SRF UOW visited Prof Shaomin Liu in the Faculty of Science and Engineering, Curtin University, Perth Western Australia, 25 September.
104	Forsyth, Maria (2019) ACES CI Deakin visited Dr Zhenguo Huang, School of Civil & Environmental Engineering, University of Technology, Sydney, to discuss collaborative research opportunities, 4 October.
105	Hodgetts, Rebecca (2019) ACES PhD Monash worked with Thomas Gotsch, Marc Tesch and ACES PhD alumni Shannon Bonke at BESSY II Adershof, Berlin Germany on in situ interrogation of electronic states of iron-based catalysts during electrochemical reduction of dinitrogen to ammonia, 7-13 October.
106	Higgins, Michael (2019) ACES CI UOW visited Clive Prestige at University South Australia to follow up on collaborative research opportunities discussed in July, 28 October.
107	Higgins, Michael (2019) ACES CI UOW visited Sophie Leterme and Harriet Wiley at Flinders University, South Australia, to present a lecture and discuss collaborative research opportunities, 29 October.
108	Rakov, Dmitrii (2019) ACES PhD Deakin began establishing a new collaboration with National Aeronautics and Space Administration (NASA, USA) for his upcoming internship in March 2020 in October 2019.
109	Pozo-Gonzalo, Cristina (2019) ACES RF Deakin began a collaboration with Prof Julian Gale at Curtin University on different strategies in Na-oxygen batteries, focusing on the nucleation and growth of the discharge products, October.
110	Yue, Zhillian (2019) ACES SRF UOW visited collaborators at the Sydney Eye hospital to discuss a potential Synergy Grant application, 7 November.
111	Higgins, Michael (2019) ACES CI UOW visited Mark Wainwright in the Microscopy Centre at UNSW to discuss research results, 8 November.
112	Moulton, Simon (2019) ACES CI Swinburne visited Prof Sugeun Yang at Inha University Hospital in Korea where he presented a seminar, discussed collaborative research opportunities and reviewed their facilities, 11-13 November.
113	Moulton, Simon (2019) ACES CI Swinburne visited Prof Bong-Sup Shim at Inha University Hospital in Korea where he presented a seminar, discussed collaborative research opportunities and reviewed their facilities, 13-15 November.
114	Blum, Anna (2019) ACES PhD UNSW visited Dr Deborah Diaz Granados at Virginia Commonwealth University (VCU) in US and attended a seminar on "team science" - defined as the collaborative effort to address scientific challenges requiring the collaboration and expertise of professionals trained in different fields, 15 November.
115	Simonov, Alexandr (Sasha) (2019) ACES SRF Monash had discussions with editors of Joule Dr Philip Earis and Dr Rose Zhu, participants of Cell-iChEM Symposia in Xiamen University China the outline of an invited perspective on NNR, 16-19 November.
116	Chung, Johnson and Wallace, Gordon (2019) ACES AI and CI UOW visited NCTU in Taiwan to discuss ongoing collaborative and future work, 20 November.
117	Goddard, Eliza (2019) ACES ECR La Trobe met with Sarah Anderson from the La Trobe Prosthetics and Orthotics Department to establish connections with the ACES ethics and soft robotics teams, 21 November.
118	Simonov, Alexandr (Sasha) (2019) ACES SRF Monash visited Prof A Yella, A/Prof A Punwar and joint IITB-Monash PhD student Ms Sibimol Luke to discuss draft publications and possibilities for future collaborations in a broader electromaterials field, 21-23 November.
119	Officer, D.L. (2019) ACES CI UOW visited Dr Damia Mawad and A/Prof Patrick Spicer at UNSW where he gave a lecture and progressed collaborative research, 22 November.
120	In het Panhuis, Marc (32019) ACES CI UOW visited Prof Joost Vlassak, Applied Science and Engineering, Harvard, Boston, USA to progress collaborative research activities, 7 December.
121	Chen, Jun (2019) ACES CI UOW visited Prof Qun Xu at Zhengzhou University, China to discuss potential collaborative projects, 23-26 December.
122	Wang, Caiyun (2019) ACES CI UOW visited Prof Haihua Wang at Shaanxi University of Science and Technology and Prof Wei Yan at Xi'an Jiaotong University, Xi'an, China, to progress collaborations, 23-26 December.

ACES Invited Seminars/Collaborative visits showcasing research activities 2019	
123	Chen, Jun (2019) ACES CI UOW visited Prof Shu Wang at Institute of Chemistry, Chinese Academy of Science, China to discuss potential collaborative projects, 27-31 December.
124	Qin C (2019) ACES PhD UOW visiting Dr Shu Wang and Dr Qi Gu at the Chinese academy of Science, China to discuss the ACES conducting polymers based biploar electrochemical cell stimulation platform, 26-31 December.
125	Chen, Jun (2019) ACES CI UOW visited A/Prof Terry Steele at Nanyang Technological University, Singapore to discuss progress on collaborative projects, 7-13 July.
126	Pozo-Gonzalo, Cristina (2019) ACES RF Deakin visited Prof David Mecerreyes at Polymat Spain for joint project discussions on the use of polymers in metal air batteries, 8 July.
127	Simonov, Alexandr (Sasha) (2019) ACES RF Monash visited Prof Matthias Dreiss at Technical University Berlin where he gave a seminar and progressed collaborative research discussions, 9 July.
128	Mudiyansele , Isuru Eranda Gunathilaka Adikari (2019) ACES affiliate PhD Deakin visited Dr Melanie Britton at the University of Birmingham, UK to undertake magnetic resonance imaging techniques, 12 July – 30 August.
129	Simonov, Alexandr (Sasha) (2019) ACES RF Monash visited Profs Christina Roth, Roland Marschall and Mukundan Thellakat at Bayreuth University, where he gave a seminar and progressed collaborative research discussions that included a possible joint PhD project, 14 July.
130	Wagner, Pawel (2019) ACES SRF UOW visited Prof Pu Xiao at ANU to progress collaborative research, 15 July.
131	Ralph, Natalie (2019) ACES RF Deakin visited Jay Joseph, Assistant Professor Enterprise and Development, American University of Beirut and Fahrettin Sumer, American University of Iraq to discuss research on renewable energy in conflict affected areas (e.g. Iraq) and developing theory, 16 July.
132	Simonov, Alexandr (Sasha) (2019) ACES RF Monash visited Prof Elena Savinova at Strasbourg University, where he gave a seminar and discussed possible collaboration in the field of electrocatalysis, 16 July.
133	Higgins, Michael (2019) ACES CI UOW visited Clive Prestige at University South Australia to discuss collaborative research opportunities, 19 July.
134	Mudiyansele , Isuru Eranda Gunathilaka Adikari (2019) ACES affiliate PhD Deakin worked with Dr Galina Pavlovskaya at the University of Nottingham, UK on sodium imaging, 18, 19 and 24 July.
135	Sparrow, Robert (2019) ACES CI Monash visited Prof Julian Savulescu, Oxford Uehiro Centre for Practical Ethics, Oxford, UK where he gave a seminar 'Robotics has a race problem' and held collaborative research discussions, 18 July.
136	Simonov, Alexandr (Sasha) (2019) ACES RF Monash visited Prof Antoni Liobet at ICIQ, Tarragona, to discuss possible collaboration in the field of electrocatalysis, 21 July.
Invited Seminars	
137	Wallace, Gordon (2019) ACES CI UOW invited seminar '3D Bioprinting: printing parts for bodies' at the University of Minho, Portugal, 18 January 2019.
138	Coote, Michelle (2019) ACES CI ANU presented an invited lecture at University of North Texas, Denton Texas USA, 1 February.
139	Gilbert F., (2019) ACES AI UTAS gave a talk "Closed-Loop DBS and its implications for Autonomy. Psychiatric Neurosurgery -Ethical, Legal and Societal Issues" at the Berlin School of Mind and Brain, Humboldt University, 22-23 February.
140	Walker, Mary (2019) ACES AI and former RF gave a seminar "Neurotechnologies, relational autonomy and authenticity", at the Institute of Ethics, History and Theory of Medicine, Ludwig-Maximilians-Universität, Munich, 19 March.
141	Wallace, Gordon (2019) ACES CI UOW gave an invited seminar '3D Bioprinting' at the New and Emerging Technologies Information Session at RPA Institute of Academic Surgery, Sydney, 25 March.
142	Coote, Michelle (2019) ACES CI ANU presented an invited lecture at Brigham Young University, Provo Utah USA, 25-27 March.
143	Coote, Michelle (2019) ACES CI ANU presented an invited lecture at University of Utah, Salt Lake City, Utah USA, 28-29 March.
144	Walker, Mary (2019) ACES RF Monash gave a lecture "Facts, values and stipulations in defining disease", at the University of Antwerp, Belgium, 27 March.
145	Walker, Mary (2019) ACES RF Monash gave a seminar 'Evidence for personalised medicine: Mechanisms, correlation, and new kinds of black box', at the University of Antwerp, Belgium, 28 March.
146	Wallace, Gordon (2019) ACES CI UOW gave an invited seminar '3D Bioprinting- Printing Parts for Bodies 'at the Hunter New England Local Health District 3D Printing Forum, John Hunter Campus, Newcastle, 30 March.
147	Wallace, Gordon (2019) ACES CI UOW gave an invited seminar 'Research commercialization: The Scientist's experience' at the Surgical Innovation Workshop, RACS NSW Office, Sydney, 31 March.
148	Zhang, Jie (2019) ACES CI Monash invited seminar 'Electrocatalysis' at Fuzhou University, China, 1 April.
149	Quigley, Anita (2019) ACES SRF UOW at St Vincent's Hospital Melbourne, gave an invited masterclass lecture on 3D printing to AMS medical students, department of Medicine, University of Melbourne, 16 April.

ACES Invited Seminars/Collaborative visits showcasing research activities 2019	
150	Mozer, A.J. (2019) ACES CI UOW invited seminar 'Exploiting intermolecular interactions between alkyl-functionalised electron donor–acceptor pairs to enhance interfacial electron transfer rates', Szeged, Hungary, 23 April.
151	Ruland, Andres (2019) ACES ECR UOW was invited to give a seminar to the UOW VC Professor Paul Wellings and DVCR Dr Jennifer Martin at the AIIM early career research talks "Ultrasound as a non-destructive technique for biomaterial characterisation", 8 May 2019.
152	Fay, Cormac (2019) ACES Affiliate ECR UOW was invited to give a seminar to the UOW VC Professor Paul Wellings and DVCR Dr Jennifer Martin at the AIIM early career research talks "This is What Happens When You're Surrounded by Chemists", 8 May 2019.
153	Howlett, Patrick (2019) ACES CI Deakin invited seminar 'Organic Ionic Plastic crystals – novel ionic electrolytes for alkali metal batteries' at Australian Institute for Bioengineering and Nanotechnology (AIBN), University of Queensland, 9 May.
154	Quigley, Anita (2019) ACES SRF UOW at St Vincent's Hospital Melbourne, visited RMIT Bundoora to give an invited seminar 'Brains, Biomaterials and Bioprinting', 14 May.
155	Walker, Mary (2019) ACES RF Monash gave an invited seminar 'Diagnosis, screening and defining disease' at the University of Melbourne Department of General Practice, 22 May.
156	Walker, Mary (2019) ACES RF Monash gave an invited seminar 'A heart without life: Artificial organs and the lived body' at the La Trobe University Philosophy Department, 29 May.
157	Higgins, Michael (2019) ACES CI UOW invited seminar 'Understanding Cell – Material Interactions, One Molecule at a Time' at Ulm University, Medical Seminar Series, Germany, May.
158	Wallace, Gordon (2019) ACES CI UOW seminar '3D Bioprinting: Printing Parts for Bodies' at POLYMAT, University of the Basque Country, Spain, 6 June.
159	Wallace, Gordon (2019) ACES CI UOW seminar '3D Bioprinting: Printing Parts for Bodies' at The Centre for Cooperative Research in Biomaterials (CIC biomaGUNE), San Sebastian, Spain, 6 June.
160	Wallace, Gordon (2019) ACES CI UOW gave an invited seminar 'Biographene: Processability, Fabrication and Biomedical Applications' at INL, Braga, Portugal, 11 June. The INL International Iberian Nanotechnology Laboratory was founded by the governments of Portugal and Spain, under an international legal framework to perform interdisciplinary research, deploy and articulate nanotechnology for the benefit of society.
161	Wallace, Gordon (2019) ACES CI UOW gave a seminar '3D Bioprinting: Printing Parts for Bodies' at University of Aveiro, Portugal, 12 June.
162	Wallace, Gordon (2019) ACES CI UOW gave a seminar '3D Bioprinting: Printing Parts for Bodies' at School of Medicine, University of Minho, Portugal, 12 June.
163	Wallace, Gordon (2019) ACES CI UOW gave an invited seminar 'Bioinks- bioprinters - biomedical solutions' at Università di Pavia, Italy, 24 June.
164	Wallace, Gordon (2019) ACES CI UOW gave an invited seminar 'Advances in Materials and Fabrication enhance our ability to communicate with and within living systems' at Istituto Ortopedico Rizzoli, Bologna, Italy, 25 June.
165	Zhang, Jie (2019) ACES CI Monash invited seminar 'Formation of advanced 2D materials by electrochemical exfoliation for electrocatalytic reduction of CO ₂ ' at the University of Warwick, UK, 9 July.
166	In het Panhuis, Marc (2019) ACES CI UOW invited presentation 'Talk story with surfing scientist Marc in het Panhuis', Pupukea, Hawaii, USA, 11 July. *Open to public
167	Ralph, Natalie (2019) ACES RF Deakin was co-facilitator of workshop 'Building our 3D printed future: Backcasting device-based precision medicine', Science and Society Network, and Alfred Deakin Institute, Deakin University, Melbourne, 23 July.
168	Alici, Gursel (2019) ACES CI UOW invited lecture 'Soft robotics for prosthetic devices; are we proposing to solve a hard problem with a soft approach?', Bilkent University, Ankara, Turkey, July 2019.
169	Wallace, Gordon (2019) ACES CI UOW seminar '3D Printing with Living Cells – Tackling Medical Challenges' at Nanyang Technological University Singapore, Singapore, 21 August.
170	Coote, Michelle (2019) ACES CI ANU presented an invited lecture at University Adelaide, Adelaide, 5 September
171	Coote, Michelle (2019) ACES CI ANU presented an invited lecture and held collaborative research discussions at Flinders University Adelaide, 6 September.
172	Coote, Michelle (2019) ACES CI ANU presented an invited lecture at Monash University Melbourne, 23 September.
173	Alici, Gursel (2019) ACES CI UOW invited lecture 'Soft robotics for prosthetic devices; how are we advancing in solving a hard problem with a soft approach?', University of British Columbia, Canada, September.
174	Higgins, Michael (2019) ACES CI UOW invited seminar 'Hydration Layer Structure of Biofouling Resistant Nanoparticles' at Flinders University for the Biofilm Consortium seminar, 29 October.
175	Wallace, Gordon (2019) ACES CI UOW gave an invited seminar 'Translation – Don't wait until the end to get started' at the 3rd Australia Corneal Bioengineering Working Group/1st ANZ Corneal Bioengineering Working Group meeting, Sydney, 7 November.

ACES Invited Seminars/Collaborative visits showcasing research activities 2019	
176	Pringle, Jennifer (2019) ACES CI Deakin invited presentation at the 'November Lectures', run by the Chemistry Education Association, University of Melbourne, 22 November.
177	Wallace, Gordon (2019) ACES CI UOW gave an invited seminar 'Biographene' at Curtin University, Perth, 13 December.

APPENDIX 12: ACES INTERNATIONAL EVENTS 2019

2019 Global Engagement Event Description		Date	Venue
1.	13th Annual International Electromaterials Symposium and associated ACES Showcase. The symposium featured renowned speakers from USA, France, Japan, UK, Spain, India, Korea and Australia. It brought together leading researchers engaged in ground-breaking materials science, presenting an opportunity to review the most recent advances in materials science, new electrochemical applications and fundamental understanding in this important field of electromaterials. Topics covered both the fundamental and applied aspects of electromaterials and new devices across our broad areas of research in Health, Energy and Ethics.	11-13 Feb	The Pier Geelong Waterfront, Victoria, Australia
2.	ACES-NCTU workshop. ACES hosted 10 members from BETRC at the National Chiao Tung University (NCTU) for a workshop to progress collaborative research activities. As part of the activities of the visits ACES UOW and NCTU signed a memorandum of understanding (MOU) with NCTU in the presence of the executive director Dr Suang-Jing Pong, of Science & Technology Division at the Taipei Economic and Cultural Office in Australia.	7 May	iC campus University of Wollongong
3.	Australian Research and Development Commercialisation Mission to Korea. The mission, organised by Austrade Korea, provided a platform for ACES to showcase our R&D capabilities to the global market by engaging directly with leading Korean conglomerates. The ACES technologies packaged for the mission were: ► TRICEP ► Edge Functionalised Graphene ► Ultralmage - Quantitative Ultrasound Imaging of Cellular Constructs ► PanCure - Controlled Drug Delivery for the treatment of Pancreatic Cancer ► Soft Robotic Hand	15-16 May	Seoul, Korea
4.	ACES @ DCU workshop – Storing, Converting and Transporting Energy. Advances in materials and fabrication technologies have had a profound effect on our ability to convert renewable energy sources into practically useful forms. Recent attention has turned to the storage and transportation of energy generated from renewable sources, in order to account for the temporal and geographical dimensions associated with energy from renewables. The symposium explored recent advances in addressing all of these challenges.	20 May	DCU, Dublin
5.	ACES HQ@UOW - The Virtual Tour. Keen to get an insider's view of cutting edge research into advanced materials and device fabrication for game changing health and energy solutions? Guests were invited to receive an insight into our team's fundamental work including synthesis of advanced materials such as graphene, manufacturing of composite materials like bioinks containing human cells and methods to create structures from such materials using fibre spinning and 3D printing – all from the comfort of their own home or workplace. ACES and ANFF materials node researchers were online to answer questions.	28 May, 30 May and 10 December	Virtual
6.	Educating Teachers. The I-Form Advanced Manufacturing Research Centre in Ireland brought together teachers from the Engineering and Technology Teachers Association, Dublin youth workers and representatives from the Dublin Maker festival to hear about the latest bioprinting research from ACES Director Prof Gordon Wallace and ACES AI Dr Stephen Beirne. The aim was to strengthen links between Ireland and Australia in the education space.	19 June 2019	Dublin Ireland
7.	ACES @ DCU workshop – Advances in Materials for Medicine. Advances in materials and fabrication technologies have had a dramatic impact on fields such as tissue engineering, cell therapy and medical bionics. Clinical challenges such as bone and cartilage regeneration, development of more effective islet cell transplantation therapies and neural connectivity to electrodes for disease monitoring and control have been addressed. The symposium highlighted advances in a number of clinical areas and discussed the implementation of a translational environment that ensures delivery to patients in need.	21 June	DCU, Dublin
8.	ACES Reception at the Australian Embassy in Ireland. Hosted by Simon Mamouny, Deputy Head of Mission, a handful of short presentations by ACES members addressed advances in materials and fabrication strategies and the impact on medical challenges-progress through Irish-Australian Collaboration.	21 June - evening	Australian Embassy, Dublin

2019 Global Engagement Event Description		Date	Venue
9.	3D Bioprinting workshop. This highly successful workshop was hosted by our colleagues at the Andhra Pradesh Medtech Zone (AMTZ). Orchestrated by Ear, Nose and Throat Surgeon A/Prof Payal Mukherjee (Royal Prince Alfred Hospital (RPAH), Sydney) and colleagues in India, the event attracted researchers and clinicians from a number of cities across the country. ACES/ANFF members presented our 3D printing and bioinks synthesis capabilities and their application for specific medical conditions.	8 September 2019	Vizag, India
10.	MOU signed with Andhra Pradesh Medtech Zone (AMTZ). UOW signed a memorandum of understanding (MOU) with AMTZ to lay the framework for progressing our collaborative efforts in both research and research training. Taking part in the signing ceremony were UOW Vice Chancellor Prof Paul Wellings, UOW Executive Director (Global) Brett Lovegrove, UOW Director Government Relations Canio Ferrevanti and the University's Global Brand Ambassador, the legendary Adam Gilchrist.	10 September	Vizag, India
11.	Design for Additive Manufacturing of Medical Devices workshop. ACES-ANFF materials node were represented at this roundtable with participants from around the globe coming together to discuss the role of design, advances in characterisation, major issues and barriers towards wider use, state-of-art applications in health.	26-27 September	Berlin, Germany
12.	Champagne Reception for Promotion BIOFAB2020. At the 2019 International International Society for Biofabrication's Annual Meeting (ISBF), ACES held a champagne reception to promote the 2020 Conference, which is being held in Wollongong. The reception was attended by close to 100 people and featured Australian wines to showcase the region and the fact that 2020 will mark the first time the International Conference on Biofabrication will be held in Australia.	20-22 October	Columbus, Ohio, USA
13.	Wireless Communication – Enabling Electroceuticals with Biosystems: An ACES Workshop. The use of electrical conduits to interrogate and regulate biological entities stems from the amazing work of Luigi Galvani and Alessandra Volta. One can only imagine that Galvani and Volta would be dancing with excitement were they to appear in today's world where we have a plethora of choices in terms of electromaterials and electronic devices to facilitate these communications. Welcome to the new frontier of electroceuticals where bioelectronics are being explored for healthcare to diagnose and treat disease. A foremost area of research for electroceuticals is wireless bioelectronics, which this workshop explored. Discussion centred on the use of: ► <i>RF Communications</i> – wherein stimulation is provided by wirelessly coupled antennas ► <i>Ultrasound</i> - to drive piezoelectric transducers for targeted and remote, low-intensity electric stimulation of cells and tissues; ► <i>Magnetoelectric composites</i> - to deliver targeted and remote stimulation via clinically approved magnetic coils; ► <i>Bipolar electrochem</i> – wherein we are able to induce redox reactions in an electric field, and ► <i>Transient power sources</i> – systems designed to “degrade” and produce power to influence biological processes featuring a complete disappearance in a controlled manner after their operation.	13 Nov	iC campus Wollongong
14.	ACES –NCTU joint workshop: 3D Bioprinting and cell stimulation/sensing. This workshop followed on a series of meetings to progress collaboration within the Biomedical Electronics Translational Research Center (BETRC).	19 November 2019	National Chiao Tung University, Hsinchu City,Taiwan

APPENDIX 13: ACES INTERNATIONAL ACADEMIC VISITORS 2019

The list below does not include visitors to ACES as part of events or conferences that ACES organised throughout 2019.

ACES International Academic Visitors 2019	
1.	Ms Marion Cretin, ENSCBP affiliated with Bordeaux Montaigne University, France, exchange student doing project at ACES Deakin, 6 August 2018 -15 February 2019.
2.	Jacopo Bani, Utrecht University in Netherlands, at ACES UOW completing the second year of the dual degree, from November 2018 – September 2019.
3.	Ane Urigoitia Asua, Utrecht University in Netherlands, at ACES UOW completing the second year of the dual degree, from November 2018 – September 2019.

ACES International Academic Visitors 2019	
4.	Ane Albillos Sanchez, Utrecht University in Netherlands, at ACES UOW completing the second year of the dual degree, from November 2018– September 2019.
5.	Borja Sanz Gutierrez, Utrecht University in Netherlands, at ACES UOW completing the second year of the dual degree, from November 2018– September 2019.
6.	Ms Danielle Warren, Masters Student, University of Wurzburg, Germany spending 6 months in ACES UOW from 2 January 2019.
7.	Prof Alexei Sokolov, Department of Chemistry, University of Tennessee, USA, visited ACES Deakin node to undertake collaborative research activities, 19 January - 21 February 2019.
8.	Mr Takuya Harada, visiting student from Shinshu University, Japan working for 2 months in ACES UOW from 21 January 2019.
9.	Prof Zhen Zhou, Nankai University in Japan visited ACES at UOW to discuss a potential collaboration in electrocatalysis, 1 February 2019.
10.	De Nerea Casado, POLYMAT, University of the Basque Country Spain, visited ACES Deakin to undertake collaborative research activities, 1-15 February 2019.
11.	Esther Udabe, student POLYMAT, University of the Basque Country Spain, visited ACES Deakin to undertake collaborative research activities, 1 February to 30 April 2019.
12.	Leire Meabe, student POLYMAT, University of the Basque Country Spain, visited ACES Deakin to undertake collaborative research activities, 1 February to 30 April 2019.
13.	Prof Juergen Groll, Dept Functional Materials in Medicine & Dentistry, University of Wurzburg, Germany visited ACES at UOW to review facilities at AIIM and TRICEP, gave a seminar and discussed the biofabrication masters projects progress, 4-6 February 2019.
14.	Prof Anthony Burrell, National Renewable Energy Lab, United States to hold collaborative research talks at ACES UOW, 5 February 2019.
15.	Prof Mario Romero Ortega, University Dallas Texas, United States visited ACES at UOW as guest speaker for a workshop and toured facilities at AIIM and TRICEP, 6 February 2019.
16.	Dr Camila Shirota, Rehabilitation Engineering Lab, Institute of Robotics and Intelligent Systems Department of Health Sciences and Technology ETH Zürich, Switzerland visited ACES at UOW to hold collaborative discussions and tour the ACES facilities at AIIM and TRICEP, 8 February 2019.
17.	Dr Alejandro Melendez-Calderon, Senior Research Scientist (Neuromechanics) at cereneo Zentrum für Interdisziplinäre, Switzerland visited ACES at UOW to hold collaborative discussions and tour the ACES facilities at AIIM and TRICEP, 8 February 2019.
18.	Yu-Wei Lin, PhD student from National Cheng Kung University in Taiwan, visited ACES UOW to undertake his research project and progress a joint collaboration project for 3 months from 13 February 2019.
19.	Kun-lin Tsou, PhD student from National Cheng Kung University in Taiwan, visited ACES UOW to undertake his research project and progress a joint collaboration project for 3 months from 13 February 2019.
20.	Abe Masato, exchange student from Japan visited ACES at UOW to tour facilities in AIIM and TRICEP, 13 February 2019.
21.	Kyle Wedgewood, Research Fellow at the Centre for Biomedical Modelling and Analysis at University of Exeter in UK, visited ACES at UOW to hold collaborative research discussions with the 3D Printing and Islet teams cells and tour the ACES facilities at AIIM and TRICEP, 15 February 2019.
22.	Dermot Diamond, ACES PI and Prof School of Chemical Sciences at DCU, Ireland visited ACES at UOW to tour the ACES facilities at TRICEP, 15 February 2019.
23.	Ben Sherlock, Research Fellow at the Centre for Biomedical Modelling and Analysis at University of Exeter in UK, visited ACES at UOW as a guest speaker at the ACES workshop on contactless characterisation of 3D structures containing cells and toured the ACES facilities at AIIM and TRICEP, 18-22 February 2019.
24.	ACES AI Prof Junji Fukuda and PhD student Ms Mio Aoki, Graduate School of Engineering at Yokohama National University in Japan visited ACES at UOW to carry out experimental analysis of electrochemical cell detachment using QCM, 18-22 February 2019.
25.	Dr Mary Josephine Morton, Research Associate at Ulster University, Ireland visited ACES at UOW to work on characterisation techniques using ultrasound and attend the ACES workshop on contactless characterisation of 3D structures containing cells. She also toured the facilities at AIIM and TRICEP, 18-22 February 2019.
26.	Gabriel Comeron Castillo, Masters of Energy Storage and Conversion (MESC) student, 6 month research project 'Harvesting waste heat using thermoelectrochemical cells' at Deakin University, 19 February to 17 August 2019.
27.	Prof Jean Le Bideau, University of Nantes, France visited ACES Deakin node to undertake collaborative research projects, 20 February - 3 April 2019.

ACES International Academic Visitors 2019	
28.	Mr Conrad Holc, University of Nottingham, UK, visited ACES Deakin node to undertake a research project, 20 February-31 August 2019.
29.	Mr Ludovic Carre, masters student intern from University of Montpellier France, doing a project at ACES Deakin on 'A theoretical and experimental study of ionic liquid electrolytes for sodium-ion batteries', 22 February - 31 August 2019.
30.	Mr Camille Pinchart, masters student intern from University of Montpellier France, visited ACES Deakin to do research project 'Ionic liquid for recycling critical material, 22 February - 31 August 2019.
31.	Prof Michel Armand, CIC EnergiGUNE, Spain, visited ACES Deakin to progress collaborative projects, 25 February -7 March 2019.
32.	Prof Jie Tang from the National Institute for Materials Science Japan, visited ACES at UOW to discuss research in energy storage program and tour the facilities in AIIM and TRICEP with the view towards a potential research collaboration, 20 February 2019.
33.	Dr Kiyoshi Ozawa from the National Institute for Materials Science Japan, visited ACES at UOW to discuss research in energy storage program and tour the facilities in AIIM and TRICEP with the view towards a potential research collaboration, 20 February 2019.
34.	Dr Taizo Sasaki from the National Institute for Materials Science Japan, visited ACES at UOW to discuss research in energy storage program and tour the facilities in AIIM and TRICEP with the view towards a potential research collaboration, 20 February 2019.
35.	ACES PI Prof Dirk M. Guldi, Department of Chemistry and Pharmacy at Friedrich-Alexander-Universitaet in Germany visited ACES at UOW to give a seminar and discuss research progress in collaborative charge transfer projects, as well as touring the new facilities within TRICEP, 12-17 March 2019.
36.	Dr Kerstin Lenk, University of Tampere, Finland visited University of Melbourne/St Vincent's node to discuss mathematical modelling astrocyte activity and to understand more about ACES activities, 18-22 March 2019.
37.	Distinguished Prof Cees Dekker, Kavli Institute of Nanoscience, Delft University of Technology, Netherlands visited ACES at UOW and gave a seminar "Nanotechnology for studying biology at the single-molecule and single-cell level" then held collaborative talks with researchers, 19 March 2019.
38.	Vianka Reddy, Department of Chemistry, University of Warwick, UK, has a placement at ACES Deakin from 1 April 2019.
39.	Prof Amal Kumarage, Department of Transport and Logistics Management at the University of Moratuwa, Sri Lanka vvisited ACES at UOW and toured the facilities at AIIM and TRICEP, 17 April 2019.
40.	Drs Michelle Brown and Lorenza Manzanares, Research Fellows at University of Chemistry and Technology Prague, Czech Republic visited ACES at UOW to hold collaborative research discussions and to give an overview of the Electrochemical and 3D-Printing Activities in the Pumera Group, 9 May 2019. Both toured the facilities at AIIM and TRICEP.
41.	Dr Grzegorz Lisak, School of Civil and Environmental Engineering College of Engineering, Nanyang Technological University Singapore, visited ACES UOW node to discuss a collaborative manuscript in preparation, 16 May 2019.
42.	Miguel Dias Castilho, University Medical Centre, Utrecht University, Germany visited ACES at UOW to progress a biofabrication convergence review and to tour the facilities at AIIM and TRICEP, 11-12 June 2019.
43.	Ruijie Qiu, a visiting Master Student from Shaanxi University of Science & Technology student began a 3 month research visit at ACES UOW from 17 June 2019.
44.	Jiahao Zhang, a visiting Master Student from Shaanxi University of Science & Technology student began a 3 month research visit at ACES UOW from 17 June 2019.
45.	Ms Amelie Lambert, ENSCBP affiliated with Bordeaux Moutaigne University, France, exchange student doing project at ACES Deakin, 24 June-8 November 2019.
46.	Shun-Min Chang and Ming-Chun Tsai, Master Students from National Cheng Kung University in Taiwan worked at ACES UOW for collaborative project on photoelectrochemical reforming of glucose to formate, 1-31 July.
47.	Mr Vincent Vangrunderbeek, Vrije Universiteit Brussel, exchange student doing project at ACES Deakin from 2 July 2019.
48.	Yi-Chin Toh, Assistant Professor National University of Singapore, visited ACES UOW to explore future collaborative opportunities in drug testing using 3D culture and microfluidic systems, 3 July 2019.
49.	Mr Aitor Gastaminza Unanue, POLYMAT, San Sebastián, Spain, visited ACES Deakin to progress collaborative project, 7 July-18 July 2019.
50.	Dr Ajnug Moon, McGill University, USA visited ACES Monash to progress collaborative research with Prof Rob Sparrow, 14 August 2019.
51.	Arizona State University Regents Professor Austen Angell visited ACES Deakin node to progress collaborative research, 29 July – 2 August 2019.
52.	Prof Murthy, Indian Institute of Technology Madras, visited ACES PhD Matthew Cherian to discuss hydrogen fuel cell research, 30 August.

ACES International Academic Visitors 2019	
53.	Prof Lei Jiang, Technical Institute of Physics and Chemistry at Beihang University China, visited ACES UOW to tour the facilities and conduct collaborative research talks, 2 September 2019.
54.	Dr Liangliang Li, Tsinghua University China, visiting ACES Deakin to undertake collaborative research project, 9 September-31 December 2019.
55.	Dr Laifa Hendarmin, The Faculty of Medicine and Health Sciences, Syarif Hidayatullah State Islamic University (UIN Jakarta), visited ACES Swinburne to work on biomaterial development for dental applications and to explore establishing an MOU between Swinburne and Syarif Hidayatullah State Islamic University, 18 September to 25 October 2019.
56.	Prof Haihua Wang, Shaanxi University of Science and Technology, China visited ACES UOW to tour the facilities and discuss the research progress of a current joint project, a potential joint project for submission 2020 and the possible exchange of staff and students in 2020, 18 September - 2 October 2019.
57.	Prof James Yoo, Institute for Regenerative Medicine Wake Forest University, USA, visited ACES UOW to tour the facilities and conduct collaborative research talks in addition to launching BIOFAB2020 being held in Wollongong in September 2020 from 9-11 October 2019.
58.	Dr May El Barachi from UOW Dubai visited ACES UOW to tour the facilities and conduct collaborative research talks, 11 October 2019.
59.	Prof Swee-Hin Teoh, Nanyang Technological University, visited ACES UOW to tour the facilities and conduct collaborative research talks, 14 October 2019.
60.	Dr Qi Gu, ACES alumni from Institute of Zoology Chinese Academy of Sciences China returned to ACES UOW to give a seminar, tour the facilities and progress collaborative research, 18 October 2019.
61.	Prof Susann Miettinen, Tampere University Finland, began a 12-month research fellowship at ACES UOW from 18 October 2019.
62.	Ms Maria Martinez Ibanes, POLYMAT, University of the Basque Country, Spain, visited ACES Deakin to progress collaborative project, from 22 October 2019.
63.	Dr Yoichi Tominaga, Tokyo University, Japan, visited ACES Deakin to give a seminar and hold collaborative research, 22 October 2019.
64.	Dr Antonio Salgado, Life and Health Sciences Research Institute (ICVS) at the University of Minho, Portugal visited ACES UOW to tour the facilities and conduct collaborative research talks, 25 October 2019.
65.	Jung Gi Choi (2019) PhD from ACES partner organisation Hanyang University visiting ACES UOW to prepare a sinking/ floating gel to control a submarine, 4-30 November.
66.	Ciro Rodriguez, Professor Tecnologico de Monterrey and visiting scientist at Ohio State University USA visited ACES UOW to tour the facilities and hold collaborative talks on designing task specific bio-printers in collaboration with clinicians, 8 November 2019.
67.	Dr Corinna Maass, from Max Planck Institute for Dynamics and Self-Organization, visiting ACES UOW to work on the collaborative project 'Photoactive droplet swimmers - concepts for chemical driving and quantification', as part of an Australian-German grant, from 18-28 November 2019.
68.	Babak Vajdi Hokmabad PhD student from Max Planck Institute for Dynamics and Self-Organization undertaking research on the collaborative project as part of an Australian-German grant at ACES UOW from 19 November to 14 December 2019.

APPENDIX 14: ACES NATIONAL ACADEMIC VISITORS 2019

The list below does not include visitors to ACES as part of events or conferences that ACES organised throughout 2019.

ACES National Academic Visitors 2019	
1.	Dr Melanie Elisabeth and Miss Maryam Hejazi, University of Melbourne, visited ACES Deakin Geelong to perform dopamine sensing testing using surface treated carbon fibre electrodes, 15 January 2019.
2.	A/Prof Raad Radd, UOW Deputy Head of School, School of Electrical, Computer and Telecommunications Engineering, accompanied visitors to ACES UOW to view the facilities in AIIM and TRICEP, 31 January 2019.
3.	A/Prof Zongyou Yin from ANU visited ACES at UOW to discuss a potential collaboration in electrocatalysis, 1 February 2019.
4.	Prof Margaret Sheil (AO), Vice-Chancellor and President QUT, Australia visited ACES at UOW to give the LKM public address and tour TRICEP, 5-6 February 2019.
5.	Prof Joe Chicharo, DVC Academic at UOW and ACES IAC member visited ACES at UOW to tour TRICEP, 7 February.
6.	Dr Xiao Pu Future fellow ANU and ACES CI at ANU Prof Michelle Coote, visited ACES at UOW for collaborative research discussions and to tour the facilities at AIIM and TRICEP, 22 February 2019.
7.	Dr Alex Qin, Institute for Frontier Materials at Deakin University, visited ACES at UOW to work on artificial muscle development and assess the capabilities at AIIM and TRICEP, 25-28 February 2019.

ACES National Academic Visitors 2019	
8.	Ms Negar Mansouri, PhD candidate from laboratory of Dr Said Al-Sarawi, School of Electrical and Electronic Engineering, The University of Adelaide, South Australia, visited ACES UOW to progress collaborative research, 28 February 2019.
9.	Dr Leszek Lisowski, Group Leader, Translational Vectorology & Manager, Vector and Genome Engineering Facility, Childrens Medical Research Institute, visited ACES UOW to discuss collaborative research opportunities, 5 March 2019.
10.	Prof Paul Cooper and a group from Sustainable Building Research Centre (SBRC) toured TRICEP to get an oversight of the additive manufacturing capabilities, 6 March 2019.
11.	Yogesh Kumar, Master of Science Student (Project Management) at visited ACES at UOW to get an oversight of the additive manufacturing capability at TRICEP on 11 March 2019. Yogesh worked for a large pharma company in India in process auditing for quality management ISO13485.
12.	Dr Onur Bas, ARC ITTC in Additive Biomanufacturing I Centre in Regenerative Medicine I Institute of Health and Biomedical Innovation I Queensland University of Technology, visited ACES at UOW to give a seminar on soft actuators and discuss possible collaborative research projects, 14 March 2019.
13.	Dr Alex Bissember, senior lecturer in Chemistry at the University of Tasmania visited ACES at UOW to discuss potential collaborative projects around low cost electronic equipment for electrochemistry and toured the facilities at AIIM and TRICEP, 15 March 2019.
14.	Matthew Gadenne, Deans scholar undertaking a Bachelor of Bio-nanotechnology (Honours) at UOW commenced 100hrs research activities at ACES UOW on 20 March 2019.
15.	ACES PhD alumni Dr Torben Daeneke, RMIT, visited ACES Deakin to give a seminar and hold research discussions, 21 March 2019.
16.	EIS Deans Scholars undertaking their bachelor degrees in EIS at UOW toured ACES at UOW on 29 March 2019. ACES are hoping to inspire them so they become future PhD students.
17.	Curtis Wilson and Amal Elhage, began their 14 week final year undergraduate internship, in the area of soft robotics, at ACES UOW on 11 March 2019.
18.	Undergraduate students enrolled in engineering at UOW to tour the facilities in AIIM and TRICEP, 8 April 2019.
19.	ACES AI and former ACES RF Dr Katrina Hutchison visited ACES RF Dr Mary Walker at ACES Monash to progress collaborative research activities, 16 April 2019.
20.	Dr Teodor Mitew, Dr Jo Law and Dr Christopher Moore, Senior Lecturers in Faculty of Arts at UOW, and PhD candidate Travis Wall visited ACES at UOW to tour TRICEP to get an understanding of the 3D printing capabilities available, 16 April 2019.
21.	Jonas Marcelo, Commercial Development Manager at Innovation Campus at UOW, toured TRICEP to get an oversight of the additive manufacturing capabilities, 16 April 2019.
22.	Warrawong High School year 9 students (12) and their teacher Marc Gunner toured the facilities at AIIM and TRICEP to better understand the 3D printing capabilities, 3 May 2019.
23.	RMIT Undergraduate Biomed Science Students toured ACES at St Vincent's hospital Melbourne facilities, in particular @3DBIOFAB and were given an overview of ACES research activities, 3 May 2019.
24.	Xiaolong Zhang, PhD Candidate at Monash University, visited ACES at UOW to undertake research project work with ACES members in the area of carbon dioxide reduction, from 6-13 May 2019.
25.	Prof Lianzhou Wang, University of Queensland, visited ACES Deakin to give a seminar and hold collaborative research discussions, 7 May 2019.
26.	Dr Syamak Farajikhah, ACES alumni and now a Postdoctoral Research Associate at the University of Sydney, visited ACES at UOW to discuss neuro-muscular junction applications using his micro-structured fibres, 10 May 2019.
27.	Prof Mia Woodruff, Acting QUT Director, Herston Biofabrication Institute and 2 PhD candidates Naomi Paxton & Maureen Ross from met with ACES members and affiliated researchers in the ARC biofabrication training hub at ACES UOW to discuss bioprinting for clinical purposes, 13 May 2019.
28.	Han Li from Institute for Frontier Materials in Waurrn Ponds, was hosted by ACES Deakin node to modify carbon nanofibers, 18-20 May 2019.
29.	Prof Jane Nielsen, ACES AI and Senior Lecturer in Law at the University of Tasmania met with ACES researchers at ACES UOW to gain an understanding of the regulatory framework required for 3D printing translation into a clinical environment. Jan also gave a seminar to the ACES members, 23 May 2019.
30.	Bionanotechnology Undergraduate Students at UOW toured the ACES facilities, including TRICEP, 28 May 2019.
31.	Shirley Agostinho, Nathan Riggir, Ellie Ames, Adrian Tootell, Chantel Carr, Brogan Rylands, involved in the University of Wollongong - Future Makers UOW Global Challenge project, toured the ACES facilities, including TRICEP, 6 June 2019.
32.	Rohith Murugesh; Pradyumna Kale; Varsha Mane; Velayutham Subbiah; Narayanan Vairavan; Suraj Kanderi Ravi; Janak Chapagain; Venkatesh Krishnamurthy; Vivikt Seth; Ethikaash Elangovan; Sriram Sivasubramani; Nikita Maria Vivera; Pavani Prudhvi, student Supply Chain Management Society Members, visited ACES at UOW to tour the facilities available at TRICEP, 6 June 2019.

ACES National Academic Visitors 2019	
33.	Dr Karyn Jarvis, Research Engineer with ANFF-Vic Biointerface Engineering Hub located at the Swinburne University of Technology visited ACES at UOW and gave a seminar "Modifying Surfaces to Manipulate Bacterial, Cell and Lipid Interactions", held collaborative research discussions and toured the facilities at AIIM and TRICEP, 17 June 2019.
34.	Ali Zolfagharian, Lecturer in the School of Engineering at Deakin University, visited ACES at UOW, gave a seminar "Next Generation of 4D Printing: From Design to Applications" and toured the facilities at AIIM and TRICEP, 19 June 2019.
35.	Year 8 and 9 Dapto High School students and teacher Joel Trist, visited ACES at UOW to tour the facilities at TRICEP, 25 June 2019.
36.	Heema Vyas, PhD student IHMRI UOW, trained on JPK-AFM at ACES UOW by ACES PhD student Buddihka Gayani, 24-25 July.
37.	Linyang (Sally) Liu, biomedical engineering graduate, visited ACES UOW to tour the ACES and TRICEP facilities and meet regarding related PhD opportunities, 26 July 2019.
38.	Prof Marcia Bilek visited ACES UOW to tour facilities and further understand the ACES research activities, 31 July 2010.
39.	Australian Health Services Research Institute (AHSRI) senior manager Darcy Morris toured TRICEP and ACES UOW to get an oversight of the additive manufacturing capabilities, 8 August 2019.
40.	Dr Xianjue (Sam) Chen, Research Associate University of NSW, visited ACES and toured the facilities, 9 August 2019.
41.	Dr Shayan Seyedin, Research Fellow at Deakin gave a seminar and toured the facilities at ACES UOW, 9 August 2019.
42.	Prof Natalie Thamwattana and Michael Meylan, University of Newcastle, visited ACES UOW for collaborative research talks around mathematical modelling of stimulation of cells within 3D biomaterial, 9 August 2019.
43.	Dr Lezanne Ooi, IHMRI UOW, visited ACES UOW to progress the collaborative project, 12 August.
44.	Prof Peter Choong, St Vincent's Hospital Melbourne, ACES AI University of Melbourne, visited ACES UOW to discuss progress on current and towards future collaborative research activities, 13 August 2019.
45.	Dr Qiang Fu, The University of Melbourne, visited ACES Deakin to give a seminar and hold collaborative research discussions, 16 August.
46.	Dr Laiquan Li, University of Adelaide, visited ACES Monash for collaborative discussions around ammonia electrosynthesis, 23 August 2019.
47.	Dr Kathryn Stok University of Melbourne visited ACES UOW to tour the facilities and discuss 3D Bioprinting research activities, 30 August 2019.
48.	Dr Carmine Gentile, Lecturer at University of Technology Sydney visited ACES UOW to tour the facilities and discuss Bioprinting research activities, 20 September 2019.
49.	Dr Lezanne Ooi, IHMRI UOW, visited ACES UOW to progress a collaboration on a UOW Global challenges grant 'Modelling emergent properties in brain to combat neurodegenerative disease', September 2019.
50.	Prof Anthony Weiss, University of Sydney, visited ACES UOW to tour the facilities and discuss Bioprinting research activities, 2 October 2019.
51.	A/Prof Mike Meylan, University of Newcastle, visited ACES UOW to tour the facilities and discuss possible mathematical modelling projects with ACES researchers, 3 October 2019.
52.	A/Prof Katya Pas, Monash University, visited ACES ANU to progress collaborative research discussions, 18 October 2019.
53.	ACES Als Drs Serena Duchi and Carmine Onofrillo, University of Melbourne, visited ACES UOW to progress collaborative research projects and review the facilities and learn more about the Ultramerge technique developed at ACES, 6 November 2019.
54.	Dr Adam Martin, Macquarie University Sydney, visited ACES UOW to progress a collaboration on electrical characterisation of peptides with enzymes, 20 November 2019.
55.	Dr Majid Ebrahimi Warkiani, NHMRC CD Fellow, Center for Health Technologies (CHT) & Institute for Biomedical Materials & Devices (IBMD) at UTS Sydney, visited ACES UOW to give a seminar, tour facilities and have collaborative research discussions, 29 November 2019.
56.	Prof Dawid Janas, Department of Chemistry at Silesian University of Technology, visited ACES Monash with the view to establish a research collaboration, 2019.
57.	Prof Thomas Nann, Faculty of Science, The University of Newcastle, Newcastle, visited ACES Deakin to give a seminar and hold collaborative research discussions, 17 December 2019.