

OUR RESEARCH



BUILDING OUR ECONOMY | CREATING JOB OPPORTUNITIES | IMPROVING SOCIETY

AUSTRALIAN TECHNOLOGY NETWORK OF UNIVERSITIES



INTRODUCTION

The universities that make up the Australian Technology Network of Universities (ATN) are the engine room of new ideas that will shape Australia's prosperity for years to come.

At ATN, the research we do has real-world impact. We are leaders in collaboration with industry partners and other universities to leverage the right skills in research, engagement and commercialisation. Our research drives benefits for the economy, for people's health and safety, and for meeting the world's biggest challenges.

Along with innovative, flexible, workplace-connected teaching and a deep commitment to access and social justice, research with real-world impact is a part of ATN Universities' DNA.

ATN Universities are joined by The University of Newcastle in this publication.

**AUSTRALIAN
TECHNOLOGY
NETWORK**
OF UNIVERSITIES



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PainChek®	6
Improving quality of life for patients with dementia and their carers	
Autism Academy for Software Quality Assurance	7
Developing employment opportunities for people living with autism	
New protein sources	8
Innovating feed crops to meet global demand	
AROSE:	9
Remote operations expertise leveraged between earth, the moon and space	

Innovative justice	12
Preventing family violence through systemic changes	
Biosolid management	13
Saving time and money through improved understanding of wastewater risk	
Reducing the youth road toll	14
Peer facilitators making the difference	
CAMS	15
Driving cost-efficient and effective management of infrastructure assets	

Pandemic drone	18
Monitoring the health of the crowd from a bird's eye view	
Future Industries Institute	19
Tackling industry challenges through collaboration	
FireFlight	20
Commercialisation support enables local fire mapping technology to reach the world	
Mental health and suicide prevention	21
Research-led transformations to practice and policy	

Algae biotechnology	24
A new global industry sector with mega potential based on microscopic species	
Safeguarding seafood	25
Helping the seafood industry anticipate and avoid marine microbe threats	
Water security	26
Holistic approaches to water management and drought preparedness	
Infrastructure robotics	27
A game changer for worker safety and cost-effective maintenance	

GreyScan	30
New sensing technology to protect against domestic terror threat and detect biohazards	
FormFlow	31
New housing forms using iconic corrugated steel in bushfire zones	
HeiQ Australia	32
Seamless partnership between industry and researchers creates global textile innovations	
Electric motorbike	33
Unlocking hidden entrepreneurship to develop new products for global markets	

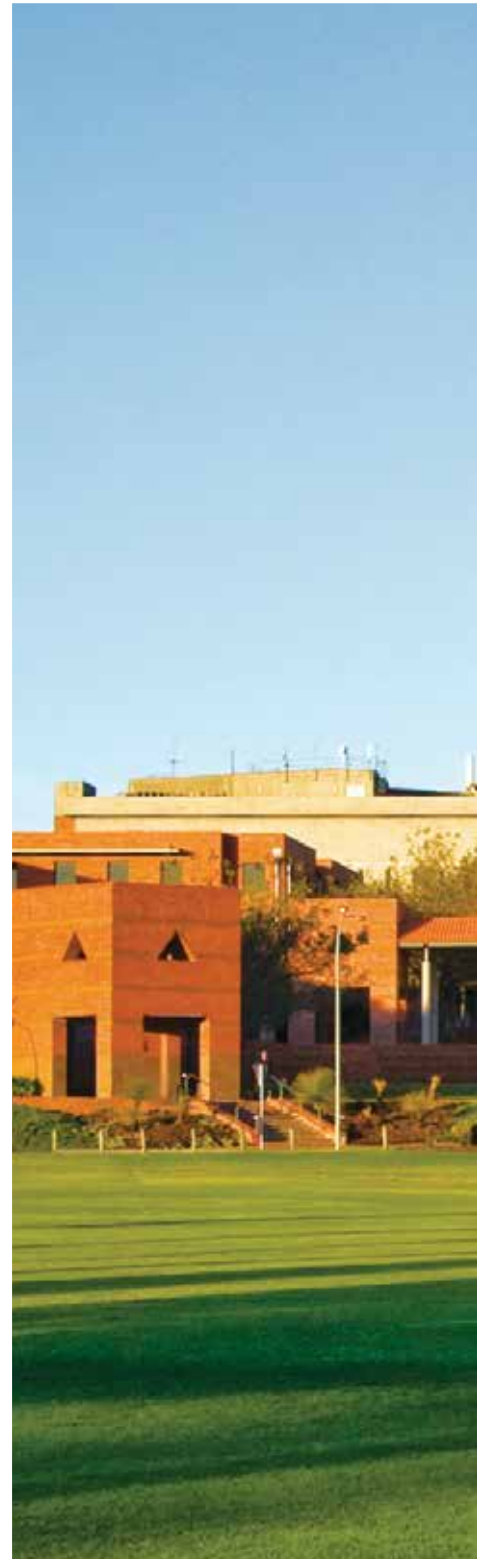
Printed solar cells	36
A new paradigm for renewable energy technology and job creation	
Quality Teaching	37
A proven approach to enhancing teaching performance and accelerating student outcomes	
Hone Global	38
Putting real-time decision making in the palm of farmers' hands	
Viralytics	39
Using the cold virus to kill cancer cells	

AUSTRALIAN TECHNOLOGY NETWORK OF UNIVERSITIES



Curtin University is Western Australia's largest and most culturally diverse university with Australia's third largest international student population.

With campuses in Malaysia and Singapore as well as face-to-face teaching in a number of countries, Curtin has a strong commitment to international engagement. This cultural diversity adds a rich and valuable dimension to the campus atmosphere, preparing all graduates to live and work effectively in an increasingly global environment.





PainChek®

Improving quality of life for patients with dementia and their carers

- **Facial recognition and artificial intelligence technologies transform pain management**
- **Enhanced quality of life for aged care patients and carers**
- **Upskilling the local workforce, and creating global export potential**

PainChek® is an innovative pain assessment tool that uses artificial intelligence and facial recognition technology to identify and treat pain in non-verbal patients, particularly those suffering dementia. In the past, patients with dementia and challenging behaviours were frequently treated with escalating doses of anti-psychotic drugs. In 2012, a Curtin University research team from the School of Pharmacy and Biomedical Sciences identified that appropriate recognition of pain could prevent these behaviours, reduce the need for heavy medication, and improve quality of life for the patient and their carers.

They developed a smartphone app that uses facial recognition software to rapidly detect and quantify pain, based on the established Abbey Pain Scale, and tracks pain over an extended time frame to assist carers and family members to develop effective pain management plans. Clinical trials in aged care settings validated significant increases in patient wellbeing, reduced use of medication to control behaviour and efficient, automated record management.

Building on the Curtin University research, a spinout company was established in 2014, raised more than \$13m in capital funding and achieved regulatory clearance in Australia and Europe in 2017. The company now has clients in Australia, UK, Singapore and New Zealand.

As of 30th June 2020, 722 aged care facilities have taken up a PainChek® license covering 61,571 Aged Care beds, training over 3000 professional carers, with more than 135,000 clinical pain assessments completed. Thanks to a \$5 million Federal Government grant in 2019, PainChek® is being rolled out to 100,000 people in residential aged care across Australia. This is particularly valuable in light of the challenges in providing care during the COVID-19 pandemic.

Consulting group ACIL Allen estimates the total health benefits of PainChek® for Australians living with dementia with moderate to severe pain between 2018 and 2027 may be as much as \$1.4 billion.

The company has commenced the process to obtain FDA regulatory approval for the US and Canada, tapping into a massive global export market. New applications are being developed outside aged care settings for patients who cannot verbalise their pain, such as Alzheimer's patients, young children and people living with disability or neurological disorders.

**They developed a
smartphone app that uses
facial recognition software
to rapidly detect and
quantify pain**



Autism Academy for Software Quality Assurance

Developing employment opportunities for people living with autism

- **Industry linkages create pathways to high-value employment for people living with autism**
- **Training and practical experience empower job-ready trainees**
- **Harnessing the talents of people living with autism to address technology industry challenges**

Research shows fewer than one third of autistic adults have paid employment, with more than half never having held a paid position. Autism affects around one in every 100 people.

In 2016, Professor Tele Tan from Curtin University's School of Civil and Mechanical Engineering launched the Autism Academy for Software Quality Assurance (AASQA). It is a flagship outreach program of the Curtin Autism Research Group (CARG), whose research facilitates independence and autonomy for people on the autism spectrum. Professor Tan and colleagues recognised that many young people with autism have potential skills in the challenging field of software analysis. AASQA is an initiative that combines a software inspector training Academy with a social enterprise that creates employment opportunities in this area of growing market demand.

In 2018, AASQA was further complemented by the addition of a Neurodiversity Hub in collaboration with global technology services company, DXC. This program creates more work experience opportunities for neurodiverse students and links them into DXC's global network of neurodiverse-friendly employers, including SAP, Westpac, ANZ Bank and the Australian Government.

By the end of 2019, the Academy had trained 250 people, all of whom moved into high-value jobs. Another 180 are enrolled for 2020, growing to 400 in 2021. In addition, 36 trainees transitioned into tertiary education, 12 have completed their studies and another 36 have participated in high-value internships.

AASQA has broadened its reach, developing strong partnerships with commercial, state and non-profit entities, including BHP, BankWest, Planit Testing, rerisk Pty Ltd, the WA Department of Training and Workforce Development and the Autism Association of WA.

This model harnesses the talents of people with autism for the collective benefit of individuals, industry and the wider community. It creates pathways into valued, long term employment for those who may otherwise struggle to achieve the dignity of independence and work.



◀ Former Vice Chancellor Prof Deborah Terry and Former WA Chief Scientist, Lyn Beazley, visit AASQA.

New protein sources

Innovating feed crops to meet global demand

- **Unlocking new value from low-margin crops**
- **Enabling the agriculture sector to adapt to a changing climate**
- **Improved productivity for farmers and global export potential**

Global demand for plant protein and gluten free products is growing exponentially, as consumers reduce meat intake and avoid potential allergens. In 2017 the global gluten-free market was valued at around US\$4.72 billion and the plant-based protein market is worth US\$18.5 billion. Australia is a significant producer and consumer of these products in the Asia-Pacific region and a major exporter to the US and Europe. Global innovation in agriculture is also being driven by the imperative to find crops that prove resilient to climate change.

Collaborative research led by Curtin University's food scientist, Associate Professor Stuart Johnson, has converted low-margin crops of sorghum and lupins, typically used for animal feed, into innovative nutritional food ingredients that meet escalating consumer demands. His work on the nutritional value of sorghum informed the development of Sanitarium's Gluten Free Weet-Bix in 2014, the first staple food based primarily on sorghum to be commercially released in Australia. It quickly became the highest penetration gluten free cereal and segment leader within six months of launch.

A May 2020 agreement between Curtin and ASX-listed Wide Open Agriculture, a regenerative food and farming company, will focus on developing and commercialising a new technology that has the potential to unlock innovative and valuable functionality of proteins found in the lupin seed. Modified lupin protein is inexpensive and versatile, yet currently only four percent of the lupin crop is consumed by humans. CSIRO will also collaborate on this locally developed technology that offers immense potential to value-add to Western Australia's lupin crop, elevating it into a rapidly growing sector of the global food market.

Sorghum is drought resistant and thrives in hot temperatures that cause traditional cereal crops to fail. Western Australia is the world's leading producer of lupins, which also play a critical role in sustainable farming systems. As Australia's agricultural sector adapts to a changing climate and evolving consumer needs, these innovations have real-world, everyday applications that will benefit farmers, food ingredient manufacturers and consumers alike.

AROSE

Remote operations expertise leveraged between earth, the moon and space

- **Translating years of remote operations expertise to boost the emerging space sector**
- **Securing Australia's competitive position in the global space industry**
- **Creates local STEM employment and global export potential**

Perth is set to become a global centre for remote operations in space, with the launch in February 2020 of the Australian Remote Operations for Space and Earth (AROSE). The consortium comprises Curtin University, the Western Australian government and The University of Western Australia, with industry partners Woodside, Fugro and Nova Systems. Remote operations is the ability to connect, monitor and control technology, people and processes over vast distances, often in harsh or high-risk environments. It enhances the productivity and safety of industries through advanced remote asset management and research and development in robotics.

The Curtin team will contribute its unique 'Binar' technology, used to build 'CubeSats' – small, lightweight satellites with low launch costs and minimal fuel requirements. Curtin will be engineering all the systems required to operate the satellites, including power, computer, steering and communications systems. These tasks provide hands-on experience for Curtin PhD researchers and students. Under Curtin's Binar Spacecraft Program, 'Binar' being the Nyungar word for fireball, Curtin researchers aim to develop a lunar orbiter that will deliver data for NASA's Artemis program, which is expected to return astronauts to the moon within four years.

Through AROSE, Australia's globally recognised expertise in remote operations, developed over decades of experience at mine sites, undersea equipment installations, Antarctic exploration, offshore oil and gas rigs, will be leveraged in support of the rapidly growing space sector. According to the federal government's Australian Civil Space Strategy (2019-2028) this segment could grow from \$3.9 billion to \$12 billion by 2030, accounting for 20,000 jobs.

The technological advances made through the AROSE project will also benefit industries back on earth. Economic modelling indicates that AROSE will add \$196 million to the state's economy per year and support more than 1,500 jobs in the next five years.



◀ AROSE research team with industry partners and representatives from NASA and the Australian Space Agency.

AUSTRALIAN TECHNOLOGY NETWORK OF UNIVERSITIES



RMIT University is a global university of technology and design and one of Australia's original tertiary institutions.

Based in Melbourne, we have a global reputation for excellence in practical education, applied and innovative research, and engagement with the needs of industry.

RMIT is a leader in engineering, accounting and finance, computer science and information systems, communication and media studies, psychology, education, law and economics.





rmit.edu.au

Innovative justice

Preventing family violence through systemic changes

- **Family violence research translates to policy reforms for real-world impacts**
- **Making families safer through early interventions and better-connected social services and justice systems**
- **Enabling perpetrators of family violence to change behaviour and break the cycle**

Considerable reform to the justice system in recent decades has strengthened the response to individuals who perpetrate family violence. This reform, however, has focused predominantly on punitive approaches, while not necessarily keeping perpetrators effectively engaged with interventions, or monitoring the risk that they pose.

Research conducted at RMIT University's Centre for Innovative Justice (CIJ), however, has contributed significantly to a shift in this response – keeping perpetrators visible, enabling better co-ordination across the justice and services sectors and ensuring that perpetrators do not slip between the cracks of different agencies with tragic outcomes.

Led by CIJ's Director of Research, Advocacy and Policy, Elena Campbell, and informed by the systemic failure which resulted in the tragic death of Luke Batty in 2014, the research highlights the need to keep perpetrators on the radar across all services. It identifies specific early interventions that could reduce the risk that perpetrators pose. This included connecting perpetrators with crisis accommodation, drug and alcohol and mental health services, and using Courts to greater effect, such as by bringing perpetrators of family violence back before the same judge.

Campbell's recommendations were adopted by the Royal Commission into Family Violence and her research has informed the *National Outcome Standards for Perpetrator Interventions* and the Victorian Premier's 10 year plan for the elimination of family violence.

Campbell has since worked with many government agencies and Courts to support the implementation of the Royal Commission's recommendations and continues to advise agencies on perpetrator interventions and reforms that address family violence.



Biosolid management

Saving time and money through improved understanding of wastewater risk

-
- **Multi-disciplinary team translates research into outcomes that benefit the water industry, residents, farmers and the environment**
 - **Building the circular economy through targeted university-industry collaboration**
 - **Advancing the local water industry and providing global solutions**
-

For years, biosolids – one of two major end products of treated wastewater – has been used in agriculture as a nutrient amendment that maintains soil fertility, stimulates plant growth and improves farm productivity. However, in the absence of Australia-based evidence on survival times of pathogens present in the biosolids, Victorian regulation required that water utilities stored biosolids for three years prior to reuse to ensure they are safe to use on farmland.

South East Water, which delivers water, sewerage and recycled water services to 1.79 million people in Melbourne, produces around 3,000 dry tonnes of biosolids each year. This figure is projected to triple over the next 30 years, requiring the construction of additional storage facilities. Storage of biosolids is not only expensive, but also impacts the amenity of local residents due to odour.

Now, thanks to research into pathogen survival and treatment conducted by RMIT's Centre for Environment, Sustainability and Remediation in collaboration with industry partners, the Victorian Environmental Protection Authority has, subject to site-specific validation, changed regulation to cut minimum storage times to 12 months rather than three years. The cross disciplinary RMIT team, led by Distinguished Professor Andrew Ball, brought together environmental scientists, social scientists and engineers, as well as industry partners South East Water and ALS Environmental Services with expertise in wastewater processing. Through their collaboration they identified a new technique to isolate and enumerate pathogens in biosolids.

South East Water estimated that the reduced storage requirements have delivered over \$1.5 million in savings in a single year. It has also delivered environmental benefits, including reducing Victoria's greenhouse gas emissions by an estimated 87,000 kg each year.

Professor Ball is now leading the establishment of the Australian Research Council (ARC) Training Centre for the Transformation of Australia's Biosolids Resource at RMIT, bringing together expertise from universities, water management authorities and industry in Australia, the United Kingdom and the United States. The Centre will transform the way biosolids are managed in Australia, provide global leadership in environmentally sustainable practices, and support the development of the circular economy through multiple new smart carbon products converted from otherwise polluting biowaste.



The reduced storage requirements have delivered over \$1.5 million in savings in a single year

Reducing the youth road toll

Peer facilitators making the difference

- **Community grief fuels long-term research partnership and saves young lives**
- **Evidence-based youth education program translates to policy reforms for real-world impacts**
- **Practical experience and valuable facilitation skills equip university students for the future**

A tragic series of fatal crashes involving school students in a semi regional Victorian community in 1999 moved devastated school and community leaders to work with road safety experts to find new approaches to engage young people with safer driving behaviours. The Fit to Drive (F2D) program does not teach driving skills, rather it empowers young drivers and passengers to reflect on their own driving attitudes and behaviours, take responsibility for their actions and identify strategies to use in dangerous road use situations.

Dr Kerry Montero, from RMIT's Social and Global Studies Centre, has a background in youth work, youth health promotion and education. In 2002 she applied her practical and research knowledge to collaboratively, along with co-founder Graham Spencer, design F2D road safety education workshops, which are delivered to over 20,000 Year 11 students annually across 200 Victorian schools. An outcome of Dr Montero's research has been the establishment of the Fit to Drive Foundation, a not-for-profit organisation dedicated to reducing road trauma in young people aged 16-25 through education and influencing public policy.

Following a multiple-fatality young driver crash in 2012 the Victorian Coroner recommended that compulsory and consistent road safety education, and specifically the Fit to Drive program, was essential for all young people. VicRoads and the Transport Accident Commission relaunched the program with support from the MFB/CFA (now Fire Services Victoria), Victoria Police and local councils. Since 2014 a further 120,000 students from 370 schools have participated in the workshops and over 80% of students expressed intention to use the strategies learnt to avoid risky driving situations.

A critical success factor in the workshops is the use of "near peer" facilitators, creating the most conducive learning environment for Year 11s. Over 800 Victorian university undergraduate students have been trained as facilitators since 2002. Additionally, second- and third-year students from RMIT's Youth Work and Youth Studies degree trained as facilitators, gaining course credits and enormously valuable practical experience.

This program has won multiple state and national road safety awards and has been implemented in NSW (as 'Blue Datto - Keeping Safe'), Indonesia, Malaysia and Cambodia.

During the Covid-19 crisis the F2D Foundation has developed virtual programs using university facilitators as hosts. Two programs have been developed, Steer Right for secondary students, and Carpool, aimed at learner drivers and their supervising parents.



CAMS

Driving cost-efficient and effective management of infrastructure assets

- **Local councils collaborate with researchers to revolutionise public asset management**
- **Valuable practical experience equips university students for the future**
- **Local productivity solutions have global export potential**

Australia's infrastructure assets are valued at around \$100 billion. The management of these assets, including public buildings, roads, and bridges, is a costly but essential financial and safety obligation for local councils, government agencies, engineering companies and infrastructure operators. A Central Asset Management System (CAMS) developed by RMIT's School of Engineering in collaboration with 15 local councils delivers a scientific solution that saves costs and provides safer, more resilient infrastructure.

Drawing on her research interest in the lifespan of public buildings, Professor of Civil Engineering, Sujeeva Setunge, initially partnered with six local councils and the Municipal Association of Victoria in an ARC Linkage project aimed at developing a new building asset management system. The partners took a whole-of-lifecycle approach to building management, incorporating social and environmental considerations, deterioration forecasting, best practice management practices and real-world building inspection datasets to develop an asset management model. RMIT's Melbourne city campus was used as a living lab to test the model. Once it was proven, the team worked with a software development company to translate the model into user friendly software that was initially rolled out to four councils.

RMIT student teams gained valuable practical industry experience using CAMS to perform asset inspections for councils, and their findings contributed to further enhancements of CAMS. The result was a tablet app that enabled council building inspectors to collect data more easily and accurately, upload it on location, and dispense with paper records. It optimises decision making for asset managers regarding risk, maintenance and budget forecasting.

CAMS has been adopted by ten Victorian councils, who report an increase in building user satisfaction of 60-90% and a 30-40% reduction in the cost of on-site inspections. Partners now include Melbourne Water and VicRoads. New opportunities are under development to assess the condition of roads, bridges and stormwater infrastructure, as well as an Asian Development Bank-funded project in Sri Lanka.



AUSTRALIAN TECHNOLOGY NETWORK OF UNIVERSITIES



University of South Australia

The University of South Australia (UniSA) is Australia's University of Enterprise; engaged with the world and responsive to its needs. With more than 33,000 students, the university is South Australia's largest.

Since its foundation in 1991, UniSA has earned a reputation for innovation, adaptability and smart planning. Our ethos has always been to make a difference in the wider world by contributing to local, national and global communities through our research and innovation and through the education of quality graduates ready to make their mark.





unisa.edu.au

Pandemic drone

Monitoring the health of the crowd from a bird's eye view

- **Cutting-edge imaging and sensor technology finds new applications for non-invasive public health monitoring**
- **University-industry collaboration provides practical solutions for living safely post-pandemic**
- **Local health impacts and global export potential**

A pandemic drone to remotely monitor and detect people with infectious respiratory conditions is being developed by the University of South Australia (UniSA) in partnership with award-winning Canadian drone technology company, Draganfly Inc. The drone will be fitted with a specialised sensor and computer vision system that can monitor fever, heart and respiratory rates, as well as detect people sneezing and coughing in crowds, work places, airports, cruise ships, aged care homes and other places where groups of people may work or congregate.

The UniSA team led by Defence Chair of Sensor Systems, Professor Javaan Chahl, achieved global recognition in 2017 when it demonstrated image processing algorithms that could extract a human's heart rate from drone footage. The research team has since proved that heart and breathing rates can be measured with high accuracy within 5-10 metres of people using drones, and at distances of up to 50 metres with fixed cameras.

The technology was originally envisaged for use in war zones and natural disasters as well as remotely monitoring heart rates of premature babies in incubators. Having successfully developed algorithms that can interpret human actions such as coughing and sneezing, they technology is proving a viable screening tool for infection monitoring and control during the COVID-19 pandemic.

Common privacy and security concerns about mass surveillance have been addressed up front. While the technology takes biometric readings, it does not use facial recognition. Other leading industry partners are involved to ensure that cyber and data security measures are robust in a global setting.



Future Industries Institute

Tackling industry challenges through collaboration

- **Deep university-industry collaboration delivers breakthrough technologies to solve diverse challenges for recycling, manufacturing and mining sector partners**
- **Leveraging industry-centric research to build sovereign capabilities that strengthen the local manufacturing sector**
- **Nimble researchers adapt cutting-edge coating technologies to address pandemic priorities**

As the nation prepares for a post-pandemic economy, UniSA's Future Industries Institute (FII) is leveraging its deep industry connections to build a sustainable local manufacturing sector to help stimulate employment and economic growth. At the same time, it is harnessing its partnerships to tackle global problems and reduce reliance on international supply chains.

FII has a multifaceted research relationship with the Detmold Group, a leading manufacturer of sustainable packaging products which employs 3000 staff across 17 countries. The FII and Detmold collaborated to tackle the global waste scourge of disposable coffee cups, with 16 billion thrown away each year. Detmold sought an alternative to plastic lined disposable cups, which cannot be recycled. FII's thin film coating experts have analysed next-generation linings that can be readily removed, so that established recycling processes can be maintained. Applications across other Detmold products are now being explored with support from FII's Future Industries Accelerator program, which consisted of a \$7.5 million investment from the South Australian Government to support SA based companies.

Another highly valued FII industry partner is LaserBond. Together with Boart Longyear, the partners have just wrapped up a project aimed at tackling the \$30 billion problem of wear and tear on drilling components in the mining industry. Using FII's unique tribology capabilities, combined with actual drilling trials, they have rapidly

developed new protective coatings that extend the life of drilling and cutting components for use in the mining and agricultural sectors. Parts are currently undergoing long-term testing in the tough Pilbara region.

LaserBond is also collaborating with FII on the development of an economical process for applying copper coatings on frequently touched surfaces such as door handles and handrails. Copper is well known for its anti-viral and anti-microbial properties and research has shown that coronaviruses live for approximately 4 hours on copper, compared to 72 hours on stainless steel and plastic surfaces. However, wire arc spraying of copper or copper alloys is significantly cheaper, overcoming the cost barrier of bulk copper parts.

The pandemic has placed a spotlight on Australia's reliance upon global supply chains and equally highlights opportunities to leverage industry-focused research to build a more resilient future.



FireFlight

Commercialisation support enables local fire mapping technology to reach the world

- **Game-changing fire-mapping system provides fire intelligence in real time**
- **Business incubator program accelerates an entrepreneur's path to market**
- **Advancing local fire management and global export potential**

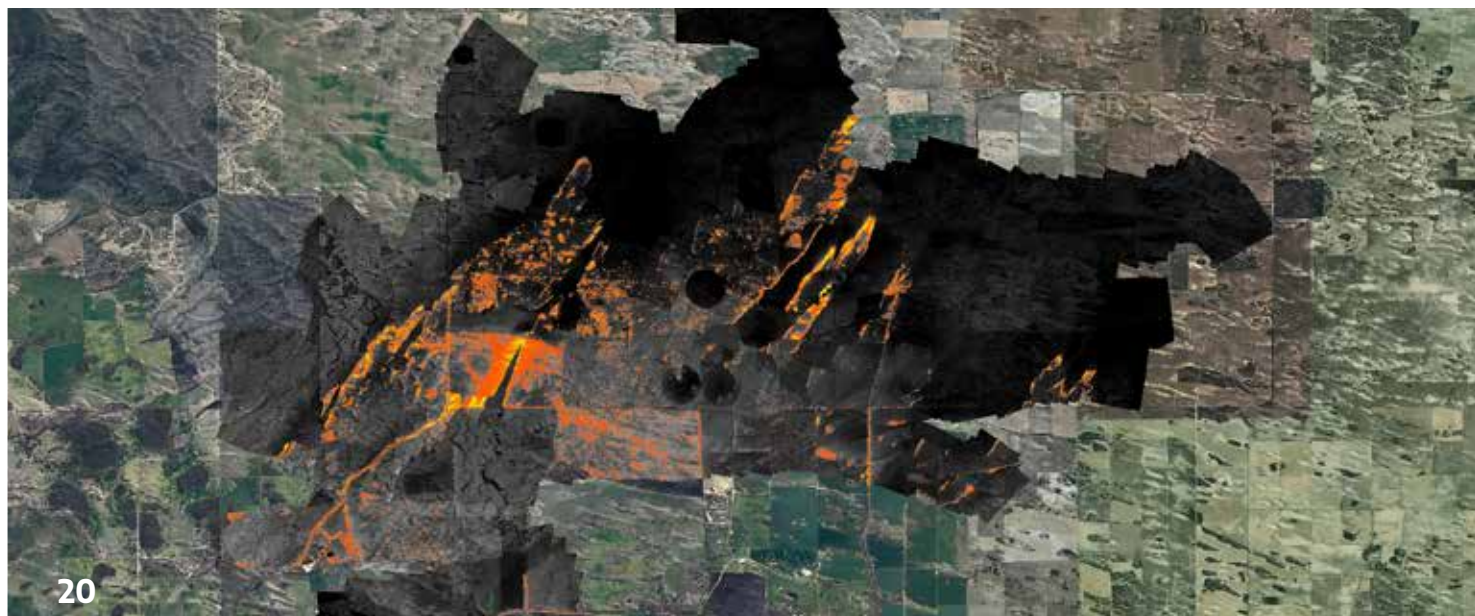
FireFlight is an airborne fire mapping system that provides real-time fire maps, and post-fire hotspot maps to fire managers, fire agencies and other relevant stakeholders. In January 2020 FireFlight mapping was used during the Kangaroo Island fires to help the relief and recovery teams from the Australian army and other fire agencies to plan and execute their operations.

FireFlight's aerial mapping system was deployed in a single-engine Piper aircraft flown over the fires at 3000m. Using specialist thermal imaging cameras, high-precision GPS and advanced data processing software, FireFlight's fire mapping system provided real-time maps of wildfires as well as details of post-fire hotspots, underpinning a strategic and efficient plan to fight the fires and aid recovery.

Founder and CEO of FireFlight, Dr Paul Dare, himself a volunteer firefighter, pilot and aerial imaging specialist, began developing the fire mapping technology 15 years ago. He credits the Venture Catalyst Space program at UniSA's Innovation & Collaboration Centre (ICC) with enabling him to commercialise it.

The tailored six-month incubator program gave FireFlight access to funding, training and workshops, one-on-one mentorship, a modern co-working space and cutting-edge world class technical resources and tools. FireFlight's collaboration with the ICC is a prime example of the role universities play in rapidly accelerating exceptional ideas or projects onto the world stage to solve complex global problems.

The FireFlight system is now achieving its global potential. The systems are shipped from Australia and operated by local pilots in fire danger regions worldwide. Cheap to deploy, it is provided to end users as a service, leaving these emergency responders to focus on fighting fires, while FireFlight operators provide real-time fire intelligence. This is more cost effective than the traditional use of large aircraft assets and world demand is growing in line with increasingly intense wildfires across the globe.



Mental health and suicide prevention

Research-led transformations to practice and policy

- **Deep expertise delivers holistic advances to treating and mitigating mental ill-health across the social spectrum**
- **Mental health research translates to policy reforms for real-world impacts**
- **Future mental health workforce equipped with evidence-based skills and knowledge**

In Australia, mental ill-health and suicide exact an immeasurable human toll, diminishing the happiness and potential of individuals, their families and communities, while at a macro level undermining the nation's prosperity, equating to a cost of \$500 million per day.

It is an evolving challenge that crosses all demographics and is amplified by rapid changes in technology, social conventions, family structures and workplaces.

UniSA's Mental Health and Suicide Prevention Research Group (MHSPRG), led by nursing academic Professor Nicholas Procter, has for decades undertaken research inspired by the real experiences of people living with mental distress, the needs of their carers, and health professionals.

Committed to finding new ways to support recovery with dignity, their findings and insights are shared through publications, clinical practice and input to public policy at a state and national level. They also teach undergraduate and postgraduate programs, equipping students and health professionals with the latest evidence-based skills and knowledge.

Recent examples demonstrate the powerful impact of this approach and build on long-standing partnerships with people with a lived experience of mental health challenges, government and non-government agencies, including SA Health and the Office of the Chief Psychiatrist. In 2017 Professor Procter was a Chief Investigator in the highly publicised Chief Psychiatrist's review of the Oakden Older Person's Mental Health Facility. 'The Oakden Report' found widespread clinical and governance failures, resulted in referrals to health authorities and police and laid the foundation for the Royal Commission into Aged Care Quality and Safety, which is currently underway.

The MHSPRG also has a long-standing program of work in the area of mental health and suicide prevention across a broad social spectrum, including emergency responders, asylum seekers, trauma survivors and in correctional settings. This has contributed to significant changes in suicide prevention education and government policy development. This includes evaluation of the suicide prevention networks introduced under the South Australian Suicide Prevention Plan 2017-21, and public guidelines for responsible reporting of suicide in the media and its portrayal on screens.



AUSTRALIAN TECHNOLOGY NETWORK OF UNIVERSITIES



The University of Technology Sydney (UTS) has a bold vision to be a world-leading university of technology.

We are known for our industry focus, practice-based teaching and learning, real world research and location.

With state-of-the-art campuses and facilities, we pride ourselves on preparing students to become global thinkers, leaders and innovators.





Algae biotechnology

A new global industry sector with mega potential based on microscopic species

- **Decarbonising established industry, while accelerating new start-ups and products**
- **Positioning Australia at the forefront of the new multi-billion-dollar global algae bioeconomy**
- **Valuable practical experience for students helps to develop the future workforce for a new industry sector**

Algae are microscopic organisms that can make virtually any product and there are over 300,000 species found across the planet. The market for algae-based applications in agricultural, industrial and medical biotech in the US alone is worth about \$350 billion. UTS's Deep Green Biotech Hub (DGBH), established in 2016 with support from the NSW Government, supports a diverse, resilient and connected algae bioeconomy in Australia. It is the world's first vertically-integrated innovation hub for algae-based products and services and includes Green Light, a globally unique algae biotech accelerator program.

DGBH brings together researchers, SMEs, industry partners, start-ups, students and other stakeholders to launch new businesses and encourage existing companies to adopt algae biotechnologies. Critically, as this new global industry sector rapidly grows, it is also training the next generation of engineers, scientists and specialist technicians for these jobs of the future.

Algae offers enormous potential to provide products and services needed to decarbonise industries, create new industries and support a circular economy. Independent beer brand, Young Henry's, worked with DGBH to capture the benefit of using an algae bio-reactor to offset carbon dioxide emitted during brewing. It is a neat match: while the yeast in the brewing process takes in oxygen and sugar and produces CO₂, the microalgae in the reactor takes in CO₂ and produces oxygen and a sugar substrate. Algae is up to five times more efficient than trees at absorbing carbon and one 400-litre bag of algae can produce as much oxygen as about a hectare of Australian bush.

In 2019-2020 DGBH supported 93 businesses and assisted the establishment of 19 new start-ups, contributing to a 33% annual increase in Australia's algae-based businesses. Diverse industry partners range from nutritional products maker, Sea Health, to Regional Development Australia and the global giant, GE Healthcare Life Sciences. Students gain valuable experience working directly with industry partners, positioning them strongly for employment when they finish their studies.

Safeguarding seafood

Helping the seafood industry anticipate and avoid marine microbe threats

- **Empowering seafood farmers with diagnostics to manage changing environmental threats**
- **Deep university-industry collaboration informs research that protects Australia's lucrative aquaculture sector**
- **Translating cutting-edge marine science into real-world impacts and commercial value**

Australia's seafood industry is worth around \$3 billion annually, with half of this exported. This lucrative industry sector faces evolving threats from rising water temperatures, changes to ocean currents, pollution, salinity levels and biotoxins.

Researchers from the UTS School of Life Sciences Seafood Safety research group are actively engaged with diverse industry partners, from the CSIRO to government primary industry departments, food safety authorities, aquaculture companies and the Sydney Fish Markets. They study the molecular genetics, ecology, phylogenetics and systematics of marine microbes, discovering new ones and determining the toxicology of many others, with real-world implications for seafood safety and industry productivity.

For example, the team has developed new methods of monitoring two dangerous marine biotoxins: saxitoxin and ciguatoxin. Both biotoxins are invisible to the naked eye, odourless, tasteless, and heat-stable, meaning they cannot be destroyed through cooking. They also have the potential to cause fatalities in humans.

The early warning diagnostic test for saxitoxin has already reaped benefits for the seafood industry, providing early detection of two emerging algal bloom events in Tasmania. This gave mussel farmers sufficient time to move production to safer sites, avoiding losses of around \$13 million, not to mention the danger to consumer health.

The test kit has been commercialised by Australian biotechnology company, Diagnostic Technology, and is now being used by aquaculture farms and shellfish safety regulators.

Ciguatoxin has long been known in tropical environments but in the last five years has become more common in NSW as ocean temperatures rise. Based on the UTS research, the Sydney Fish Market has changed its practices to protect consumers from high risk fish.

In addition, working with partners from the NSW oyster industry, the team has also developed real time salinity and temperature sensors in each estuary of NSW. This information is correlated with other water testing data, such as biotoxins and microbial communities, to develop models that improve harvest management plans. This has reduced the number of closure events and is expected to improve industry revenue by around \$3.03 million per annum across all NSW oyster farms.

It will improve industry revenue by around \$3.03 million per year



Water security

Holistic approaches to water management and drought preparedness

- **Data science informs predictive maintenance to save millions in repair costs**
- **Research enables governments to strike the right balance of infrastructure investment and water supply, meeting community demand**
- **Advancing the local water industry and providing global solutions**

Water security underpins all economic activity and is essential for life in Australia. Responding to drought and ensuring affordable, reliable access to water is an imperative now more than ever.

For more than two decades, The Institute for Sustainable Futures (ISF) at UTS, has partnered with governments and water utilities across Australia to ensure water security in our cities and towns. IFS' point of difference is its holistic approach: integrating both supply- and demand-side management measures, while drawing on a wide range of research disciplines to devise the most efficient, quickest and cheapest solutions to conserve and increase water supplies.

Historically, in response to drought, water agencies would seek to increase supply (build more dams and infrastructure) and reduce demand (through water restrictions). IFS has developed an innovative adaptive planning approach, incorporating both supply and demand planning into urban water management. During the Millennium Drought (1997–2010) this approach allowed the NSW Government to identify the storage level trigger point beyond which new dams were required and gave the government confidence to take a modular approach to constructing desalination capacity. As a result, Sydney averted water shortages but also avoided wasted capital investment on surplus capacity.

In Sydney alone, ISF's research has informed measures that have saved 120 million cubic metres, or 25% of water used each year. This represents cost savings to Australian households, as well as greenhouse gas savings of more than 300,000 tonnes per year for Sydney alone, equivalent to taking 112,000 cars off the road. ISF's expertise is in international demand, including advising governments in California and Brazil.

The complex challenge of water management requires multi-disciplinary solutions. UTS also boasts an award-winning team at the Data Science Institute, whose analysis of more than 10 million pipes with more than 30 global water utility partners show that UTS' predictive models of pipe maintenance have achieved between 5- and 10-times greater accuracy than the industry standard. This could enable Australian water utilities to save \$700 million a year on reactive repairs and maintenance.

Infrastructure robotics

A game changer for worker safety and cost-effective maintenance

- **Protecting workers by developing robots that take the risks**
- **Translating research into real commercial value and job creation**
- **Advancing local industry and generating global export potential**

Steel bridges and infrastructure are maintained through abrasive blasting to remove rust and scale, a market estimated to be worth \$A1.2 billion globally. However, it is physically demanding and dangerous work, with deadly risks to worker safety from falls and exposure to dust and lead-based particulates.

In 2006 the NSW Roads and Maritime Service and UTS collaborated to design robotic solutions to the Sydney Harbour Bridge's annual A\$18 million maintenance bill. Over six years, UTS researchers developed two autonomous grit-blasting robots, purpose-built to perform condition assessments on the steel girder bridge and to grit blast old paint and corrosion in preparation for repainting and repairs. Led by Professor Dikai Lui, the UTS Centre for Autonomous Systems created a new field of infrastructure robotics, which has huge potential to shape the future of global infrastructure maintenance by delivering productivity and safety gains, with cost savings.

In 2013 UTS and the NSW Government established SABRE Autonomous Solutions to commercialise the technology and create production quality systems suited to a range of tasks. The partners, now also including Burwell Technologies, have developed an intelligent climbing robot known as CROC, inspired by the movement of an inchworm. The machine can climb vertical steel walls, avoid obstacles and pivot through confined spaces inside bridges and other steel structures such as ship hulls and oil rigs. Along the way, it can collect and record inspection data and compare it with data from previous visits. The team has also perfected autonomous underwater robots for cleaning and inspection of bridge pylons, replacing a system that required potentially risky manual inspections.

With more than 270,000 steel bridges in the US, Europe and Japan alone and enormous potential in the oil and gas sector, Sabre has attracted investment from Shell's Gamechanger program. It will soon establish a US presence as part of global expansion.



AUSTRALIAN TECHNOLOGY NETWORK OF UNIVERSITIES



As one of Australia's largest universities, Deakin has strong global linkages, world-class research and, most importantly, an educational portfolio that blends the best of campus and digital delivery into a highly supportive and personalised student experience.

Our graduates are smart, collaborative and entrepreneurial. We give our students opportunities to develop a global mindset through our partnerships with universities and organisations around the world.

No matter where you are in Australia or the world, whether you seek a commercial, academic, or community partnership, we invite you to collaborate with us. Let's see what we can achieve together.





deakin.edu.au

GreyScan

Long term collaboration creates new sensing technology to protect against domestic terror threat and detect biohazards

- **Multi-disciplinary collaboration delivers breakthrough technology to solve anti-terrorism, health and environmental challenges**
- **Long-term university-industry partnership creates new high-value jobs**
- **Local industry applications and global export potential**

Fertiliser and other inorganic compounds used in homemade bombs or improvised explosive devices (IEDs) are now the most common terrorist device and the greatest threat to domestic security worldwide. However, until recently they could not be reliably detected by typical airport security scans. Detection of inorganic explosive traces has been revolutionised by a world leading research collaboration involving Professor Rosanne Guijt, leader of Deakin University's Smart Sensing team, the University of Tasmania (UTAS) and industry partner, Grey Innovation Group.

Funded by an ARC Linkage grant, UTAS's Professor Michael Breadmore and Professor Guijt, who relocated from UTAS to Deakin three years ago to lead Deakin's Smart Sensing team, have continued to collaborate. Together and with industry partners, they are exploring next generation applications for the fully-deployable chemical analysis system that is the core technology of GreyScan, drawing on their collective, cross-disciplinary strengths in inorganic compound analysis, microfluidics, microfabrication, and engineering. Deakin's focus within this collaborative effort is to advance the sophistication, capability and wider utilisation of technologies including sensing systems and automation.

It was a ten-year journey to create GreyScan, supported by several research grants from the Australian Research Council, as well as the US military. The next application, EcoDetection, is the beneficiary of this prior investment of human and research capital. Designed to detect chemical traces in water, rather than homemade explosives, it is already deployed in pilot settings in Australia and New Zealand. This game changing system uses innovative sensors to test water quality every 15 minutes and transmit the data in real-time, rather than waiting weeks for test results in response to contamination events.

In March 2020, GreyScan launched the world's first fieldable Trace Virus Detector, which again repurposes the original technology to detect surface traces of COVID-19 in community and public settings.

GreyScan now employs 20 people at a dedicated manufacturing plant in Port Melbourne, holds distribution agreements in multiple regions and is working with the International Air Transport Association to update international aviation regulations. As EcoDetection approaches commercialisation, this is a compelling demonstration of how long-term collaboration between researchers and industry partners, combining blue sky and applied research and channelling the creativity of multi-disciplinary teams, results in products with truly global relevance and enormous commercial potential.



◀ Deakin researchers Associate Professor Robert Shellie, Dr Ryan Nai and Professor Rosanne Guijt, who contributed to the GreyScan project

FormFlow

New housing forms using iconic corrugated steel in bushfire zones

- **Practical solutions to the housing needs of bushfire-affected communities**
- **Accelerating the translation of brilliant ideas into new applications for an established product**
- **University-industry partnership creates new manufacturing jobs**

An innovative new production technology applied to Bluescope corrugated steel will provide attractive, affordable, fire-rated housing solutions in bushfire zones. FormFlow was founded in 2016 by Deakin academics, Dr Matthew Dingle and Dr Matthias Weiss, with the owners of Geelong's award-winning engineering firm Austeng, Ross and Lyn George. FormFlow is now a technology development partner of Bluescope Steel.

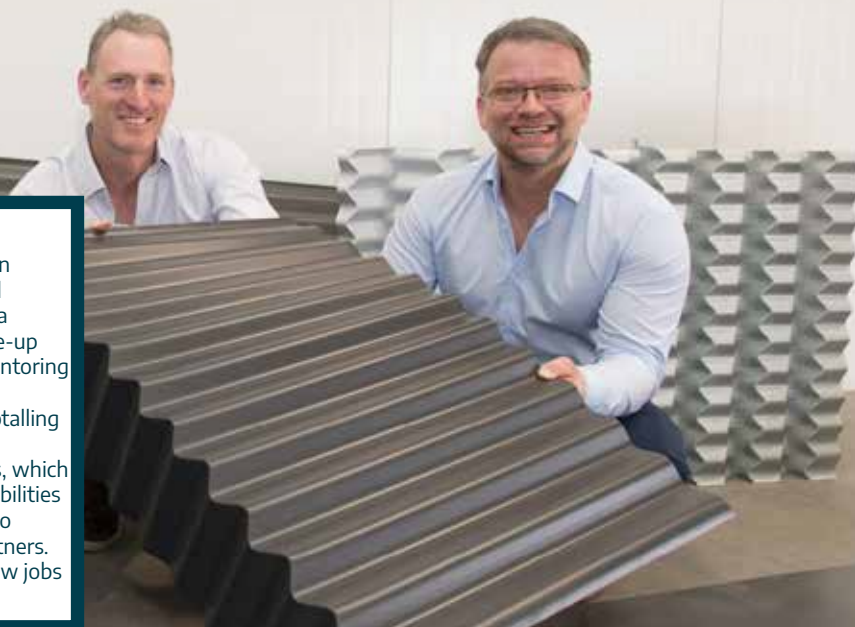
Hosted within Deakin University's ManuFutures advanced manufacturing innovation and acceleration hub, the FormFlow team accessed technology and business scale up support to commercialise their idea. Together they developed an industrial-scale machine that bends corrugated steel sheets at sharp angles, while preserving structure, coating and strength. Applying the mathematical principles of origami, the result is a seamless, airtight structure, eliminating seams and capping, with six-star energy efficiency and enhanced fire resistance.

Students and academics from Deakin University's School of Architecture and Built Environment have designed attractive, affordable modular homes using FormFlow. The company has a contract to supply transitional accommodation for homeless people and is now fielding many inquiries from bushfire ravaged communities, where individuals needing to rebuild are desperately seeking affordable homes that comply with new fire ratings.

With staff numbers expected to double to cope with demand, FormFlow's team of 12 has outgrown its location at ManuFutures and will move into new premises in North Geelong later in 2020.

▼ *Dr Matthew Dingle and
Dr Matthias Weiss*

ManuFutures is Deakin University's purpose-built advanced manufacturing innovation and acceleration hub that has generated 112 new jobs since it opened in 2018. ManuFutures hosts up to 15 enterprises at a time and provides a nationally unique model of scale-up services, combining technical, research, business mentoring and export support, as well as delivering 35 student engagement or internship opportunities per year, totalling 500 to date. It is located within the Geelong Future Economy Precinct at Deakin's Waurn Ponds campus, which integrates the University's specialised research capabilities and equipment with industrial-scale infrastructure to deliver complete solutions for Deakin's industry partners. The Precinct has led to the creation of over 2000 new jobs in the past 10 years.



HeiQ Australia

Seamless partnership between industry and researchers creates global textile innovations

- **Innovative materials with extraordinary functionality used to develop smarter products and fight COVID-19**
- **Partner-centric researchers take a nimble approach to meet industry needs**
- **Local manufacturing opportunities and global export volumes**

HeiQ Australia is focused on the research, development, and commercialisation of novel materials for modifying the properties of textiles. Its parent company, HeiQ Materials AG, was co-founded in Switzerland in 2005 by Australian scientist, Dr Murray Height. HeiQ supplies textile makers with specialised treatments that are applied onto the surface of textiles during their manufacture. Its unique products add functionality, such as adaptive cooling, odour control, antimicrobial properties and moisture management, to everyday apparel produced by over 200 global textile brands.

Attracted by Deakin University's novel technology to produce short polymer fibres that offer a unique platform for functionalising surfaces, Dr Height established HeiQ Australia, which became one of the first tenants in ManuFutures in 2018. The company works seamlessly with a cross-disciplinary team of researchers led by Associate Professor Alessandra Sutti at Deakin's Institute for Frontier Materials, including researchers from the ARC Industrial Transformation Research Hub for Future Fibres.

A partner-centric approach that meets HeiQ's industry requirements and tight commercial time frames has seen the team successfully develop and share new technologies such as HeiQ Real Silk, with HeiQ's global operations in Switzerland, the US, China, Portugal and Taiwan.

Developed over six years, this symbiotic relationship between Deakin researchers and HeiQ has fostered a nimble research structure that has allowed the company and the research to pivot during the COVID-19 pandemic. Together, the team is helping to further advance the HeiQ Viroblock textile treatment technology. When the pandemic began, HeiQ expedited production of HeiQ Viroblock, which combines silver antimicrobial technology and vesicle technology to rapidly destroy enveloped viruses, including coronaviruses. Testing indicates that HeiQ Viroblock achieves a virus reduction of over 99.9% relative to the control.

Since March 2020, this product is being used to treat face masks with anti-viral and anti-bacterial properties, and is manufactured in Europe, the US and Victoria for global markets. The team is working fast to extend the capabilities and applications of HeiQ Viroblock. The development of textiles and surfaces that are virus and bacteria-resistant is one aspect of helping to address the current pandemic emergency, as well as future pandemic threats.

HeiQ Australia and Deakin researchers are also continuing to collaborate on new starting materials for novel textile treatments to improve sustainability, including waste materials from agricultural or food processing and recycled textiles. Future product applications and topics being explored include home furnishings, uniforms, and scope for increased Australian-based manufacturing capability.

▼ *Dr Murray Height and Carlo Centonze CEO HeiQ Group. Associate Professor Alessandra Sutti, Dr Emma Prime, Manager of the Future Fibres Hub and team.*



Electric Motorbike

Unlocking hidden entrepreneurship to develop new products for global markets

- **Extending the electric vehicle revolution to motorcycles to create jobs**
- **Holistic business support and university research expertise bring an entrepreneur's dream to market**
- **Local manufacturing opportunities and global export potential**

After 18 years working as a fitter and turner at Ford Geelong, and with extensive hands-on experience in motor sports and motorbike design under his 'Engineered to Slide' (ETS) brand, Nigel Petrie recognised the massive potential for electric motorbikes to develop as a new industry sector and market opportunity in Australia. They are quieter, more environmentally friendly and there is strong demand from the public. Nigel had developed a ground-breaking, high-tech electric driveline for motorcycles, but he lacked the educational background, business knowledge and confidence to convert this product into a viable commercial operation.

Taking up residency at Deakin's ManuFutures changed all that, as it surrounded him with a team who contributed diverse technical and business skills that helped him deal with every issue that arose, as well as access to government grants. Nigel credits the team with speeding up his entrepreneurial journey from idea to reality and planning his business future. His electric driveline for motorcycles is the most power-dense available. It combines several technologies in novel ways, drawing on Deakin academics' expertise in software, engineering, materials science and battery technologies, including researchers from the Institute for Frontier Materials.

The ecosystem of ManuFutures has also been a success factor, with co-tenant Partington Advanced Engineering contributing carbon fibre knowhow.

Initially, the electric driveline can convert petrol motorbikes to electric, and is currently undergoing federal road safety approval, ahead of a fully produced electric motorbike prototype with a lithium battery in early 2021. Once this reaches commercial production in Geelong 2022, Nigel's current staff of three will grow to ten people. There is strong export potential, as demand for electric motorcycles grows around the world, and Geelong's deep automotive manufacturing heritage is reimaged.

▼ Nigel Petrie



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Built on the principles of equity, excellence and engagement, the University of Newcastle has a reputation as a world-class institution making an impact within its own region, throughout Australia and across the globe.

Our research is world-class and diverse. Our degree programs are internationally recognised and our partnerships and collaborations drive innovation. Our alumni are leaders and our students are preparing to make a difference in the world.

We are ranked in the top three per cent of universities world-wide and we have only just turned 50.





newcastle.edu.au

Printed solar cells

A new paradigm for renewable energy technology and job creation

- **New ultra-thin flexible solar cells are poised to create jobs and drive manufacturing diversification**
- **Rapid production will improve access to solar cells and reduce power bills**
- **Education and training capability will equip workers for tomorrow's jobs**

A new era of solar energy is about to dawn, thanks to a University of Newcastle team who has created printable solar cells that are as light-weight and flexible as a chip packet. Made from recyclable polyethylene terephthalate (PET) and manufactured on conventional printers, the solar cells cost only \$10 per square metre to produce, which helps overcome the cost and waste barriers of conventional solar panels.

The first commercial-scale pilot took place in 2018 when the university partnered with CHEP – a global supply chain solutions company – to install 640 meters of printed solar panels on CHEP's Hunter Valley facility. As the next step to test durability and accelerate full commercialisation, the University of Newcastle team has installed a vivid and immersive lighting experience at 'The Canopy', a new urban space in Lane Cove, Sydney. The public will have a unique opportunity to interact with this inspiring science and ground-breaking technology, positioning renewable energy solutions as accessible for ordinary Australians and sparking the imagination about where STEM studies can lead.

Printed solar is faster than any other renewable technology to manufacture, with commercial-scale printing equipment capable of producing kilometres of material per day. This presents opportunities for conventional printing companies whose business has been disrupted by the rise of digital technologies. The world-class manufacturing facility at the university's Newcastle Institute for Energy and Resources (NIER), supported by the Australian National Fabrication Facility, is already at capacity, making manufacturing expansion a priority. The university also has the capability to develop the education and training framework that will support this emerging sector and train the new workforce.

In line with the objectives of the Australian Government's 'Technology Investment Roadmap' (May 2020), this project delivers more than just emissions reduction – it develops technology that will support jobs growth. There are endless potential applications for this flexible, wrap-able product, from defence settings, to building cladding, charging stations for electric cars and floating covers for dams and pools.



◀ Paul Dastoor

Quality Teaching

A proven approach to enhancing teaching performance and accelerating student outcomes

- **Evidence-based approach informs improved teaching performance and boosts professional morale**
- **Students benefit from measurable improvements, enabling rapid recovery from educational disruption**
- **Dramatic improvements to maths teaching and student outcomes, supporting national STEM goals**

The link between high-quality teaching and positive student outcomes is indisputable, yet until now there has been little reliable evidence that shows positive impact from the plethora of teacher professional development programs. Over the past 15 years, rigorous research by the University of Newcastle, led by Laureate Professor Jenny Gore, has delivered the Quality Teaching (QT) model and Quality Teaching Rounds (QTR) program. There is now both anecdotal and measurable evidence of the tangible positive impact these have had on teacher development and student advancement, supporting evidence-based education policy.

The QT model provides teachers with a tested conceptual framework for articulating, sharing, assessing and refining their practices. It helps teachers understand what it means to teach well. The QTR program follows the model of medical teaching rounds, a carefully designed process that enables teachers to share advice and use rich collaborative processes to improve their teaching practice across any subject or grade. The QT model has been applied in over 2600 government, Catholic and independent schools in NSW and the ACT and has also informed education policy in South Australia. More than 250 schools have trialled the QTR program, benefiting 150,000 students, and directly correlating to positive impacts on NAPLAN results.

A \$16.4 million grant in 2018 from the Paul Ramsay Foundation will expand QTR to reach an additional 30,000 teachers over the next five years. It also funded a study in 2019, supported by the NSW Government, on the impact of QTR on students and teachers in a range of contexts. The initial findings show a remarkable 25% improvement to student learnings in maths, equivalent to an additional two months learning in less than a year. The academic gains were slightly greater in disadvantaged schools and these results are likely to be replicated for other subjects.

As schools and students grapple to recover from the educational disruption of COVID-19, this dramatic acceleration is highly significant. Other measurable improvements to teacher morale, performance and collegiality enhance the attractiveness of the profession and support the national goal of increasing participation and success in STEM subjects.

Professor Jenny Gore ►



Hone Global

Putting real-time decision making in the palm of farmers' hands

- **Empowering farmers with real-time data insights to improve productivity and save costs**
- **Enabling the agriculture sector to adapt to a changing climate and compete globally**
- **Creating commercial value and jobs by translating advanced spectroscopy and chemometric science into intelligent software**

In 2016 three University of Newcastle PhD students created Hone Global – a digital platform that uses patented technology to put real-time analysis of crops and soils in the palm of farmers' hands, thereby helping them save time, effort and money. It gives farmers direct access to laboratory standard chemical analysis from their own paddocks, empowering their decision making.

Hone's patented platform attaches to the back of a smartphone and uses advanced spectroscopy techniques to assess the chemical traits of any solid or liquid. Data is transferred to Hone's cloud-based, artificial intelligence chemometric platform using a specially-designed smartphone app. Within seconds, quantitative and qualitative insights are delivered to the user's smartphone so farmers, winemakers, brewers and others in the agribusiness supply chain can make real-time decisions that improve soil health, produce quality and production processes.

Hone engaged industry-leading laboratories to help develop a suite of applications on its platform to enable testing of soil, leaf, grain, feed, and other samples in a fraction of the time of traditional off-site laboratory methods. The real-time nature of Hone means producers can take earlier action to improve performance and yield. By instantly knowing the quality of their produce, farmers are empowered to optimise water, fertiliser and storage capabilities and intelligently trade their commodities to increase their margins.

All of this can lead to increased confidence among growers to meet escalating national and international produce demands, quality and environmental expectations.

Importantly, Hone offers significant cost benefits, with costs averaging \$1 per test on the Hone platform compared to an average of \$100 per sample using traditional laboratory methods.

Today, they have over 450 users, have conducted more than 345,000 sample tests, and have worked with national and international agribusiness partners such as Cargill, GrainCorp, Ridley, AMPS Agribusiness, the Australian Wine Research Institute, the NSW Department of Industry, and the International Crop Research Institute for the Semi-Arid Tropics.

Hone has several other patent applications pending and maintains a one-of-a-kind machine learning chemometrics platform. It employs 15 staff and is developing additional applications for its technology, including environmental testing, water testing and medical devices.



◀ Hone founders

Viralytics

Using the cold virus to kill cancer cells

- **Translating 20 years of pioneering research into real clinical benefits for patients with advanced cancers**
- **Lessons learned from successful biotech spinout applied to new university venture**
- **Australian biotech advances on the world stage**

While traditional cancer treatments have improved over time, they still come with serious and sometimes debilitating side effects. Their effectiveness also varies depending on the type and stage of the cancer. A new treatment approach is immunotherapies, which essentially introduce viruses to induce an immune response against cancerous tissues. Immunotherapy represents a new paradigm in cancer treatment, has fewer side effects, and is proving to be particularly useful in late stage and metastatic diseases where conventional therapies fail.

Professor Darren Shafren's research into the common cold led to a major immunotherapy breakthrough and one of the largest biotech acquisitions in Australian history. Shafren was originally investigating ways to prevent the cold virus from binding to molecules in the lungs, nasal passage and respiratory tract. In 1999, he was approached by a colleague trying to find new ways to kill melanoma cells in the laboratory setting. On a whim, Shafren suggested using the airborne virus Cocksackievirus A21, one of the causes of the common cold. It obliterated the melanoma cells.

Later that year the University of Newcastle helped Professor Shafren patent the use of CAVATAK® in oncology and found the company Viralytics. With support from the university, Professor Shafren spent nearly 20 years guiding his experimental drug through various clinical trials.

In 2018, pharmaceutical company MSD (a subsidiary of US-based pharmaceutical giant Merck & Co., Inc.) acquired the Australian virotherapy firm Viralytics and the rights to its cancer-busting drug CAVATAK® for AU\$502 million.

Clinical trials involving CAVATAK® as a stand-alone treatment have consistently shown significant tumour reduction. The drug has also been highly effective in combination with other immunotherapy drugs. CAVATAK® is currently being investigated in Phase 1b clinical trials in combination with checkpoint inhibitors for patients with advanced melanoma, lung cancer and bladder cancer. These are highly prevalent cancer types in the United States and Australia.

In 2020, Shafren became the Chief Scientific Officer in a new private venture backed by the University of Newcastle called ImmVirX, that aims to develop even more cutting-edge cancer therapies to improve outcomes and quality of life for cancer patients worldwide.

Professor Darren Shafren ►





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