PARTNER WITH US TO TACKLE WICKED PROBLEMS
We acknowledge the tradition of custodianship and law of the Country on which the University of Sydney campuses stand. We pay our respects to those who have cared and continue to care for Country.

Progressive thinking, breaking with convention and improving the world around us is in our DNA and we have a proud track record of doing this for more than 170 years. We believe that creative solutions to complex problems aren’t developed in silos. That’s why we bring together diverse expertise – from both within the University community and beyond – to tackle problems from every angle and to generate many of the ground-breaking ideas, innovative solutions and critical thought leadership required to address some of the most intractable problems and unknowns facing our world today.

In 2021, three of our colleagues were awarded prestigious Prime Minister’s Prizes for Science, recognising their contribution to research and innovation. Professor Holmes’ work with Fudan University to publicly share the COVID-19 virus genome sequence laid the groundwork for the rapid development of COVID-19 vaccines. Professor Weiss’ pioneering research and commercialisation of synthetic tropoelastin biomaterials is a breakthrough in healing human tissues and organs. Associate Professor Bowen’s discovery and development of a novel molecule has potential to treat addiction and other disorders of the brain and mind.

Every day our researchers are producing work that makes a difference to society. Our partnership with Microsoft to build a quantum computer that could transform the future of computing, the economy and the way we live, builds on more than a decade of basic research in the laboratory.

This publication is a celebration of these important partnerships – a tiny snapshot of the research and education partners we collaborate with. It is also an invitation to start a conversation about your challenges and explore how we can work together to address them. It’s easy to connect with us through our dedicated engagement team, who will help you find the best researchers and students to address your needs from all angles. We’re proud of our history, but even more excited about the future we could build together.

FROM THE CHANCELLOR AND VICE-CHANCELLOR

Belinda Hutchinson AM
(BEc ’76), Chancellor

Mark Scott AO
(BA ’84, DipEd ’84, MA ’93, DLitt ’15)
Vice-Chancellor and Principal
Whether you’re a university, multinational business, startup, government or not-for-profit, it’s no longer enough to rely on traditional approaches to compete and thrive in today’s world.

This was dramatically demonstrated with the arrival of COVID-19 which has been the biggest social, scientific and economic challenge of the age. Adding it to the other challenges we face globally, one thing is evident - we need to innovate collaboratively.

It’s now more clear than ever, that strong economies grow from resilient industry and communities. We must address the global threats of climate change and growing inequality while containing costs and securing income. We want to optimise the wellbeing of our employees and communities and invest in leadership for the future. We want to be good citizens and remain globally relevant and competitive.

At the University of Sydney, we have over 170 years of experience in breaking with convention and improving the world around us. We understand that some problems are so complex they require a radically different approach – that’s why we work with our partners tackling issues from all angles, to understand the needs of people, communities and our environment.

To collectively thrive in today’s world, we must work together. That’s why partnerships are at the core of what we do at the University of Sydney.
Deep expertise is essential for world-class teaching and research. But we believe that siloed knowledge isn’t enough, especially when grappling with the scale of challenges facing the world today. That’s why we have invested in and developed our multidisciplinary research, bringing together the knowledge and expertise of academics and students across diverse disciplines.

On the surface, a philosopher and a physiologist working together might seem like an unusual academic match. We see it differently – our multidisciplinary approach ensures our academics and students are connected to rich intellectual and professional networks where ideas are freely exchanged, assumptions are challenged, and hypotheses refined to create stronger, more robust outcomes. This approach sets us apart from the rest – enabling us to be an active, informed voice in the conversations that industry and the community are having.

Whether we’re building the world’s first quantum computer, converting plastic waste into fuel, or reforming policy, partnerships are integral to innovative solutions. Explore how we work with organisations of all sizes to tackle wicked problems then contact us to find out more and start a conversation.
“This is a breakthrough for Australia’s advanced manufacturing industry. Via the Sydney Manufacturing Hub, Australian manufacturers and small to medium enterprises will now have ready access to GE’s own production-grade additive technology.”

Sam Maresh, country leader, GE Australia
A long-term collaboration between Microsoft and the University positions us at the forefront of the quantum revolution. This partnership represents the largest single investment in quantum computing ever made in Australia.

Led by Microsoft Scientific Director and School of Physics Professor David Riley, the joint quantum computer team is based at the Microsoft Quantum Laboratory within the Sydney Nano Institute, one of five experimental facilities worldwide in which Microsoft has invested. At this facility, academics and students work alongside Microsoft personnel to develop the interface between classical and quantum systems – a critical step for quantum machines to scale up to useful devices.

The partnership builds infrastructure to enable growth of the broader quantum economy. In a November 2019 announcement, Microsoft CEO Satya Nadella revealed the development of a full-stack, open-cloud ecosystem that delivers benefits of quantum computing to developers worldwide. The partnership saw a breakthrough in qubit control technology, allowing us to scale beyond the limitations of current systems. Applications impact the future development of health, finance, transport, information and communications technology, security and defence. As it evolves, organisations can leverage quantum to solve increasingly complex problems.

A further initiative is Project Q, which takes a multidisciplinary approach to breakthroughs in quantum technology. Project Q brings together physicists, philosophers, policymakers, military specialists, social scientists and international relations experts. This spectrum of intellectual talent explores the geopolitical and societal implications that surround quantum technology, for the greater good.

In partnership with three other Australian universities and the NSW government, we have established the Sydney Quantum Academy. It is training the next generation of engineers and scientists in quantum computing, cementing Sydney’s place as the leading global city for quantum technology and ensuring NSW is a world centre for jobs in the emerging quantum economy. To find out more visit sydneyquantum.org

“We sit at the threshold of an age in which quantum properties can revolutionise computing. Microsoft’s approach to building a quantum computer relies on investing in and connecting experts in industry and academia to make quantum computing a reality.”

David Pritchard, Managing Director of Technology Partnerships, Microsoft
By 2050, it’s been estimated that global food demand will increase anywhere between 59 and 98 percent. This rapid growth will put unprecedented demands on our agriculture and farm sectors.

Our Australian Centre for Field Robotics (ACFR) is working with industry partners, the Grains Research Development Corporation; Meat and Livestock Australia; and Hort Innovation, to find solutions to this problem. By applying cutting-edge technologies including advanced sensors, intelligent robotics and machine learning, we help farmers create more productive crop yields, improve food security and produce crops that enhance food quality and nutritional content in developing countries.

Inventions have included the world’s first cattle station robot, that performs automated tasks like weeding, spraying and herding livestock; robots that can undertake mechanical weeding to reduce chemicals; and robots that collect data and map landscapes to help crop farmers make decisions about when to spray and plant for maximum crop yields in vegetable and fruit farms.

SwagBot, developed by the ACFR, is an autonomous vehicle designed for use on grazing livestock farms.
Recipient of the 2020 Prime Minister’s Prize for Innovation, Professor Thomas Maschmeyer is focused on the two challenges central to the global sustainability crises: recycling plastic waste and renewable energy storage.

While the world reacted with alarm to mountains of plastic waste, Professor Maschmeyer saw an opportunity to transform end-of-life plastics destined for landfill and convert them to repurposed materials useful for another manufacturing life cycle.

His ground-breaking biomass, as well as mixed plastics waste-to-oil conversion research, led to the creation of the “Cat-HTR technology”, a process that is being commercialised by Licella Holdings, a company he co-founded, to be deployed around the world. Global licensees and partners include Mura, Shell, Dow, KBR and Mitsubishi Chemicals. Mura’s goal alone is to process 1 million tonnes per year by the end of 2025.

The technology could soon help Timor-Leste, one of the world’s most plastic-polluted countries per capita, become the first plastic-neutral economy in the world. The Timor-Leste government has been given a royalty-free, perpetual licence for this technology.

As the world gradually makes the switch from fossil fuels to renewables, storage systems will become vital to enable the post-carbon economy. Based on his research into zinc-bromide battery technology, Professor Maschmeyer founded Gelion, to commercialise and develop this revolutionary energy storage platform and make batteries that are safe, scalable, and recyclable.

“We need safe and robust batteries for a renewables revolution,” he says. The battery is ideally suited for use in Australian conditions. With properties that make it resistant to overheating, catching fire or exploding, it’s a game-changer for the agriculture and mining industries. Initial deployments will be in off-grid areas followed by large-scale support for solar and wind farms.

With manufacturing partners signed up both in Australia and India for local and global markets, Gelion is an Australian success story and an example of the pivotal role Australian universities play in the development of high-value, export-driven technology.
Humans are generating more waste than ever before. The average Australian produces between 1.2 and 2.1 tonnes of waste, every year. To tackle this unsustainable trajectory, our researchers are transforming our waste systems by putting the circular economy into practice.

The Waste Transformation Research Hub unites industry and leading academics to create value from waste resources and develop innovative low-carbon products to help achieve net-zero emissions targets. Our multidisciplinary research team led by Associate Professor Ali Abbas is seeking to collaborate with industry to lead the future of waste transformation.

Our team applies expertise in circular design, process modelling, AI and process intensification to develop advanced manufacturing solutions that reap maximum material resource value and make high-value niche circular products. These solutions can process waste at source and can be successfully applied to both urban and regional areas.

For example, we are re-processing industrial waste to manufacture new construction materials. We’ve also incorporated carbon dioxide into concrete without sacrificing strength. This turns concrete into a lower carbon product that actually prevents carbon dioxide from entering the atmosphere. We have partnered with local manufacturer and supplier of environmental concrete materials, Circrete, to commercialise these ideas and roll them out as eco-pavements and roadways.

Waste transformation technology is powering Australia’s circular economy business revolution by generating new revenue streams for green business, new employment opportunities for workers, and a cleaner, brighter future for everyone.

“The fast growing waste and recycling sector offers Australian firms great potential and global scale underpinned by research strengths in the circular economy in places like the University of Sydney’s Waste Transformation Research Hub”

Prime Minister Scott Morrison*

* Press Club Speech 1 October 2020, A Modern Manufacturing Strategy For Australia National, Press Club, ACT
GENDER EQUALITY IS PRODUCTIVITY

Inclusive and equitable workplace policies and practices boost economic growth, drive productivity, and build economic participation and inclusion across sectors, life stages and demographics. Our Gender Equality in Working Life (GEWL) Research Initiative is working to build inclusivity in the workplace through a collaboration between industry, government, and NGOs, on cutting edge research to produce actionable insights that organisations can use to build true gender equality.

Led by Professor Rae Cooper AO and Associate Professor Elizabeth Hill, the initiative brings together our academics with industry leaders to build the vision for a gender-equitable workforce that transforms research into policy and embeds that policy in organisations across sectors. Across their careers, Professors Cooper and Hill have collaborated on research with leading Australian organisations. These include infrastructure, utility, finance, investment and human service companies, as well as government, NFPs, professional associations and international institutions.

The initiative offers a focal point for collaboration between scholars, business practitioners and policymakers to explore, understand and respond to factors affecting individuals, work, employment, family and community. GEWL engages with trends impacting the workforce and helps link leading academic research to inform evidence-based and actionable policy.

LIFELONG CONNECTIONS

Nearly 18,000 children in New South Wales are in out-of-home care, almost a four-fold increase over the last 20 years. And studies show children are more likely to have positive life outcomes when they have a sense of belonging and emotionally secure relationships.

The University of Sydney is working with the NSW government and seven NGO out-of-home care providers, including Barnardos Australia, on practices to develop and sustain positive connections between children in care and their birth relatives and culture. Through in-the-field research with caseworkers across four sites, the study is developing evidence and training on best practices. The approach is 'trauma-informed' and has cultural safety and knowledge of Aboriginal Kinship as guiding principles.

Deep collaboration is an essential element of supporting children’s carers and birth families to sustain positive relationships. The research team and partners are engaging with the broader out-of-home care sector to develop evidence-based knowledge and tools so that children who remain in long-term care are supported in remaining connected to their families and culture.

“The Permanency Support Program is one of the most significant changes made to the NSW child protection and out-of-home care system in decades. I see the relationship with the centre as critical to helping us understand the impacts of some of these changes, and to guide policy and practice to improve the lives of children and families.”

Craig Layton, Executive Director, Child & Family, DCJ
Millions of people around the world suffer bone loss due to injury, infection, disease or abnormal skeletal development, and treatment often requires the regeneration of new bone. A dramatic advance in helping affected people could be a unique ceramic material that is 3D printed to act as a scaffold for the body to use as it regenerates new bone: a scaffold which gradually degrades as it is replaced by natural bone. This miraculous ceramic has been developed in collaboration with Allegra Orthopaedics and Hala Zreiqat AM, who is Professor of Biomedical Engineering, Head of our Biomaterials and Tissue Engineering Research Unit and Director of the Australian Research Council Training Centre for Innovative BioEngineering.

We have been collaborating with Allegra Orthopaedics, an Australian company, since 2013. In 2018, Allegra Orthopaedics Ltd was awarded a grant of $891,500 in the Australian Government’s BiMedTech Horizons program to contribute directly to commercialisation of one of the many applications of this technology and to Professor Zreiqat’s research. This research has the potential to affect an enormous number of people globally, including reducing the amount of organ rejections and wait times for vital transplants.

“We are very honoured to be one of the successful recipients of this grant. Our project was selected based on the recommendation of a diverse panel of high-calibre experts in the sector with research, clinical and commercialisation expertise. This grant is significant as it will allow Allegra to increase the resources and scale of our product development efforts.”

Jenny Swain,
Allegra Orthopaedics CEO

By using 3D printing technology, our researchers are creating synthetic scaffolds to stimulate the body’s ability to regenerate its own bones, tissues and organs.
Entrepreneurship and innovation matter to everyone, not just because they convert knowledge to productivity, but they also bring resilience to business and society. A community of researchers and industry practitioners from across multiple disciplines elevates innovative thinking and universities have a vital role to play in nurturing and supporting innovation.

We support entrepreneurship at all stages. INCUBATE is our award-winning startup accelerator program, which provides early access to some of the world-leading innovations at the pre-seed stage. As one of the oldest and leading accelerators in Australia, INCUBATE launches startups from all sectors with mentoring, masterclasses and equity-free grants. Each year, over 50 industry leaders join us as mentors and connect with the vibrant startup community.

Each year, over 50 industry leaders join us as mentors and connect with the vibrant startup community. Our membership-based coworking space, the Sydney Knowledge Hub, connects innovative start-ups, non-profits, and corporates with our researchers, students, and high-end research facilities. Both business and researchers benefit as they share expertise and develop ongoing networks. Sydney Knowledge Hub supports organisations working in advanced manufacturing, agtech, AI, biotech, medtech, nanotech, edtech and quantum.

One of our success stories is early crop disease detection platform Bioscout. Bioscout’s technology facilitates targeted crop spraying, which can reduce chemical use, costs and promote soil health. Early involvement with INCUBATE and the Sydney Knowledge Hub enabled Bioscout’s founders to respond to their target market, growing the idea to commercialisation in just three years.

To find out more about Sydney Knowledge Hub, visit sydney.edu.au/sydney-knowledge-hub

In Australia, mental ill-health and suicide are costing our economy $43-$51 billion annually, 75 per cent of major mental disorders have their onset before age 25 but less than 20 per cent of young people have access to high-quality mental health intervention.

Our Brain and Mind Centre is partnering with the BHP Foundation on a five-year program ‘Right care, first time, where you live,’ combining local knowledge and lived experience with cutting edge research to create sustained, coordinated and digitally enhanced youth mental health care.

Our mental health and systems modelling researchers work with local health, education and social services in eight regions across Australia to find the tipping points and turning points in young people’s mental health trajectories. Together, we’re creating a dynamic decision support tool based on our mental health modelling and research that will give people delivering mental health services the data and evidence needed to respond to the mental health needs of their community.

A successful 9-month pilot program was run in 2020 with Healthy North Coast, the provider of the North Coast Primary Health Network (PHN). Armed with real-time data, the PHN worked with community and service providers to focus on social connectedness through a program that is now in place in six towns in the region. These local models will become a blueprint, to be scaled up or down to support the mental health service needs of communities across the country.

“The scale of Australia’s youth mental health challenge demands testing new approaches. This innovative project has the potential to make a real impact in Australia and globally, and aligns with the Foundation’s ambitions to give young people every chance to fulfil their potential.”

James Ensor, BHP Foundation Chief Executive Officer
A ROADMAP TO REOPENING

One of the by-products of the COVID-19 pandemic has been “Fortress Australia” – the closure of international borders and our separation from the wider world. With a view to securing our future prosperity and stability, we have established an Independent Taskforce to address how we can move beyond Fortress Australia towards re-engagement.

The Taskforce brings together leaders from a cross-section of Australian society, including business, the professions, the arts, civil society and academia.

Listening to the experts, taking evidence from the public and learning from developments across the world, the resulting “Roadmap to Recovery” report sets out policy options that will make Australia’s future stronger and more confident.

We have outlined a five-point roadmap for reopening and a five-point plan for rebuilding that address areas including immigration, the economy, governance, human rights and civil liberties, public health including mental health, cities and suburbs, and the arts and creative industries.

The recommendations have been informed by the belief that bringing together academic researchers and diverse parts of Australian society will unlock answers to the urgent challenges of our time.

This ongoing project seeks collaborators to define Australia’s vision for rebuilding. To read the report, visit sydney.edu.au/policy-lab/roadmap-to-reopening

UNLOCKING POTENTIAL IN WESTERN SYDNEY

By 2050, four million people are expected to call Western Sydney home, with Parramatta now the third-largest economy by GDP in Australia, with only Sydney CBD and Melbourne ahead.

We have an 80-year history of engagement in Western Sydney and longstanding leadership in the Westmead Health and Education Precinct. Our staff and students are based across the Precinct in three major medical research institutes, two large-scale University of Sydney teaching hospitals and the largest pathology service in NSW.

Our researchers at the Westmead Children’s Hospital have partnered with an international bioscience company to develop orthopaedic devices for children, and on a research program to improve children’s orthopaedic care through 3D printing and design. This research will have a huge impact on young patients’ lives.

To expand our presence, we are working with the NSW Government to develop a new world-class multi-disciplinary university campus in Parramatta.

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By 2050 our vision is to host 25,000 students, generating 20,000 jobs and adding $13 billion to the NSW economy.

Further west, extensive commercial, research and education opportunities exist near the future Western Sydney Airport. Our significant landholdings represent huge potential for the future Western Parkland City. It is the optimal location for collaborations between the University and industry leaders in advanced manufacturing, advanced agribusiness, aerospace, defence, and logistics.

We are looking for organisations that share our ambitions for Western Sydney, to partner with us and elevate Australia’s future capabilities.
What we call 'the workplace', is now for many unrecognisable with COVID-19 causing a radical rethink in how and where people work. Despite challenges on mental health and organisational levels, there have been significant successes in the transition, and a lot of that is due to the inventive use and evolution of technology.

We support this ongoing evolution by working closely with our partners so our students are prepared for the ever-shifting contemporary workforce.

Reflecting our multidisciplinary approach to research, our students don’t learn in silos. Our reimagined undergraduate curriculum ensures that students have opportunities to work across fields of knowledge and on authentic projects with our partners.

Together, we’re nurturing the next generation of leaders who excel academically and possess the critical thinking, creative problem-solving, cultural competence and resilience to thrive in the most diverse and demanding work environments.
Students from our Business School are undertaking academically guided action research projects to support the business aspirations of remote communities in Australia and South-East Asia. By tackling complex, real-world problems during their degree in this way, our students develop essential problem-solving skills and graduate as leaders in their field.

In the Remote and Rural Enterprise (RARE) program, students work on entrepreneurial projects in partnership with communities. They research best practice, explore innovative ways to leverage local resources and create viable business – a collaboration that can add significant value to resource-strained organisations and entrepreneurs.

“RARE goes far beyond experiential learning,” explains Jared Harrison, RARE Program Manager. “It’s hands on. Students engage with community members to understand and assess problems, explore creative solutions and ensure their recommendations are an appropriate cultural fit.”

RARE has delivered more than 150 projects in Australia and South-East Asia and sent more than 400 students on-country for action research activities. Projects have included strategic business planning for cultural tourism ventures and business modelling for local enterprise hubs to support entrepreneurial activity with the Bawinanga Aboriginal Corporation (BAC) in Maningrida, NT. The impact of the program was recognised in 2018 by the Association for Tertiary Education Management, receiving the esteemed Engagement Australia Excellence in Community Engagement Award.

In the modern workplace, employees are required to continually update their skills to be successful. So how do we educate the next generation of students to equip them with the necessary skills, resilience and experience to secure their future in a rapidly changing environment?

As part of our Industry and Community Project Units (ICPUs), students address complex problems on behalf of our partners. With Adobe, students are looking at “how we close the digital skills gap?” and are proposing solutions on how we should enhance the future of education. Adobe challenged our students to identify creative ways that businesses, educators and governments can tackle the digital skills shortages and provide Australian graduates with the skills they need to lead effectively in the contemporary digital workforce.

Solutions to complex problems such as these cannot be solved in a silo. Therefore, we bring together interdisciplinary groups of students to come up with genuine ‘out of the box’ solutions. Throughout the semester student groups have the opportunity to learn from and engage with, senior Adobe executives before presenting their final recommendations.

This is just one of many ICPU projects that partners our students with leading organisations to tackle real-world problems. More than 70 organisations across six countries have engaged with over 5000 students. The solutions offered by our students have reinforced the value of these industry partnerships and the importance of involving industry in creating real-world educational experiences for students.

“We all learnt a lot during this program and it was amazing to see what the students came up with. Their presentations were so spot on and inspiring.”

Sandra Kirwan, Customer Success Manager, Adobe
FUTURE PROOFING THE WORKFORCE

For any organisation with an eye on the future, life-long learning and upskilling must be part of its talent strategy. Whether you want to equip employees with technical skills or enhance mentoring, we help organisations like yours address specific needs with interactive, experiential learning.

We draw on the expertise of our extensive academic network to deliver courses in many areas, whether to give individuals technical or management skills, or for organisations that have set goals for achieving greater diversification and inclusion.

Our delivery method is as flexible as you need it to be: entirely online; face-to-face; or blended learning. This has seen us work successfully with organisations and industry leaders in Australia and around the globe, including the Australian Department of Defence, Accenture, ANZ, BHP, Telstra, Bank of China and many more.