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“If innovation is to be the engine of growth for our future, then we need active intervention now to change the gender imbalance in science and technology areas.”

ALUMNA DR RAJI AMBIKAIRAJAH  
(BE (Hons) ’06, PhD ’13)
Welcome to the innovation issue of UNSWorld. Since the last edition, the UNSW 2025 Strategy has been launched at our annual Town and Gown gala event in October. Our strategy describes an innovative, ambitious and altruistic agenda, reflecting a conviction across our University community that UNSW has the potential to achieve great things during the next decade.

The University’s 2025 Strategy is supported by new research from a UNSW-commissioned Deloitte Access Economics report, The Economic Contributions of Australia’s Research Universities – the UNSW example. This report reveals the large contribution Australian universities make to the economy; the impact of the research conducted at UNSW was estimated to contribute $15 billion to the national economy last year. UNSW added a further $1.76 billion through its day-to-day operations. These numbers illustrate the major contribution UNSW makes to the innovation agenda and we are determined to do more as we implement the 2025 Strategy.

The impact of the research conducted at UNSW was estimated to contribute $15 billion to the national economy last year. UNSW added a further $1.76 billion through its day-to-day operations. These numbers illustrate the major contribution UNSW makes to the innovation agenda and we are determined to do more as we implement the 2025 Strategy.

The 2025 Strategy commits UNSW to work with government, industry and the community to translate research advances into social progress and economic prosperity. Innovation and technology development have the potential to reshape the economy and our lives. The UNSW Innovation Statement has now been published and includes plans for creating a UNSW innovation precinct. The precinct will link all the steps in the discovery-to-application continuum, from harnessing the creativity of our students, staff and alumni, through to incubating our best ideas and bridging them to industry or the end-users of our research. Dr Kevin Cullen from UNSW Innovations describes our activity in this area on page 11.

We believe that UNSW is well placed to play a major “relationship orchestration” role in bringing research and industry closer together. The federal government’s National Innovation and Science Agenda, launched by Prime Minister Malcolm Turnbull and the Hon. Christopher Pyne, Minister for Industry, Innovation and Science, on 7 December, is an important contribution to the ongoing effort by governments, universities, industry and research institutions to scale up innovation and work more collaboratively for a far greater impact. UNSW welcomes the prime minister’s commitment to major research infrastructure, leading the global race to build the world’s first quantum computer in silicon, which you can read about on page 4. The Commonwealth Bank and Telstra quickly followed the government’s announcement by confirming investments of $10 million each, thus establishing a powerful University-industry-government partnership.

2016 is shaping up to be a big year as we begin implementation of the UNSW 2025 Strategy. We thank you for your support, and hope we can welcome you back to UNSW in the near future.

All the very best for the holiday season.
NSW has welcomed the federal government’s announcement of a $26 million investment in the university’s world-leading quantum computing research. This major funding over five years will support the development of silicon quantum computing technology in Australia, in association with the Australian Research Council (ARC) Centre of Excellence for Quantum Computation and Communication Technology, headquartered at UNSW.

The announcement is part of the federal government’s $1.1 billion National Innovation and Science Agenda. “Australia needs to take advantage of, and evolve with, the rapid pace of this technological change,” the government statement said.

“It is … a university that provided the foundation for my career, the extent of which I could never have imagined – a career that has given me the opportunity to be involved in work I would gladly have performed irrespective of money or accolade,” she said.

From 1988 to 2007, Broderick worked at law firm Blake Dawson Waldron (now Ashurst). As a partner and a member of the board, she introduced part-time work there for the first time. For the next eight years, she served as Australia’s Sex Discrimination Commissioner.

Her career highlights include co-chairing the Women’s Empowerment Principles Leadership Group, serving on the World Bank’s Advisory Council on Gender and Development, and on the Australian Defence Force Gender Equality Advisory Board.

She said new graduates should not be discouraged by an apparent lack of jobs in business and law. “All the roles that I have held across my career, with the exception of ‘junior lawyer’, had not even been invented when I graduated from law school.

“There’s never been a more exciting time to graduate and start work. I wish I could start all over again.”
More than 350 million people globally suffer from depression and UNSW is now leading the world’s largest university-based and government-funded clinical trial to explore the potential of ketamine as a new treatment for this widespread mental illness.

The trial, funded with a $2.1 million grant from the National Health and Medical Research Council, will enrol 200 patients worldwide who have not responded to existing medications and compare the effects of ketamine against an active placebo treatment for four weeks.

Professor Colleen Loo, from UNSW’s School of Psychiatry and the Black Dog Institute, will lead the trial. It builds on five years of research which shows a single dose of ketamine can reduce depressive symptoms within hours, even in treatment-resistant patients.

“The trial will allow us to examine whether the positive effects of ketamine on an individual’s depression are sustained over a longer period, using the gold standard approach for research – a randomised control trial,” Loo says.

The UNSW team will also study the potential for ketamine to rapidly remove suicidal thoughts, due to rapid improvements in mood within hours of treatment. Ketamine targets a key signalling chemical in the brain known as glutamate. This contrasts with other antidepressant medications, which alter different brain neurotransmitters such as serotonin and noradrenaline.

UNSW has awarded one of its highest honours, an Honorary Doctor of Business, to Kathryn Fagg (MCom ’90), an experienced executive who has held senior leadership roles in logistics, manufacturing and banking.

She is currently a non-executive director of the Reserve Bank of Australia, Boral, Djerriwarrh Investments and Incitec Pivot. She also chairs the Melbourne Recital Centre, is on the board of the Breast Cancer Network of Australia and is a former chair of Parks Victoria.

“Kathryn is a consummate professional,” said Chancellor David Gonski when he presented Fagg with the award. “An experienced chair and board member, Kathryn has built an enormously successful career in the worlds of petroleum exploration, steel making, logistics and banking.”

Fagg started her professional career as a petroleum engineer with Esso in regional Victoria. After studying for a Master of Commerce at UNSW, she secured a consulting role at McKinsey & Co, then senior executive roles at ANZ Bank, BlueScope Steel and Linfox.

The Chancellor also applauded her as “a prominent activist and tireless advocate for women and their rightful place in senior management in the Australian workforce.”
“Our alumni remain one of our greatest assets. Congratulations to Mike Cannon-Brookes and Scott Farquhar from Atlassian on their successful listing on the US stock exchange. Thank you for making us proud.”

JENNIE LANG

Vice-President Advancement

Earlier this year, we shared with you the exciting news of the Roundhouse redevelopment and plans for the Alumni Entrepreneurs and Innovation Summit in June 2016 in San Francisco. I am pleased to report that both these initiatives are progressing, and we thank alumni who have already shared their Roundhouse anecdotes. We look forward to receiving many more stories, and we will shortly be releasing the initial program for the Summit. The calibre of alumni speakers is truly outstanding, and we thank them for readily agreeing to join and contribute to the San Francisco Summit.

This year we have seen the Global Circle of Friends come together in its entirety, and we are delighted that Professor Ian Jacobs, UNSW President and Vice-Chancellor, in his first 12 months in the post, attended meetings of the Foundation boards in Sydney, the UK, US, Hong Kong, and the inaugural meeting of the Singapore Advisory Council held earlier this month. We are privileged to have eminent alumni who volunteer their time to lead and serve on these groups. They assist us in our endeavours to position UNSW as a leading global university, ensuring there are avenues for UNSW graduates to remain connected with the University and with each other, and support the important work of the University.

We previously shared with you the UNSW 2025 Strategy, which sets out our ambitious plans for the next 10 years, and you will note that engagement with our alumni networks is a major priority.

Our alumni community is characterised by people who were first in the family to attend university; are second or third generations to attend UNSW; and are passionate about making an impact and changing people’s lives.

We hope to grow programs that encourage alumni to volunteer their time to support initiatives such as mentoring and internship opportunities for students and young alumni, helping us build industry and community partnerships, and promoting UNSW as the destination of choice to prospective students. We are already working to build the engagement opportunities we offer our alumni and we look forward to taking key Global Challenge forums to various countries in 2016.

2015 has been a bumper year and here are some of the stories that made the headlines:

- UNSW ranked 46 globally in the QS World University Rankings
- UNSW received $46 million investment in its world-leading quantum computing research: $26 million from the government’s Innovation Statement and $10 million each from the Commonwealth Bank and Telstra
- UNSW received $14 million from the Ramsey Foundation for the Black Dog Institute
- UNSW received its largest bequest to date of over $4 million from alumnus Ian Burgess
- UNSW co-hosted an event featuring Stephen and Lucy Hawking at the Sydney Opera House
- The Prime Minister acknowledged UNSW at the UN Climate Summit in Paris as a world-record holder in solar cell efficiency.

We look forward to staying in touch and keeping you informed about the many innovative and exciting initiatives taking place at UNSW.

With best wishes for the festive season and for 2016, Jennie

JENNIE LANG

Vice-President Advancement

FROM SILICON VALLEY TO QUANTUM HARBOUR

JUNE 2016, SAN FRANCISCO

UNSW Alumni Entrepreneurs and Innovation Summit
Women in innovation

As Australia focuses on innovation as a driver of future economic growth, engineering alumna Dr Raji Ambikairajah (BE (Hons) ’06, PhD ’13) argues that a greater role for women is a critical ingredient of success.

My childhood toys comprised books, Lego and puzzles. There wasn’t a doll in sight. My parents, especially my father who is an engineer, encouraged problem solving and understanding computers and technology early on.

In my high school graduating class, only two other women went into engineering like me. They also had engineers in their families. Most girls who were good at physics and maths and had high ATARs were encouraged by their families to go into medicine or law.

This is a problem for Australia, because if innovation is to be the engine of growth for our future, then we need active intervention now to change the gender imbalance in science and technology areas.

We must change community attitudes towards women in engineering, science and entrepreneurship or we risk an ever widening gap. There are too few women pursuing long-term careers in these fields, applying their knowledge and participating in the innovation economy. »
Twenty-five years ago, most Year 12 students across Australia studied sciences for their final exams. Now, the figure is less than half. About 90 per cent of boys study maths, compared to only 78 per cent of girls; and less than seven per cent of girls study advanced maths compared to 10 per cent of boys, according to the Australian Mathematical Sciences Institute.

And once you get to tertiary education, the numbers dwindle even further. In 2011, only a third of female graduates were from the science, technology, engineering and maths (STEM) disciplines.

When more girls study science and technology, and learn coding as part of their core curriculum, we can build critical mass and systemic change. Not just loving their iPhone, but understanding its inner workings and thinking of how to design better solutions – when that happens, then there is hope.

But one of the big issues facing young girls today, when they make subject and career choices, is a lack of tangible female role models in entrepreneurship and innovation. And even if they do go into a career in finance or engineering, staying in that career and moving up the ranks to leadership positions isn’t so common.

Few Australian women feature prominently in the start-up scene. Those that do – such as Jodie Fox, co-founder of Shoes of Prey, the international online shoe retailer, or Melanie Perkins, co-founder of the online graphic design platform, Canva, or Marita Cheng, founder of Robogals and 2Mar Robotics – are wheeled out again and again.

These entrepreneurs are inspirational, but we need a continuous pipeline of newly minted, successful women to encourage the innovators of the future.

In my electrical engineering undergraduate degree at UNSW, men far outnumbered women. It was the same when

I went on to join a start-up. After my PhD, I was a consultant for venture capital firms, and was continually amazed: where were all the women?

The major focus of most angel investors and venture capitalists is supporting start-ups in bio-medical, computer hardware and software fields where, in most cases, the original start-up founders have studied these subjects.

I’ve since become involved in several initiatives which, although they are not silver bullets, offer some hope for the future.

I was an adviser to Springboard Enterprises, the Australian arm of a larger American start-up incubator. I’ve been involved in several of their boot camps, providing feedback and advice to some of their female company founders.

I’ve since become involved in several initiatives which, although they are not silver bullets, offer some hope for the future.

Many of these women unconsciously under-sell themselves, but at Springboard they are given six months of mentorship from successful entrepreneurs and venture capitalists, with networks in the US and Australia being opened up to them.

I’m also a member of the Sydney Division Board at Engineers Australia (the profession’s peak body), where we are trying to stimulate our members’ “inner engineer” to encourage them to innovate.

I chair the Innovation and Entrepreneurship Committee where we are looking at how to engage engineers with fashion designers or musicians and other artists to re-ignite their creativity.

These are some reasons for optimism, but of course a lot more work needs to be done if we are to reach the $136 billion we could contribute and the 540,000 jobs we could create if Australia became an innovation-focused economy in the next 20 years – according to economic modelling by PricewaterhouseCoopers.

So encourage your sisters, female cousins, nieces, young daughters and granddaughters to explore science, maths, engineering and technology across their primary, secondary and tertiary education and beyond, to critically train their minds in problem solving, and to become significant players in our innovative future. Australia needs them.
New space buzzes with innovators

Transforming ideas into reality is the focus of a new centre where students from different disciplines come together to innovate, writes Melinda Ham.

What do a bicycle-powered esky, an unmanned ground vehicle, a 3D printer using recycled plastic, a shared satellite and an app for a car-free CBD for Sydney all have in common? These are some of the many projects students at the newly launched Michael Crouch Innovation Centre (MCIC) are collaborating on. Named in honour of its donor, innovator Dr Michael Crouch (HonDBus '07), MCIC is the first of its kind at an Australian university and attracts students from across disciplines.

The focus of the centre is a large “maker space” with 3D printers, laser cutters, soldering stations, CNC machines – a computer-controlled cutting tool that can machine material in three directions – drill press, sewing machines and every power tool you could wish for.

Open-plan discussion areas encourage students to talk about ideas with each other or learn at workshops, seminars and pitch and ideation events facilitated by UNSW experts and a network of corporate partners.

From 10am to 10pm every day, the centre is buzzing with a shifting contingent of students and student-led groups revelling in their freedom to tinker, innovate and play.

Yunzhen (Winnie) Zhang, an electrical engineering student, is the treasurer of CREATE, a student maker group with more than 1,500 members which has found a natural home at the MCIC. Zhang is sitting on the floor bent over a bicycle with both its wheels off hooking it up to wires with an esky by her side. “We have adapted the bike so with pedal power you can charge your phone and also a camping fridge,” Zhang says. “I come in here as much as I can, every day really. It’s a great place to hang out and make things. With this project we are also working with Bikeology, a student bike group.”

Laura Walker is a commerce and liberal arts student who also loves coming into the MCIC. With a group of four other students from different faculties, Walker recently used it as a meeting space to brainstorm and create Project Step City, the winning entry for the Universitas 21 Global Ingenuity Challenge.

For Project Step City, Walker and her colleagues developed a pedometer and geo-locator.
app so that participants could compare foot traffic with vehicle traffic in the CBD. To encourage app users to walk instead of taking a car, participants accumulate reward points to cash in at healthfood and sporting shops. The team also made an animated promotional video.

“It was great fun brainstorming and bouncing ideas off each other and using creative media to come up with solutions,” Walker says. Now she is working on a new project with some CREATE students at MCIC, constructing a 3D printer from scratch that will use recycled plastic. She has also completed a workshop to understand how to use a 3D printer herself. “The Centre is great because apart from learning new skills and making new connections with people, I am helping to turn an idea into reality,” she explains. “CREATE loved my Step City video and so now they want me to make another branding video for them – ‘turning trash into treasure’ – so they can get some funding for the new printer.”

Evan Lister is an engineering student who has led the construction of an unmanned ground vehicle called Debbie, named after the young woman who donated her electrical wheelchair to the project. “We use an Xbox controller to direct it,” explains Lister. “Our intention is to get it to navigate around the whole UNSW campus.” Lister says he has really enjoyed collaborating with non-engineering students such as Walker. “I’ve found that working in such a way, you have to be inclusive of everyone. It’s taught me to value other people’s opinion. “The space is very transient; a lot of people move through it but you can learn something from all of them.”

Next year, Lister is shifting to studying part-time, as he has found a full-time job in engineering telecommunications and is going to put what he’s learned at the Innovation Centre into practice.

SOLANGE CUNIN is a mathematics and aeronautical engineering student who has spent hours in the Centre, using it as an incubating platform for her start-up project. “MCIC has given us a hot desk and advice on how to support us and help us develop our business,” she says.

Cunin’s unusual business idea is to create a cost-effective model where interested scientific institutions and companies can cost- and time-share satellites, in a bid to boost the nascent Australian space industry.

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**Future in good hands**

On September 17 Dr Michael Crouch and the Governor of NSW, His Excellency General, the Honourable David Hurley (BA Mil ‘75), officially opened the Michael Crouch Innovation Centre. The Governor remarked that the Centre’s success would depend on the students. “We provide. We support. We lead. We mentor. We assist. And they will drive it. I think the future of Australia is in good hands.”

During the opening, UNSW’s President and Vice-Chancellor, Professor Ian Jacobs, emphasised that the MCIC was at the heart of the university’s 10-year strategy. “We want to make UNSW the leading university in Australia for the translation of great ideas, discovery and knowledge into activities that lead to social progress and economic prosperity,” he said.

From left: President and Vice-Chancellor Professor Ian Jacobs, Dr Michael Crouch, Chancellor David Gonski, former Vice-Chancellor Fred Hilmer and Governor David Hurley
NSW Innovations is the technology transfer and commercialisation office for UNSW, but we are really quite unusual or, as we would prefer to describe ourselves, more innovative than usual.

Most conversations about tech transfer focus on intellectual property, patents, licences and revenues. Our focus is both broader and simpler: our job is to get UNSW research put to use. It is that simple.

If a patent and a licence helps make that happen, great, but we can equally get our research put to use through staff exchanges, collaborative research, consultancy or student start-ups. All of these are powerful ways by which we engage with business, industry, policy makers and other research users.

In fact, data from the UK shows that of all the streams of revenue from industry into universities, IP commercialisation is the smallest – indeed half that of the next smallest.

So while commercialisation of IP is important – and we are actively commercialising such excellent research as quantum computing, photovoltaics and Kakadu software – we will also continue to drive engagement and knowledge flow through all the other channels, ensuring that we put our research in the hands and heads of people who can use it to create social and economic impact.

Getting research put to use isn’t always straightforward, and we are constantly working to remove any barriers to knowledge flow.

Companies don’t know what research is being done? Invite them in to meet with researchers in our “sandpit” innovation forums. The cost of licensing IP is stopping small to medium enterprises from engaging with us? Licence IP for free to get the IP used. Licence agreements are too complex? Create a one-page licence. Student start-ups need legal support? Create Australia’s first university start-up legal centre to provide free advice. The list goes on.

Everything we do at UNSW Innovations is designed to drive university/industry engagement, knowing that this will lead to knowledge flow and innovation in Australia.

But what exactly does that mean? It’s when we help Cochlear improve its next generation hearing implants; when our student interns and PhD students help Arrium make its steel-making processes more efficient and environmentally friendly; when our medical scientists work with Metrobiotech to help prevent reproductive infertility caused by chemotherapy; and when our engineering faculty working with Ramsey Stewart Industrial Design develops GPS and Wi-Fi systems to help vision-impaired people navigate independently.

These are not major IP deals, but they are innovation partnerships and examples of the thousands of interactions UNSW staff and students have with industry and entrepreneurs every year, helping them become more competitive and successful. Individually they are not blockbuster deals, but the sum total adds up to a massive contribution to Australia’s competitiveness and Australia’s productivity. It is how UNSW Research contributed $15 billion to Australia’s GDP last year, as Deloitte recently highlighted in a report we commissioned from them.

So, yes, we are the tech transfer office, but the role is both bigger and more exciting than just patents and licences. It’s about connecting people. It’s about creating change. It’s about helping our researchers to make a difference.

UNSW Innovations, chief executive of UNSW Innovations, discusses the significance of working with industry and commercialising research for the future of Australia.

Dr Kevin Cullen, chief executive of UNSW Innovations, discusses the significance of working with industry and commercialising research for the future of Australia.
Seeing is believing

Immersive technology united with medical science opens up new horizons for research, teaching, discoveries, treatments and patient rehabilitation writes Melinda Ham.
Professor Peter Gunning stares upwards and is transported into another dimension; he is under the DomeLab, a six-metre-wide, planetarium-like structure that for the first time enables a startling immersive perspective for researchers analysing data.

Gunning, who is the head of the UNSW School of Medical Sciences and at the forefront of childhood cancer research, sees it as a dome of possibilities. “What I really want to do is to go under the dome and get inside a cancer cell. I want to walk around inside it and see all the structures and connectivity, and I believe that will lead to new drugs to penetrate those cells,” he says.

“I am old enough to remember that movie *Fantastic Voyage* (1966), starring Raquel Welch, when some scientists travel by microscopic submarine inside the human body. I think it will feel like that.”
What is the EPICentre?
DomeLab is one component of UNSW’s new visualisation facility EPICentre (Expanded Perception and Interaction Centre). Inside the facility another panoramic immersive visualisation cylinder environment is also due to be completed in mid 2016.

The additional cylindrical structure will be a seven-metre, 340-degree panoramic projection environment cylindrical system, with a resolution of 120 million pixels in 3D. It has three times higher resolution than its nearest equivalent. Combined with 32 speakers in a surround-audio system, this creates dazzling effects that deliver a multi-sensory user experience.

The real purpose of this world-first project – led by Professor Caroline Rae, Professor of Brain Sciences from the School of Medical Sciences, and Professor Sarah Kenderdine, EPICentre’s director of visualisation, from UNSW Art & Design – is to bring together 40 academics from UNSW and other universities internationally working across art, design, engineering, medicine and science to tackle some of today’s greatest challenges.

“The exciting thing is that while other universities have some of the technology, we have two completely unique systems enhancing our capacity to do research, to illuminate our understanding of rich medical information. A lot of what we do in medical research is very visual,” Gunning says.

**The impact of this data fusion will enable researchers to reframe massive amounts of complex and fast-moving data sets, and hopefully lead to new hypotheses and discoveries, novel ways to problem-solve, and develop new pathways for treatment, operational techniques and teaching methods.**

Rae says: “As scientists, we have to completely re-imagine how we use data.”

EPICentre is hosting 10 ground-breaking medical and mental health research projects, known collectively as M+, which involve collaboration across diverse disciplines including bioinformatics, medical and neuro-imaging, anatomy research and computational engineering.

The EPICentre’s visualisation environments will all be located at UNSW’s Paddington campus.
Construction began this year and is due to be completed in mid 2016 to create new premises, which will also act as an exhibition venue to engage with the public, hosting a range of performances, seminars and workshops.

“We are bringing together artistically-informed, integrated design thinking to provide a whole new understanding of how people look at the world, and this applies to scientists and researchers as much as it applies to the general public,” Kenderdine says.

UNSW students, staff and members of the public are already having a taste of DomeLab’s scope in a temporary exhibition at the UNSW Kensington campus.

Up to 30 participants at a time can either stand under it, or sit on beanbags and feast their eyes on a curated selection of 16 full-dome 3D films. Subject matter includes a trip to Mawson’s hut in Antarctica, the Indigenous story of the night sky, the spectacular displays of the aurora borealis and molecular and cellular visualisations of blood.

Re-imagining data use

Some of the first researchers using EPICentre will harness the DomeLab to analyse complex magnetic resonance imaging (MRI) data sets to discover more about the brain’s organisation and function.

“Looking at the data on a flat computer screen you can see fewer connections,” Rae says. “Seeing it in the DomeLab means that I can bring all the data sets together, and with layering it becomes statistically meaningful. This is amazing.”

EPICentre will hopefully accelerate discoveries across many fields of brain research including improved understanding of the brain’s ageing pathways. This could lead to better prediction, diagnosis and treatment for patients with mild cognitive impairment (MCI) and dementia.

“We can project real data onto the screen to visualise a ‘mega brain’, and this lets us see what’s hidden behind the structure and layers, and how stimulation to the brain activates cognitive circuits and pathways,” Rae explains.

Gunning adds that this is how the EPICentre technology will move medical research forward. “When you are looking at a 2D image, you can’t take in all the information. To walk inside your data, the dome allows you to actually interact with the data in a very different way,” he says.

“You will be able to see what an internal organ or a cell really looks like in 3D, take apart its structure and its workings to really understand it.”

The immersive visualisation capability of EPICentre can also be a therapeutic tool for patients with cognitive perception symptoms, including those with brain trauma and mental health disorders such as post-traumatic stress disorder, anxiety and depression.

In addition to research, the EPICentre will become a vital interactive resource for lecturers to teach human anatomy, Gunning says. It will combine X-rays, ultrasound and MRIs, and offer students 1:1 scale simulations at vastly reduced costs, enhancing the traditional teaching methods of dissecting human cadavers.

“It won’t replace dissection because students need to develop those technical skills, but it will improve their abilities to visualise what they are doing in 3D and understand in more detail how the body works,” he explains. “Students will also be able to do virtual dissection and operations, like a 3D flight simulator for medicine.”

EPICentre will also add a unique dimension to the “operating theatre of the future”. The patient will remain at the centre of the theatre, but the space itself becomes an omni-directional space for multiple real-time, diagnostic and longitudinal data. The EPICentre’s interactive technologies also include “medi walls” for use in a GP visit of the future.

“This will give the patient a better understanding of what is happening, hopefully with better health outcomes. This is the way artists can really help scientists and the community,” says Professor Robert Clark, chief scientist in residence at Art & Design.

Gunning adds that the interdisciplinary connections between the faculties to create the EPICentre now seem pretty obvious after the fact. “It’s like getting the man on the moon; we understood the key concepts long before it happened. We just had to work through the technical details and be bold enough to take the leap,” he says.

“I suspect that from the outside, it looks like what we are doing is a very bold thing. We are pushing the limits of technology and research. And it will be transformational.”
When Dr Matthew Hill was a young chemistry student at UNSW, he never imagined that about 15 years later he would lead a research team at the Commonwealth Scientific and Industrial Research Organisation (CSIRO), working on materials that could make a significant impact on carbon capture and, ultimately, climate change.

Hill, who completed an Honours Advanced Science degree in 2003 and PhD in Chemistry at UNSW in 2006, is a rising star in the science world. He won the Malcolm McIntosh Prize for Physical Scientist of the Year in 2014 at the Prime Minister’s Science Prizes, adding to the Eureka Prize for Emerging Leader in Science he won in 2012.

His CSIRO team creates the most porous materials in the world – metal organic frameworks (MOFs), which are small crystal structures of metal atoms connected together by organic plastic compounds. These materials look like sugar crystals but are like a sieve, covered in tiny nanometre-wide holes 100,000 times thinner than a human hair and 80 per cent empty inside.

“If you can imagine it looks like a building scaffolding but miniature,” Hill says. “One teaspoon of this material has the surface area of a whole football field, which is really incredible! The practical application of it is that the material can soak stuff up like a sponge.”

Hill and his team are collaborating with Australian universities and industry to use MOFs to separate gases and soak up pollutants from factories, and to capture and store carbon dioxide, preventing harmful emissions from fossil fuel-based power plants, as well as in other applications in defence and agriculture.

Commercial production of MOFs is only about five years away, Hill says, and he’s already developed a process to accelerate production time of MOFs from 24 hours to just over a minute, which will greatly enhance its commercialisation. CSIRO has selected Hill as a member of CSIRO 7, the next generation of inspiring young Australian scientists.
Thinking Independently

My childhood was ... spent living between Sydney's Northern Beaches and at North Ryde. I had blond hair then and spent a lot of time surfing, which was awesome, although I wasn't that good at it. My parents always said ... I was quiet and nerdy.

At school, I ... spent all my time doing maths and science at Sydney Boys High, so studying chemistry at university was a natural progression.

My greatest experience while at UNSW ... was learning how to think independently. It was something I didn't know how to do before, and mastering that was very satisfying and set me up for life.

My worst experience while at UNSW ... was living in North Ryde and having to travel on the bus for three hours a day. At least I got to do all my study and lecture notes before I got home but I missed out on the social life.

My most valuable lesson at UNSW was ... networking with my lecturers and PhD professors who became my mentors and now my research collaborators.

If I had known then what I know now, I would have ... been able to do my PhD in six months and spend a lot more time enjoying uni life.

At UNSW I used to worry about ... passing my exams.

Now I worry about ... cuts to the research sector. Science is a fluky profession and not very stable employment to have at the moment.

In Australia, we have seen research funding cut by 30 per cent in the last few years and CSIRO has lost 25 per cent of its staff.

The greatest lesson in my career has been ... learning that failure is good. My biggest discoveries have been when I have been trying to do something that didn't work out. You fail and then it opens another door and you achieve something better.

My most exhilarating experience so far ... is developing the next generation of scientists. Your own discoveries are very fleeting; it is more about passing on your knowledge and skill.

Others say I ... am weird, a Bogan and loud – I've changed since I was quiet in high school.

I most admire ... UNSW Professor Robert Lamb who headed the Chemistry department for many years and was my PhD supervisor.

The best piece of advice I have ever been given is ... it's not all about you; it's about your team. You can achieve so much more in a team than by yourself. This is especially true in science.

When I'm not at home, I ... am either at work or on the golf course.

I am happiest when ... I am playing with my little kids. I have a one-year-old boy and a girl who's four.

My greatest unrealised wish is ... that we could do something about the carbon dioxide emitted into the atmosphere. We haven’t quite got there yet, but hopefully we will soon.

“...it’s not all about you; it’s about your team. You can achieve so much more in a team than by yourself. This is especially true in science.”

DR MATTHEW HILL
Australian Universities:
A smart investment

To contribute to the national debate about university funding, UNSW asked Deloitte Access Economics to value the economic impact of UNSW and the whole university sector. The findings in their report are dramatic. *The Economic Contributions of Australia’s Research Universities – the UNSW example*, shows the economic impact of universities exceeds that of the mining industry and well exceeds the income we receive from government. Our impact on the national economy is from our daily operations, student fees and the productivity impact of our graduates, but the most dramatic impact is from our research.

Now is the time for university graduates to share this information: universities are not a drain on the nation’s finances, they are a smart investment.

UNSW AUSTRALIA’S CONTRIBUTION

- **$1.76 BILLION**
  The impact of our huge daily operations (buildings, student fees, spending in the surrounding economy) contributes $1.76 billion per annum to the economy.

- **11,700**
  11,700 full-time jobs were created by UNSW operations and student and visitor spending in 2014.

- **$15 BILLION**
  While UNSW receives around $1 billion in government funding annually, the research and knowledge UNSW contributes to society has an economic impact of $15 billion each year.

- **$204 MILLION**
  The impact of our graduates on tax income and productivity is worth $204 million per annum for each and every graduating year of students.

HERE’S HOW UNIVERSITIES MAKE A DIFFERENCE TO THE ECONOMY

- **$160 BILLION**
  For the whole university sector, the economic impact is $160 billion from our research – that is 10 per cent of Australia’s GDP and worth more than the whole mining sector.

- **10% GDP**
  Every $1 invested in university research produces a $5-$10 return to the economy.

- **$140 BILLION**
  $140 billion is what all university-qualified workers in the economy added to the GDP in 2014.

INFORMATION AND DATA PROVIDED BY DELOITTE ACCESS ECONOMICS

To access the full report go to [www.smartinvestment.unsw.edu.au](http://www.smartinvestment.unsw.edu.au).
Renowned as a true visionary and passionate advocate for improved eye care for the world’s neediest people, Brien Holden was a pioneering inventor of soft silicone hydrogel, the material now used in half the contact lenses worn today worldwide.

During his life, the Australian entrepreneur and UNSW professor and researcher generated more than $1.3 billion in research and development funding. His innovations and humanitarian work have touched millions of people’s lives.

Born on January 6, 1942, Brien Anthony Holden attended Christian Brothers College in East St Kilda. He studied optometry at the University of Melbourne and in 1964 travelled to London with his wife, Yvonne (née Flahavin), to complete a PhD at City University.

Returning to Sydney in the early 1970s, he became a lecturer at UNSW. In 1976, he established the Cornea and Contact Lens Research Unit (CCLRU) in the then School of Optometry, which evolved into a cross-faculty team of more than 30 people.

By 1985, Holden and his team had created the Institute for Eye Research, a university-affiliated not-for-profit; it grew into the renamed Brien Holden Vision Institute by 2010, and its offices worldwide have now trained more than 50,000 eye-care personnel.

Holden also established the Co-operative Research Centre for Eye Research and Technology in 1991, and through this collaboration with Ciba Vision and several other research partners, he and researcher George Mertz created a lens that could be safely worn continuously for up to 30 days. Holden received an Order of Australia Medal for his work in 1997.

“His pioneering breakthroughs had real-world impact and transformed lives,” says Professor Ian Jacobs, UNSW President and Vice-Chancellor.

“Some 60 million people now wear safer, more breathable ‘soft’ silicone hydrogel contact lenses manufactured using a scientific formula designed by Brien and his colleagues at UNSW.”

Holden used the ongoing royalty stream from his invention to further myopia research and also launch Optometry Giving Sight in 2003. This global not-for-profit organisation has provided eye care and eye glasses to more than three million people worldwide, in collaboration with the International Agency for the Prevention of Blindness and the World Council of Optometry.

In addition, Optometry Giving Sight has trained more than 130,000 eye-care personnel and 180 PhD students across the world.

Through Holden’s advocacy, the World Health Organization recognised uncorrected refractive errors as a major cause of visual disability.

“Brien was brilliant, a true visionary, a fantastic thinker and charismatic communicator ... he believed in the greater good, and in our collective responsibility to do what was right.”

Dr Juan Carlos Aragón, a close friend of Holden and the current chairman of Optometry Giving Sight.

Dr Tony Adams, Professor Emeritus of Optometry and Vision Science at the University of California Berkley, says Holden had the talent to bring the necessary people together to achieve unbelievable advances.

“He saw possibilities no-one else saw and made them happen. Truly a remarkable colleague and world figure.”

Holden is survived by his wife, Yvonne, children Anthony, Karen and Daniel and their partners Kathryn, Doug and Courtney, and four grandchildren.
From an early age, Jessica Roth was a keen debater and a school charity captain, laying the foundations to later study law. As one of 10 members of her extended family to graduate from UNSW, including her brother Jeremy (BCom LLB ’12), Jessica chose UNSW Law School because of its strong social justice tradition, opportunities for experiential learning and small classes.

“Dad often jokes that he is the only non-lawyer in his immediate family, with his wife, daughter, son, brother and son-in-law all with law degrees from UNSW,” Jessica says. “We have very lively and vigorous debates around the dinner table.”

Jessica met her husband Daniel Mendoza-Jones (BCom LLB ’06, LLM ’13) while at UNSW. Both of them were part of the Law Revue, the annual comedy sketch show.

“Daniel had worked on the Revue for many years and was helping out his brother Nicholas (BSc LLB (Hons) ’09) who was directing that year,” Jessica recalls. “I volunteered for the technical crew and I thought Daniel was so funny doing the voice-overs.”

During his time at UNSW, Daniel was editor of the UNSW Law Journal and Vice-President of the UNSW Law Society. He now runs his own private legal practice in Sydney.

Jessica also remembers the amount of construction on campus, really rejuvenating the face of the University. “I was there when the Law School moved from the top of the old library tower to the new building,” she says.

“The lifts were so unreliable in the old building that we always had an excuse if we were late to class. The new building was only three storeys so there were no more excuses not to arrive on time!”

After graduation, before commencing as a graduate lawyer at Mallesons Stephen Jaques (now King & Wood...
Mallesons), Jessica worked at the Australian Human Rights Commission as a researcher and then the Associate to the President. She also worked at the Public Interest Advocacy Centre, initially as a secondee from Mallesons and then directly. All along, she taught at UNSW Law School, particularly first year law students.

In 2012, Jessica won the RG Menzies Scholarship to study a Master of Laws at Harvard University, and Daniel came with her to study a Master of Liberal Arts in Management. While at the law school, she studied different areas of social impact – including social entrepreneurship. She also studied new frontiers in philanthropy and impact investing at the Kennedy School.

“I worked on a real business and human rights project when I was there, under the supervision of experts in the field. It was a transformative learning experience and I felt that Australian students should also have this opportunity,” she says.

So on returning to Sydney, Jessica established the Social Impact Hub, which brings UNSW undergraduate and postgraduate business and law students together with industry, not-for-profits, social enterprises and foundations. The students develop and conduct applied projects under the supervision of industry experts in different areas of social impact, including social innovation, philanthropy, measuring social impact and impact investing.

In addition, the Social Impact Hub has completed a number of thought leadership projects such as creating a Field Guide to Impact Investing for Charitable Trusts and Foundations. “We aim to foster the next generation of social change agents while providing not-for-profits and social enterprises with access to high quality consulting, policy, research, advocacy and advisory services,” Jessica says.

See www.socialimpachub.org for more information.
A TALE OF ENDURANCE

Alumnus Tim Griffiths (BA ’78, LLB ’80) discusses his journey writing a historic novel about the life of photographer Frank Hurley.

Griffiths’ book offers a first-person fictional account of Hurley’s experiences documenting the Antarctic expeditions of Sir Douglas Mawson and then Shackleton, and also as the official Australian photographer in World War I.

Although he has not had experiences on the scale of Hurley, Griffiths says he wrote the book because he shares Hurley’s sense of adventure – he is a keen cross-country skier and bushwalker himself, and has lived in Papua New Guinea where Hurley made documentaries in the 1920s. He’s also intrigued with Hurley’s complex personality.

“I read all the biographies of Hurley and they were very comprehensive, but I just had a sense that there were some big parts of his life that were unknown, that you could only speculate on,” Griffiths says. “So I made an attempt to explore and imagine his character. He was someone who was a loner, a misanthrope, who had a limited emotional register and probably had Asperger’s, and yet documented some epic events in Australia’s history.”

Griffiths spent five years researching and writing his book. He travelled to Bowral to see Hurley’s original cameras, to feel the weight of the heavy equipment he had to lug around and understand the cumbersome process to take photos on glass plates, each the size of an A4 notebook.

As well as faithfully reading Hurley’s diaries and the accounts of his companions in the Antarctic expeditions and World War I battles, Griffiths examined records in the State Libraries of NSW and Tasmania and National Library in Canberra.

Griffiths gives voice to Hurley’s revulsion when he arrives on the Western Front and sees a crater of decomposing German corpses: “Until my dying day I shall never forget this haunting glimpse down into the mine crater on Hill 60, and this is but one tragedy of similar thousands and we who are civilised have still to continue this hellish murder.”

At the front, Hurley clashed with Charles Bean, the official Australian war correspondent and historian. Bean criticised him for creating composite photographs – combining several plates together to create one scene – castigating them as “fakes”. This would dog Hurley’s career and lead to debate about his legacy.

Before embarking on this novel, Griffiths trained as a lawyer at UNSW and then enjoyed a 30-year career in litigation law. As a uni student in the mid 1970s, Griffiths saw great change and upheavals in the legal system. “I was there during Whitlam’s dismissal, which was a very exciting time. I also witnessed changes to the Family Law Act – when previously you had to prove fault – and also the removal of the crime of vagrancy.”

He loved studying at the new UNSW Law School. “To be part of such an innovative approach to legal teaching, that wasn’t the ‘establishment’, really appealed to me,” he says. “They used the Socratic method. We had small classes and you had to participate and do lots of research.”

For further information, see www.timgriffiths.com.au. The Australian National Maritime Museum in Sydney is currently displaying Hurley’s photos in their “Shackleton: Escape from Antarctica” exhibition. See www.anmm.gov.au
MESSAGE

STERGITSA ZAMAGIAS-HILL
Director
Alumni and External Engagement

It has been a great year for UNSW alumni. We now have more than 271,000 graduates spread across 140 countries.

During the year, UNSW graduates generously donated almost half a million dollars to the President and Vice-Chancellor’s Alumni Telephone Scholarship Appeal. Almost 2,000 alumni made a gift to UNSW this year, and this also included support for the ASPIRE program – UNSW’s outreach program aimed at encouraging school students from lower socio-economic backgrounds to consider a university education.

ASPIRE is led by a passionate colleague, Dr Ann Jardine, who firmly believes that a university education should not be dependent on where you were born, where you live, how much money your family has or where you went to school. Dr Jardine welcomed the Honourable Mike Baird, Premier of New South Wales, to UNSW in November.

He attended a design workshop at the Michael Crouch Innovation Centre with students from Canterbury Boys High, Strathfield South High School, Birrong Boys High, Auburn Girls High, Granville South Creative and Performing Arts High School and Wiley Park Girls High.

“I give you this with a 100% guarantee; every one of you can achieve more than you think you can,” Premier Baird told the senior students taking part in UNSW’s ASPIRE program.

Sixty ASPIRE students received offers to enrol at UNSW in 2015 compared with 20 in 2010. Overall, there has been a 48 per cent increase in UNSW placement offers to students from ASPIRE schools since 2010. Thank you for supporting such a worthwhile program.

For the first time the university’s mascot, Clancy the lion, went on sale at the November graduation ceremonies, with all proceeds going to the President and Vice-Chancellor’s Alumni Telephone Scholarship Appeal. To purchase your own Clancy for $49.95, visit the UNSW Bookstore or pop into the Alumni office next time you are on campus; you can also buy Clancy online at www.unswshop.com.au.

We will start the New Year with a terrific event, when journalist Peter Greste delivers the annual Gandhi Oration at the UNSW Kensington campus on 29 January. All alumni are welcome to attend.

We wish you all the very best for the holidays, Stegs

My UNSW family tree
Do you have a large UNSW alumni family? Share your family tree, interesting stories and photos with us. Go to myunswfamilytree.unsw.edu.au
EDUCATION IS A GIFT WORTH PASSING ON

Give future generations of students the opportunity to maximise their full potential by leaving a gift to UNSW Australia in your will.

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