

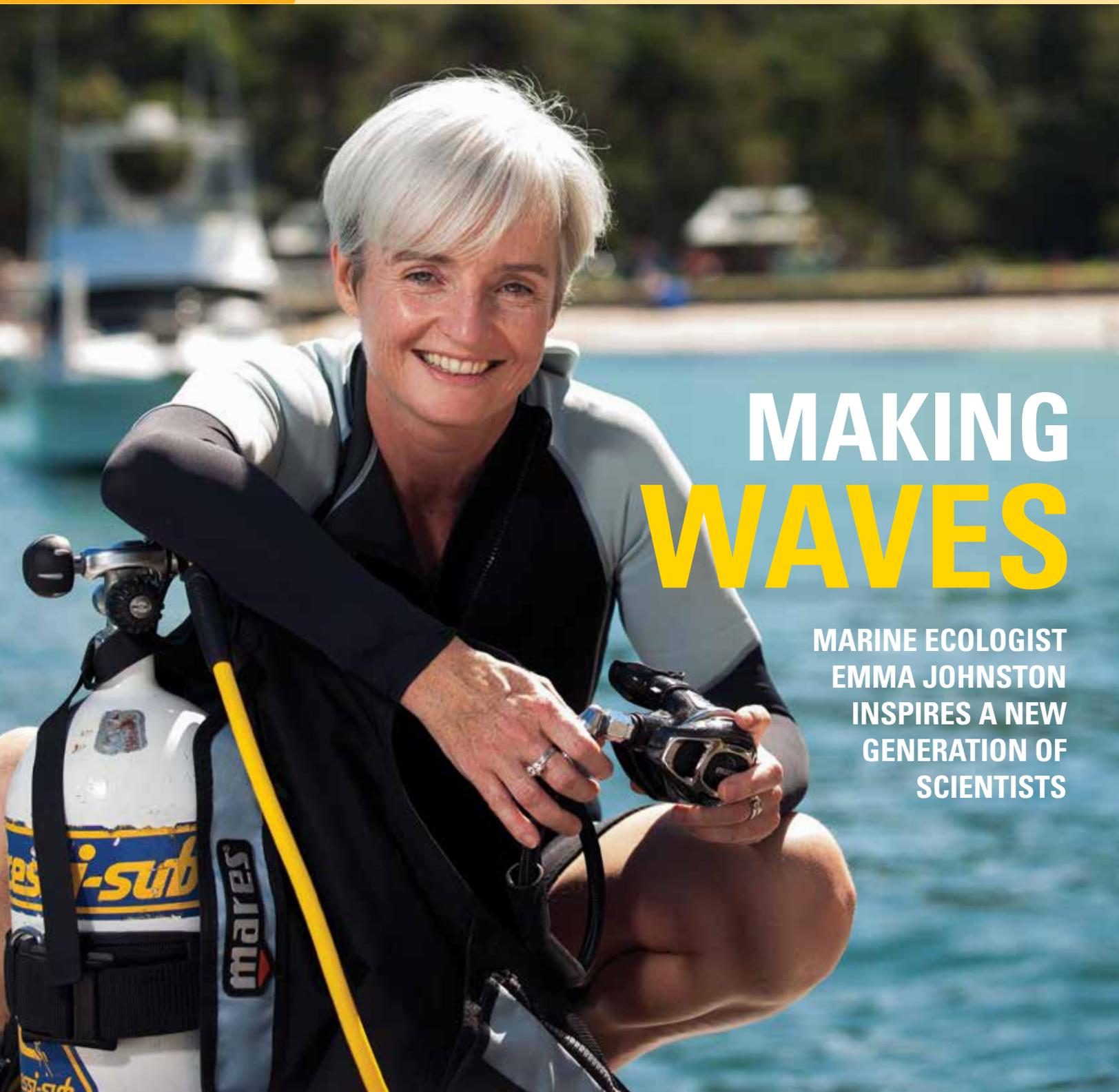


**UNSW**  
AUSTRALIA

**AUTUMN 2014**

# uniken

Never Stand Still



## MAKING WAVES

**MARINE ECOLOGIST  
EMMA JOHNSTON  
INSPIRES A NEW  
GENERATION OF  
SCIENTISTS**

### **TECH TRANSFER**

The multi-million dollar pay-off for UNSW's petroleum engineers

### **MISSION POSSIBLE**

Winning the race to build the world's first quantum computer

### **AUSTRALIAN MADE**

Copyright and the birth of our cultural identity

# AUTUMN 2014

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SLIDESHOW



## YOUR TIME STARTS NOW ...



### SU GOLDFISH, CREATIVE PRACTICE LAB

"IF ANYONE WANTS to know about me they should look at my office door," says Su Goldfish, whose memorabilia-laden door is a visual profile of her life.

The Trinidadian-born arts manager, producer, performer, documentary maker and carpenter, has managed the Creative Practice Lab in the School of Arts and Media for the past 15 years. She has helped thousands of students through the Io Myers Studio on their journey to become creative practitioners.

She has facilitated high-profile artist residencies allowing students to witness what Su calls the "vulnerable stage" of performers developing their works. "I love being at the intersection of students learning and engaging with professional artists," she says.

Performance and music settled in Su's soul in Trinidad. The colour, energy and music of the multicultural island formed the backdrop to her childhood after her Jewish father, Manfred, fled there from Nazi Germany.

Su grew up unaware of her father's loss. His history is the subject of her documentary, *The Last Goldfish*, described as "a journey through memory and amnesia, the Holocaust and calypso".

Making the documentary took Su to Cologne, where Manfred farewelled his family at the war's start.

Her grandparents and extended family later died in concentration camps.

"The whole trip was like ghosts were travelling with me, tapping me on the shoulder, saying, 'Look now, listen now.' The feeling of the past wanting to be acknowledged was very strong."

**Why did you leave Trinidad?** I left with my family when I was 14. With the rise of Black Power my parents decided to move to Australia. It was the first time I realised I was white and different.

**What keeps your work interesting?**

Watching audiences exit Io Myers Studio bristling with excitement – that's when you know the art is working.

**Advice to students:** I tell them to be curious about the world, to yearn, to discover. Working in the arts isn't about success or fame – it's about being true to the burning desire to create.

**Favourite book:** Anything by W.G. Sebald. He writes about memory and history in an incredibly poetic and visual way. He writes the way I'd like to produce a film.

**What don't people know about you?**

I've got Trinidadian dancing hips and an explosive power tools licence.

*The Last Goldfish* is in production.

By Fran Strachan.

Photo: Grant Turner/Mediakoo

• PRIZE WIN

# GLOBAL STAR SHINES

IN THE WORLDS of science and tech, it's an award second only to the Nobel, with prize money worth more than half a million dollars.

This year's winner of the A F Harvey Engineering Research Prize is UNSW Scientia Professor Stuart Wenham and his team of researchers from the School of Photovoltaic and Renewable Energy Engineering for their discovery of a technology that produces high-efficiency, low-cost silicon solar cells.

Announced in London by the Institution of Engineering and Technology (IET), the £300,000 (A\$560,000) prize recognises the discovery of a mechanism to control the charge state of hydrogen atoms to correct deficiencies in silicon – the most costly part of a solar cell.

Wenham says it is a “great honour” to receive the prize and the international recognition it brings.

“Our patented advanced hydrogenation technology will allow lower-quality silicon to outperform solar cells made from better-quality materials, producing higher efficiencies at significantly lower cost,” he says.

“The prize money will go a long way to helping us take the research to the next stage and the UNSW team is now working with the world's biggest solar manufacturers through collaborative agreements with NewSouth Innovations to commercialise the low-cost technology.”

Wenham acknowledges the Australian Renewable Energy Agency's funding support for the project, due to be completed in 2016.

As the current world record holders in silicon solar cell efficiency, UNSW's photovoltaic engineers are internationally lauded for their groundbreaking research.

“Professor Wenham has played a pivotal role in the wide-scale development of silicon solar cell technology. His pioneering research and internationally recognised leadership in the field have enabled commercial exploitation of the technology for the benefit of the global community seeking renewable energy solutions at affordable prices,” IET President Barry Brooks says.

“He is a truly deserving recipient of the IET A F Harvey Engineering Prize and an inspiration to all engineers.”

The IET is one of the world's largest organisations for engineers and technicians, with nearly 160,000 members in 127 countries. The A F Harvey Award is named after a member who bequeathed a trust fund to be used for the advancement of research into the fields of medical, microwave, laser or radar engineering.

Professor Wenham will deliver a special IET lecture in London on 21 May to commemorate his award. The lecture will be streamed live. For more details, visit [www.theiet.org/harvey](http://www.theiet.org/harvey).

▲ Scientia Professor  
Stuart Wenham.

Photo: Dan White

## BRIEFS

### START-UP CHIEFS JOIN UNSW

Technology entrepreneurs Mike Cannon-Brookes, from software maker Atlassian, and Ori Allon, from New York-based apartment rental start-up Urban Compass, have been appointed Adjunct Professors in the School of Computer Science and Engineering. The pair will adopt advisory roles in support of initiatives aimed at fostering an innovation culture. Both appointments are for an initial three years.

### ACADEMY AWARDS

Two UNSW researchers have been awarded prestigious Australian Academy of Science prizes for their work in statistical ecology and climate change science. Professor Chris Turney was awarded the 2014 Frederick White Prize for his research on understanding past and present climate change and on improving climate change models. Associate Professor David Warton won the Christopher Heyde Medal for distinguished research in mathematical sciences by a researcher under the age of 40. The awards will be presented at the Academy's annual meeting in Canberra in May.

### TEACHING EXCELLENCE

Thirteen staff have been recognised with V-C Awards for Teaching Excellence. They are in the General Category; Dr Kar Ming Chong and Dr Ricardo Flores (ASB), Dr Alexander George (Law), Dr Stewart Head (Medicine), A/Prof Norman Wildberger (Science) and A/Prof Mina Roces (FASS). In Postgraduate Research Supervision; Prof Jeffrey Braithwaite (Medicine) and A/Prof John Stride (Science). In the Sessional Teaching category; Mr Nicholas Fewster-Young and Dr Sue Morris (Science). Recognised for Initiatives that Enhance Learning was Mr Robert Tumarkin (ASB). Dr Loretta Dobrescue and Dr Alberto Motta, both from ASB, received the Learning and Teaching Technology Award and the Heinz Harant Award for Teaching Innovation.

### LONG WAY HOME

In recognition of our long-standing relationship with Defence, UNSW is proudly sponsoring the Sydney Theatre Company's 'The Long Way Home', a collaboration with the ADF. Created from first-hand accounts, the production looks at the experiences of military personnel deployed on operations in Iraq, Afghanistan and East Timor, as well as humanitarian and disaster relief, and the challenges of their return to everyday life. Assistant Director and UNSW alumna Susanna Dowling, Vice-Chancellor Fred Hilmer, UNSW Canberra Rector Michael Frater and Chief of Defence General David Hurley were among guests at the premiere in Sydney. The production is touring Australia until 12 April.

### • GRANTS SUCCESS

## NHMRC FUNDING TOPS \$22 MILLION

UNSW won \$22.8 million in the latest round of National Health and Medical Research Council (NHMRC) grants, the second largest amount Australia-wide and far ahead of any other university in the state.

More than \$20 million went to two major research programs. A team from the School of Psychology led by Scientia Professor Richard Bryant, was awarded \$10.6 million for research into post-traumatic mental health problems. Professor John Kaldor's team from the Kirby Institute for infection and immunity in society won \$10.3 million for a project developing interventions to control sexually transmitted infections and their consequences.

"This is a stunning result for UNSW and our researchers," Vice-Chancellor Professor Fred Hilmer said. "The size of our program grants is an indication of the importance of these areas of medical research and recognition of the excellence of the researchers involved."

Other recipients included a development grant of \$695,000 to Professor Mark Willcox from the School of Optometry and Vision Science. A second development grant of \$568,000 went to Professor Justin Gooding from the School of Chemistry. UNSW also received six scholarship grants, worth a total of \$576,000.

The announcement followed a separate NHMRC study that found the research it supported significantly outperformed other comparable Australian research in the five-year period 2005–2009.

UNSW performed strongly in the analysis, with figures on journal articles showing our researchers were by-lined in 2,162 NHMRC-supported publications, representing 10.3% of the national output. The NHMRC continues to outperform the world benchmark by 60% in citation rates. Australian research as a whole performed 17% above the world average.

### • FUNDING PLEA

## HIGHER THINKING FOR BRAIN CANCER

Australia urgently needs more research funding and more personalised care for people with brain cancer, according to UNSW's Dr Kerrie McDonald.

McDonald (pictured) made the impassioned plea in a story aired on Channel Nine's *A Current Affair*. The head of UNSW's Cure Brain Cancer Foundation laboratory, McDonald is leading Australia's only research into lower-grade brain tumours in young adults.

"There is currently no standard treatment available for these patients," says McDonald, who is based in the Lowy Cancer Research Centre. "It's more than likely the tumour will progress into a high-grade tumour, which has a high death rate. More research is desperately needed to slow down the progress rate."

McDonald is currently involved in an international study of lower-grade gliomas (tumours), which involves unravelling their genetic code, as well as an epidemiological study on newly diagnosed glioma patients with Associate Professor Claire Vajdic.

"I'm really optimistic this approach will lead to the identification of new treatments," says McDonald. "We still don't know what causes brain tumours and whether any environmental or genetic factors are involved."





► Photo: Britta  
Campion

## A WEALTH OF TALENT

For the first time, UNSW architecture students have the chance to be taught by three great names in the field – Ken Maher, Glenn Murcutt and Richard Johnson (pictured L-R). Maher and Johnson will teach the studio component of the Master of Architecture degree for the first time this year. They join Murcutt, who continues to teach the studio to third-year students in the Bachelor of Architecture.

Maher works in private practice and in academia as the Chair of the UNSW Built Environment Advisory Council. He was awarded the Australian Institute of Architecture's highest accolade, the AIA Gold Medal, in 2009.

Johnson's designs include the Museum of Sydney, the National Portrait Gallery and, along with with Jørn Utzon, the masterplan and refurbishments of the Sydney Opera House. "We all have time pressures but we teach because it's important [and] we teach because we really enjoy it," he says.

Murcutt adds: "Teaching makes a good architect, a better architect."

## SEARCH BEGINS FOR NEXT V-C

Professor Fred Hilmer has announced his decision to step down from the position of President and Vice-Chancellor at the end of 2014 after more than eight years of distinguished service and leadership.

An international search for Professor Hilmer's replacement is underway.

The chair of the selection committee, Chancellor David Gonski, says the most important priority is to appoint an outstanding leader who will build on Professor Hilmer's significant legacy and achievements. The committee will provide a recommendation to the University Council, which will make the final decision.

Expressions of Interest close on 31 March and interviews will be conducted over the next few months with an announcement on the successful candidate expected by July. The intention is to have the new President and Vice-Chancellor take up the role no later than early 2015.

"Professor Hilmer will leave the University in such a strong position that this is a highly prized leadership post in the higher education sector, both within Australia and internationally," Mr Gonski says. "We are planning a number of functions later in the year to recognise Professor Hilmer's enormous contribution."

## • TOP 10

### WORLD RANKINGS 'GOOD FOR BUSINESS'

UNSW once again performed strongly in the QS World University Rankings, with 16 subjects in the world's top 50 and Accounting and Finance breaking into the top 10. Pharmacology was ranked at number 11, Law at 14, and Psychology at 15th in the world.

For the second year, UNSW was the highest ranked university in Australia for Materials Science, which placed 17th.

Performing particularly well were the broad disciplines of Engineering, Life Sciences and Medicine, with every subject area ranked within the world's top 50.

"This is a very strong result that highlights the incredible breadth of UNSW's research excellence," Deputy Vice-Chancellor (Research) Professor Les Field said.

The news came as the Australian Graduate School of Management's full-time MBA was again recognised as the leading program in Australia in the *Financial Times* (UK) 2014 ranking of the top 100 MBAs globally.



◀ Photo:  
Jason Catlett

## • BRAVO

### NEW LEADER FOR AUSTRALIA ENSEMBLE

One of Australia's leading composers, Paul Stanhope, has been appointed the new Artistic Chair of the Australia Ensemble, UNSW's resident chamber music group.

Stanhope (pictured) is a composer of international standing with prominent works having been performed in the UK, Europe, Japan, and North and South America. He says he plans to work collaboratively with the Ensemble to forge new directions while continuing fine performances of masterpieces from the chamber music repertoire.

Stanhope replaces Emeritus Professor Roger Covell, co-founder of the Australia Ensemble and founding head of the School of Music and Music Education. Covell retired in March after 34 years as Artistic Chair and 47 years at UNSW.

## • SWITCHED ON

# KIDS ON SPEED?

CHILD PSYCHOLOGIST Professor Mark Dadds had reservations about featuring in a documentary exploring the controversial childhood condition, Attention Deficit Hyperactivity Disorder, or ADHD.

And there were days during the filming of *Kids on Speed?* when he admits he would have preferred to “run away and hide”.

But Dadds regards the end result – a compelling, fly-on-the-wall insight into the struggles of four Sydney families with five children suspected of having ADHD – as a “fantastic contribution” to the debate about behavioural and emotional problems in children.

By following Dadds and two other experts as they treat the five children, the three-part series helps dispel myths about ADHD, a condition mired in controversy for supposed overdiagnosis and overuse of prescription drugs.

“It revealed the complexity of some childhood conditions – how you can get impulsivity mixed with aggression and with anxiety. And it showed the benefits of a multidisciplinary approach with clinicians from psychology, medicine and education working together,” Dadds says.

“It was also brilliant to see the children tell their stories. It showed how these kids have fundamentally good hearts, and so do their parents.”

Since the series aired on ABC TV during February, Dadds has been inundated with messages of thanks from parents of children with similar problems.

“They say: ‘Thank you for showing what my daily life is like. People now treat me with more understanding and respect,’” he says.

Other clinicians have also expressed gratitude to him and the documentary makers, Essential Media and Entertainment, for revealing the tenacity required to treat difficult cases.

As director of the UNSW Child Behaviour Research Clinic, Dadds has an international reputation for the treatment of aggressive, antisocial behaviour. His approach involves enlisting parents as

therapists, forming a partnership and training them in how to manage their children’s difficult behaviours.

The clinic does not usually treat children with ADHD alone, which made him reluctant to appear in the documentary. However, the extraordinary opportunity to demonstrate the best evidence-based approaches to treating emotionally troubled children swayed him.

He admires the families for opening their lives to public scrutiny. “They were incredibly generous and brave people,” he says.

Dadds admits it was daunting to turn up for work each day knowing cameras would capture his every move: “There were moments

I thought, ‘I can’t take this anymore’, but I had to look to the families and say, ‘If they can cope, I can cope.’”

When things started to go wrong – as can often happen during family therapy – he also worried his reputation was on the line: “I thought, ‘I’m crashing and burning on national TV’.”

However, by the end of the nine-week intervention program the transformation in the children’s behaviour dispelled any doubts. “And it’s beautiful to hear the kids are still doing really well,” he says.

Dadds led the diagnosis and treatment, in collaboration with Dr Samantha Hornery, a special education expert, and Associate Professor Michael Kohn, a paediatrician who ended up prescribing medication for three of the children.

This gold-standard treatment has a high success rate – about 60%. But it is expensive and not available to many people. Only about a quarter of families of children with behaviour and emotional problems get to see an evidence-based practitioner, such as a psychologist.

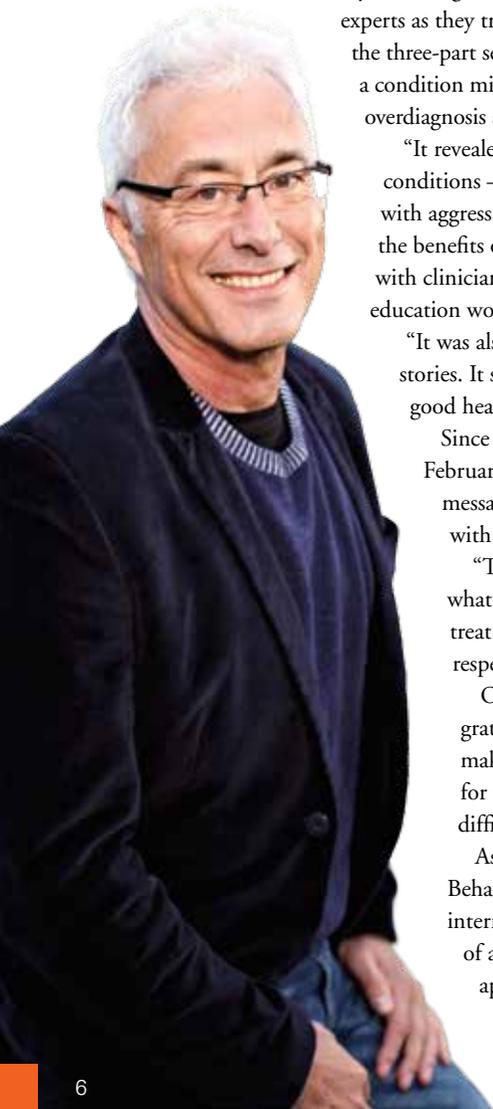
And Medicare does not cover sessions with a psychologist when parents come for training without the child, even though this is the best approach. “It makes me very frustrated,” says Dadds.

Conduct problems in children is the most common predictor of psychiatric disorders in adulthood.

“Yet less than 8% of the mental health budget in Australia is spent on child mental health. It’s unbelievable,” he says.

“There were moments I thought, ‘I can’t take this anymore’, but I had to look to the families and say, ‘If they can cope, I can cope.’”

▼ A transformative TV experience ... Professor Mark Dadds. Photo: Essential Media



– Deborah Smith



# IN HER ELEMENT

Marine ecologist Emma Johnston's high-profile work in Sydney Harbour is changing the way young women view science, writes Deborah Smith.

PROFESSOR EMMA JOHNSTON still gets a buzz when she goes diving. "It's spine-tingling to see this other world and to travel through it, interacting with so many different species," she says.

Sydney Harbour, with its seagrass meadows, kelp forests and more than 350 species of fish, is a perfect place to journey under water. "It's one of the most biologically diverse harbours in the world," says Johnston. "But it also has a legacy of toxic contamination, as well as ongoing threats."

That makes it a prime spot for Johnston too. The UNSW marine biologist is recognised internationally for her innovative research on the impact of human activity on complex marine ecosystems – including the effects of pollution, dredging, habitat destruction and introduction of invasive species.

As director of the Sydney Harbour Research Program at the Sydney Institute of Marine Science, she heads a five-year project with a \$10 million budget that will provide the information needed to sustainably manage the vast natural and economic resources of this jewel in the city's crown.

Her multidisciplinary team of 35 scientists works with government and industry to better understand the threats to the harbour's health. Major projects include a study of stormwater run-off in the upper catchment and a survey of all the human activity carried out on the harbour.

Johnston's highly original research approach, which combines traditional ecology with ecotoxicology, has also taken her from the warm tropics to icy Antarctic waters, where she studies the threat from climate change to the unique organisms living on the polar sea floor.

An outstanding communicator of science, she also co-stars on *Coast Australia*, a TV series that explores the country's coastline.

Being a TV presenter has allowed her to swim for the first time

with dugongs and whale sharks which was "a lot of fun". But her main motivation is to reveal to the public the hidden underwater world she finds so fascinating.

"I think there is a lack of empathy for marine life, largely driven by people not being able to see it and bond with it. The more we show people how remarkable these ecosystems are, the more likely it is they will want to take better care of them," she says.

For her "leadership and groundbreaking research", Johnston was honoured as the inaugural recipient of the Australian Academy of Science's Nancy Millis Medal for Women in Science – with the announcement made on International Women's Day.

Johnston, who has been involved in two gender equity programs at UNSW, hopes the new award will encourage more women into scientific research careers.

"I think it is incredibly important to have female role models and recognition of women's achievements. Part of being able to become a successful scientist is to have the confidence to try," she says.

More flexibility in career structure, however, is also vital for women. Johnston was fortunate her career was kick-started by obtaining a continuing position at UNSW on completion of her PhD: "It meant I had time to build a lab and a research program and get established before I had children."

An award-winning teacher, she now leads a team of 20 postgraduate and postdoctoral researchers. "One of the most important and fulfilling parts of my job is training the next generation of environmental scientists. And they inspire me with their energy and motivation," she says.

Johnston won a Young Tall Poppy Award in 2007 and a NSW Science and Engineering Award for Excellence in Biological Sciences in 2012. She has been awarded more than \$6.5 million in external research funding.

She is regional editor of the international journal *Conservation Biology* and associate editor of *Ecotoxicology*, vice-president of Science and Technology Australia, and a member of the NSW government's marine estate expert knowledge panel.



▲ Sydney Harbour is her laboratory ...  
Professor Emma Johnston. Photo: Dan White

# ROCK STARS

The \$76 million dollar sale of a revolutionary rock sampling technology has shaken up the oil and gas sector and delivered its creators a healthy payday. Ry Crozier reports.

UNSW ENGINEERS believed from the outset the technology they were developing would transform the way oil and gas giants did core analysis – a crucial step in the assessment of oil and gas development projects.

So confident in the technology's potential were the researchers from the School of Petroleum Engineering and their colleagues at ANU that several borrowed money to invest in bringing it to market.

Their belief was rewarded in February when the spin-off company – Canberra-based Lithicon AS – was bought by US firm FEI for A\$76 million.

For Professor Val Pinczewski, the sale capped more than a decade of work by an 'inventor group' of professors, postdoctoral fellows and PhD students led by himself and ANU counterpart Professor Mark Knackstedt.

The buyout generated \$4 million for UNSW and \$11 million for ANU, as well as returns for the inventor group, which owns part of the intellectual property (IP) in addition to personal stakes in Lithicon.

The IP was divided equally among the team, says Petroleum Engineering's Head of School Professor Christoph Arns.

Pinczewski adds: "All of those people received a return based on the fact they had some of the IP and most of them also invested in the various tranches the company went through."

For UNSW Deputy Vice-Chancellor (Research) Professor Les Field, the Lithicon sale was a textbook case of technology transfer from lab to industry.

"It's a good idea with sound underpinning of science and technology," he says.

"But getting ideas into industry is about more than just having an idea. We not only needed the technical expertise but also some substantial business and business engagement skills."

Kevin Cullen, the head of UNSW's commercialisation company, NewSouth Innovations (NSi), agrees. It was NSi's business development, contacts and negotiating nous that laid the commercial foundations for the sale.

"You can put the technology out there, subject to the slings and arrows of outrageous fortune, and you have to hope for the best," says Cullen. "It's always a rocky road, but it was one where we could see a route to commercial success."

## ROCKING OUT

Oil and gas exploration and production is expensive and high risk.

When companies find places they think might contain oil or gas, they drill an exploration well to get a better idea of what lies below the surface. These fields or reservoirs can be hundreds of kilometres off the coast and lie in hundreds of metres of water. To drill a well costs upwards of tens of millions of dollars.

Rock samples from the well are brought back to the surface for analysis. These are known as core samples, and are cylinders of rock that are centimetres in diameter and can run from 10cm to tens of metres in length.

"Conventionally what operators do is send those samples of rock for laboratory

analysis. That costs tremendous amounts of money, particularly if you're working offshore," Pinczewski says.

"We also take rock samples but we image them at very high resolution in 3D and then we use those images to compute the sort of properties that conventionally people measure in the lab."

Effectively, what the technology does is X-ray rock samples to work out how much oil and gas they contain and how quickly it can be recovered.

One of Lithicon's key selling points is that it doesn't need much rock to get great results.

Pinczewski says rock samples as small as one cubic millimetre – an "order of magnitude" smaller than a typical core





sample – can be used. This alone could save operators millions of dollars.

## UNSW RUNS DEEP

UNSW and ANU initially spun out the technology in 2009 through a start-up called Digitalcore. The company later merged with a Norwegian firm, Numerical Rocks AS, and was rebranded Lithicon.

“What people don’t know is that Numerical Rocks is also a company that was formed by a UNSW graduate who was my first PhD student working in this area,” Pinczewski says. “The two companies that merged to form Lithicon both had their roots at UNSW.”

NSi’s Cullen says the merger with

▲ IP divided equally among the team ... Professors Christoph Arns (left) and Val Pinczewski.

“The best commercialisation works when you leverage your networks, friends and alumni. We don’t know everything about every sector. It’s about creating conditions where serendipity can work.” – Kevin Cullen, NSi

Numerical Rocks was a turning point in the company’s fortunes, setting it on a commercial trajectory that ultimately led to the FEI buyout.

However Lithicon owes its success to a confluence of factors.

Arns believes it was having the right mix of technology, timing and personnel.

“We had a whole group of people working on the same challenge from different angles,” he says. Arns admits there was an element of “luck” in having the right people available at the right time to come together for the project. “Once you have that, you have to make it work, and we did.”

Cullen believes the key was tapping into specific industry skillsets. “The best commercialisation works when you leverage your networks, friends and alumni,” he says. “We don’t know everything about every sector.”

He also backs NSi’s commercial nous. “It’s about creating conditions where serendipity can work.”

Professor Field, meanwhile, sees UNSW’s investment acumen as a driving factor.

“What universities often do is seed technology to get it to the stage where somebody else can take it to the world,” he says. “We’ll invest up to a certain level but we’re not going to bankroll the technology. I think there were a couple of stages where we were wondering how much money it was going to take to get Lithicon into the league where it could get a foothold in the industry.”

Lithicon more than succeeded in achieving that foothold. A consortium of oil and gas goliaths has been funding

ongoing development of the technology over the past seven years.

It didn’t go unnoticed. Much larger rivals to Lithicon began circling with their own similar products.

“We were competing with some of the world’s biggest companies to get this technology into the market,” Pinczewski says. “We’re talking about Fortune 500 companies, and we managed to do it first.”

Pinczewski believes the technology may not have come to fruition if it hadn’t been incubated in a university environment.

“In Australia we have such good universities and people that we can put together groups that are every bit as good – and in my view, better – than groups that private companies can put together to develop cutting-edge technological products,” he says.

## IMAGINING THE FUTURE

Lithicon’s new owner, FEI, plans to further develop the core technology and apply it to markets outside oil and gas – something Field sees as the next step in the technology’s evolution.

“One of the nice things about this work is that it opens up many more potential applications than the analysis of rock cores,” Field says.

“For example, you can imagine this being used in the biomedical industry to look into the internal structure of bone or biological samples.

“I think there are a lot of different things that we are going to see as valuable offshoots from this into the future. The potential applications are open to imagination.”



# ON THE BRINK

A new field of research questions the ethical and cultural limits of conservationists' efforts to save species from extinction, writes Fiona MacDonald.

IN A REED-FILLED reserve outside of Berlin, Wisconsin, a man is dressed head-to-toe in white and carries a bird puppet. He's a strange sight, but appearances are the least of Joe Duff's worries – his focus is the light brown, whooping crane chicks squawking in front of him as he encourages them to imitate the puppet's feeding behaviour. His costume is an attempt to convince the chicks he's an adult crane, perhaps their mother, while the puppet makes up for what he lacks in bird anatomy. His main job is to teach these endangered birds that they're whooping cranes, while also imparting to them some of the skills and social and sexual cues they'll need to survive in the wild.

A little more than 100 years ago, there were only 20 of these elegant migratory cranes left, but the species is now in recovery, with an estimated 437 birds in the wild and 165 more in captivity. Thanks to the efforts of Duff and his team at Operation Migration, alongside significant ongoing investments from the US Geological Survey, the US Fish and Wildlife Service and the International Crane Foundation, the tallest birds in North America have finally returned to the skies.

Arguably, however, the success is the result of a decades-long, multifaceted deception – Duff and the team at Operation Migration not only walk around for hours in the heat of the summer sun wearing costumes in order to mimic parent cranes, they also train chicks to follow a light aircraft, which eventually guides them along their 2,000km migration route to Florida in the winter. The work begins before the chicks even hatch, when they're exposed to engine noise to develop familiarity with the aeroplanes. The project also involves frequent artificial insemination of females. In one case, a staff member was engaged in a relationship with a particular crane

over many years where they would dance and sing together in the breeding season to stimulate the bird's fertility hormones.

There's no doubt that, in the process of bringing these 1.5 metre-tall cranes back from the brink, conservationists have been required to develop some very invasive approaches, intervening in birds' developmental processes to steer them in new directions. And while this project and countless others around the world are to be applauded for their success, researchers such as UNSW's Dr Thom van Dooren, are beginning to question some of the underlying ethical and cultural dimensions of these approaches.

Van Dooren spent time with whooping cranes and a range of other endangered birds while researching his book *Flight Ways: Life and Loss at the Edge of Extinction*. In it, he attempts to untangle what extinction really means – biologically and culturally – how it is experienced by various communities and by the animals themselves. He aims to share stories about how far we will go to save species we've pushed to the brink.

"I wanted to look at the cultural dimensions of extinction, and also the philosophical and ethical questions it poses," says van Dooren, who works in UNSW's new Environmental Humanities program.

Van Dooren says the introduction of the program in the Faculty of Arts and Social Sciences is timely.

"In the past 10 years it's become increasingly obvious that scientists simply cannot address all of the complex cultural, ethical and political questions being thrown up by the new challenges facing our planet," he says. "There is a vital role for an environmentally engaged humanities."

One of the first of its kind, the program brings together scholars of history, philosophy, cultural studies, literature,





science and technology, and social theory to examine our ‘remaking’ of the natural world – whether it be damming of rivers or altering genetic sequences. UNSW now offers the first undergraduate qualification in this area anywhere in Australia, and it’s also one of the first in the world.

And the cutting-edge approach has attracted researchers internationally. Dr Matthew Kearnes came from the UK to design and teach the program alongside van Dooren, while anthropologist Dr Eben Kirksey moved from New York. And the area is growing quickly: other staff include Stephen Muecke, Deborah Bird Rose, Judy Motion, Stephen Healy and Paul Munro.

Kirksey is using a prestigious DECRA (Discovery Early Career Researcher Award) grant from the Australian Research Council (ARC) to research the “amphibian ark”, a transnational network of biosecure holding tanks and cryogenic banks of frozen tissue, working to conserve some of the world’s disappearing species of frogs. Kearnes has been awarded an ARC Future Fellowship to develop his research on the social and political dimensions of geo-engineering as a response to climate change.

For the researchers, it is literally a race against time. According to the International Union for Conservation of Nature (IUCN), the Earth is witnessing the greatest extinction crisis since dinosaurs disappeared 65 million years ago.

“We are arguably living through the Earth’s sixth mass extinction event,” van Dooren says. Such an event is defined as the loss of up to 75% of species.

But even though humans are largely the perpetrators through habitat destruction, what van Dooren finds equally upsetting is that we tend not to think much about the species we’re losing or all of the ways in which we are ourselves ‘remade’ by extinction.

“We’re impacted on by these extinctions in a range of ways, whether or not we realise it,” says van Dooren. “I’ve spoken with communities in India whose funerary practices have broken down in the absence of vultures, and people whose livelihoods and cultural practices are threatened by the disappearance of other birds. It’s not just about ‘biodiversity’, it’s about appreciating how our humanity is shaped in relationship to a wider world.”

Equally important are the ethical limits of conservation, van Dooren says.

“I’m less interested in condemning particular conservation projects than I am in rethinking some of the underlying assumptions of conservation. In particular, the notion that the end always justifies the means,” he explains. “My work has aimed to explore our ethical obligation not to drive species to extinction, but also our broader obligations to respect the wellbeing of individual animals and the human communities caught up in these extinction events.”

One of the most ambitious projects underway goes beyond conservation to the idea of resurrection, or ‘de-extinction’. Groups of geneticists and molecular biologists around the world are

working with DNA preserved in museum specimens to bring species such as the US passenger pigeon and perhaps even the woolly mammoth and Tasmanian tiger back from extinction. One of the world leaders in this field is UNSW Professor Mike Archer, from the School of Biological, Earth and Environmental Sciences, who recently succeeded in cloning embryos of the extinct gastric brooding frog as part of his Lazarus Project.

Van Dooren isn’t convinced that these projects offer a sustainable solution.

“I think there needs to be a lot more work done on the cultural context of these projects. We frequently hear that ‘the world misses these species’, but I’m not sure that things are so straightforward,” he says. “For example, in Australia, if we have issues with living with dingoes, on what grounds would we imagine that reintroducing another potential livestock predator, such as the thylacine, would work?”

But, Archer argues, bringing back some of these species would play an important role in restoring faith in environmental projects and create a new-found passion for animals.

Archer sees his work as one of the few tools still available to reverse massive biodiversity loss – and we need to use it now.

“In the face of an avalanche of global extinctions making ecosystems everywhere increasingly unstable, we’re not doing enough to stop – let alone slow down – the rate of these unfolding disasters.

“This is not a time to mourn; it’s a time to act in every way we can. We’ve been working on the naïve assumption that the environment will bounce back, but we’ve taken that resilience of natural systems away,” he says.

On that, Archer and van Dooren agree. While they suggest different approaches to conservation, both admit that society has taken species for granted for too long, and now must deal with the consequences. But after years of talking about conservation with local communities, van Dooren believes such high-stakes projects could be a waste of time and precious resources until people find ways to live more sustainably.

“I suppose I hope that by stopping and thinking about these species and what they really mean to society, people will not want to just find a quick conservation solution, but will make real change,” he says. Cultural awareness is required and this is what drives van Dooren to tell the stories of endangered species and their interactions with society.

“Good stories,” he explains, “have the power to change the world. And that’s what we really need.”

*Flight Ways: Life and Loss at the Edge of Extinction* will be published by Columbia University Press in June.

► Dr Thom van Dooren. Photo: Michelle Young

## 5 SPECIES UNDER THREAT

1. Ivory Billed Woodpecker: may actually be extinct
2. Amur Leopard: <30
3. Javan Rhinoceros: <60
4. Northern Sportive Lemur: <60
5. Kakapo Parrot: <150

Source: IUCN Red List.



# FOOD FOR THOUGHT

The power of technology to persuade is the key ingredient in a project that aims to turn meals into shared experiences. By Clive Hopkins.

PETER SLATTERY remembers watching a TV documentary about asteroids as a boy and not sleeping for a week for fear that one day a fast-moving, near-Earth object might strike him.

It was an early – and disturbing – lesson on technology’s power to send messages that can dramatically influence behaviour.

Now a PhD candidate in the School of Information Systems, Technology and Management at the Australian School of Business (ASB), Slattery is less interested in technology’s power to frighten than its potential to facilitate positive social change.

“I always wanted to do something that would make a difference for people, but for a long time I didn’t know how,” says Slattery, who is also a visiting entrepreneurial fellow in UNSW’s School of Computer Science and Engineering.

“One day, I connected the dots and realised that because information technology is being used everywhere, if I used technology to persuade, I could really make a big impact to change things for the better.”

Inspired by his own research, Slattery is part of a team developing a start-up called ‘Collaboreat’, which aims to encourage communal cooking. The system functions via both website and an app, and has been described as ‘Tinder for food’ – a reference to the GPS-based app used for dating and networking.

The founders – all members of a cooking club in International House on the UNSW campus – came up with the idea when they realised there was no easy way for people to organise communal cooking.

A prototype of the system has won an award in the IEEE/IBM Smarter Planet Challenge, government funding and access to the UNSW venture space facility.

There are multiple ways to encourage behaviours, it’s just a matter of finding out which works best and making the most of it, says the 26-year-old Slattery, who came to the ASB from Ireland via university in Edinburgh to complete his PhD under the supervision of Professor Patrick Finnegan, an internationally recognised information systems researcher.

“While communal cooking is often better than eating alone, every day millions of people eat alone at roughly the same times, even though they may be [only] five metres away from someone they could eat with,” Slattery says.

“What’s needed are triggers to get people to start cooking together and mechanisms to connect those who live close by, eat around the same time and like the same food,” he says.

In addition to the personal benefits, communal cooking has indirect social benefits, such as reducing obesity and increasing social capital by bringing people together.

While not a new idea – think the flashing symbol that tells you to put petrol in the car – innovative forms of persuasive technologies are now being utilised to effect positive change in a range of areas from apps to motivate people to exercise more, to interactive websites encouraging volunteering and philanthropy.

And while the notion of sharing underpins Slattery’s communal eating project, it also very much informs his research philosophy.

“Academics and students work hard to create new knowledge, but we don’t always make that knowledge available to the people who could best use it, or benefit from it most,” says Slattery.

“Everyone has the potential and the ability to get their ideas out there ... they just need the encouragement and some good examples to inspire them.”

– with Steve Offner

► Entrepreneurial fellow ... Peter Slattery. Photo: Britta Campion



# HIGH ANXIETY

Fear around cancer clusters is distracting us from the real risks associated with our biggest killer, writes Helen Signy.

CANCER IS NOT ONLY Australia's most prolific disease – it's also the most feared. And that can cause problems for cancer control specialists like UNSW's Professor Bernard Stewart, whose message about the individual's role in minimising risk can get lost amid the scare-mongering.

Take the issue of cancer clusters, where a group of people in one location succumbs to cancer with no apparent cause other than fears of an insidious carcinogen and a cover-up by authorities.

Investigations into cancer clusters, including those at Hinkley in California (featured in the film *Erin Brockovich*) and at the ABC studios in Toowong in Queensland, have provided no insight regarding causation, says Stewart. Evidence is scant that ingested chromium 6, publicised as the culprit in Hinkley, causes cancer in humans, while there is now definitive evidence that a cluster of breast cancer cases at the ABC was simply due to chance.

While some cancers are clearly caused by exposures beyond the individual's control, such as localised exposure to toxins from mines or in the workplace, the vast majority of cancers stem from lifestyle choices.

Yet, says Stewart, such is public anxiety about the possibility of cancer clusters that this message struggles to gain traction.

"It's easy to focus on cancer being inflicted on the community in an insidious and undetected way, and the sense of outrage carries with it a momentum all of its own," he says. "The message that having a beer or stretching out on the beach may warrant concern about cancer risk may seem pedantic or extremist in comparison."

That's why the public tends to jump on any newly publicised cause of cancer, however unlikely – from underarm deodorant to lipstick and artificial sweetener – rather than heeding public health messages that are proven to reduce risk, like giving up smoking or cutting back on alcohol.

The good news that fears of cancer clusters are unfounded "might be shouted from the top of Uluru for all the likelihood it has of reaching the wider community", says Stewart.

The *World Cancer Report 2014*, published by the International Agency for Research on Cancer (IARC), part of the World Health Organization and edited by Stewart, shows death rates from cancer have progressively increased to become the world's biggest killer.

That's partly due to an ageing population, as the greatest risk factor for any cancer is age, says Stewart. The other reason comes down to people's personal decisions or situation.

While Australia leads the world in tobacco control, cigarette smoking is still the single major cause of cancer worldwide. Other factors, such as drinking too much alcohol (responsible for 3% to 5% of all cancers in countries such as Australia), deliberate exposure to sunlight, and being overweight and obese heighten your cancer risk.

There is mounting unease over whether health systems, particularly in the developing world, will have the capacity to cope with the future cancer burden.

"It's one thing to say something is a choice for the individual; it's another thing entirely to say the whole responsibility lies with the individual."

The answer, says Stewart, lies in helping people to minimise their risk – for example by introducing legislative and regulatory measures to limit the availability and promotion of known cancer-causing agents, like cigarettes.

Stewart says research data are now sufficient to underpin recommendations to governments on regulating major carcinogens, such as alcohol, and sugar in soft drinks – a move that is certain to be resisted.

The important work may not generate the media hype that comes with reports of cancer clusters – but it does address what is most likely to succeed.

▲ The vast majority of cancers stem from lifestyle choices ...

*World Cancer Report* co-editor Professor Bernard Stewart.

Photo: Michele Mossop



# MISSION POSSIBLE

UNSW researchers are leading the race to make the sci-fi world of quantum computing an everyday reality, writes Stephen Pincock.

FAY HUDSON is sitting in a narrow, ground-floor laboratory, peering at a fuzzy black-and-white image on a computer screen.

The long, windowless lab is lined with benches. Space is tight. Everyone wears white overalls, masks and goggles, like extras in some claustrophobic sci-fi movie.

Special lighting bathes everything in an eerie yellow glow to prevent ultraviolet light damaging

sensitive materials. From grills in the ceiling super-filtered air flows down to eliminate dust.

Hudson and colleagues at the Centre for Quantum Computation and Communication Technology (CQC<sup>2</sup>T) spend all day in this room, which is part of the Australian National Fabrication Facility (ANFF) at UNSW. The only thing that makes the trying conditions bearable is the knowledge they're at the cutting edge of science.

These UNSW scientists and engineers are doing things that were considered impossible just a decade ago. They are manipulating matter at the most fundamental level, with the aim of building a powerful new kind of computer – one that will operate using the laws of quantum physics and unlock unimaginable processing power to solve problems beyond the capacity of regular computers.

## SUB-ATOMIC SCALE

For most non-scientists – and even a great many scientists – quantum physics is impenetrable. But when it comes to understanding quantum computing, most of us are familiar with ‘bits’ – the fundamental units of information regular computers are based upon.

The billions of bits inside your laptop or other computers are encoded using transistors on integrated circuits. They can have two possible values – 1 or 0 – depending on whether electrical current flows through them.

In the 1980s, scientists began to theorise it might be possible to build computers a completely different way, by harnessing special properties of matter that apply when you get down to the sub-atomic scale.

At the microscopic scale, the black and white rules that seem to govern the physical world are replaced by shades of grey, explains Andrew Dzurak, Scientia Professor of Electrical Engineering and director of the ANFF.

In this minuscule world, objects can exist in a combination of all their possible states at the same time, he says. This remarkable phenomenon is known as superposition. It’s only when the object is measured that it ‘collapses’ into one state or the other.

Superposition means electrons or photons can exist in all their theoretically possible states at once. Scientists realised if they could make computers that store information in these kinds of quantum systems, then each ‘quantum bit’ of information, or qubit, could be, in essence, a 0 and 1 simultaneously.

Another quantum phenomenon vital in quantum computing is ‘entanglement’. Put simply, this phenomenon means the characteristics of two particles that have interacted with each other become inextricably linked. So if you measure a property of one of them, the others will be found to have values that correlate.

Together these two quantum properties promise to change the arithmetic of computing completely. Scientists realised as you added more and more entangled qubits together, the computing power would grow exponentially.

If a single qubit represents two numbers at the same time (0 and 1), then two entangled qubits would represent four



numbers at once, three qubits would represent eight numbers and so on. By the time you have 300 qubits interacting with each other, you have a computational capacity that would require a classical computer bigger than the universe.

This would allow a quantum computer to compute many different possible solutions to certain kinds of problems all at once.

While a regular computer needs to take a certain number of steps in order to calculate something, a quantum computer could take huge short cuts by performing its calculations in parallel across all its entangled qubits.

“The whole way of processing information is different,” says Andrea Morello, Associate Professor in Quantum Nanosystems in the School of Electrical Engineering and Telecommunications.

“In a quantum computer you can explore different computational paths in parallel, and in the end the paths converge to a single answer – the right one,” he says.

For a long time, most of the activity in quantum computing came from theorists who were devising clever algorithms that would harness the theoretical properties of quantum computers.

That effort continues to this day. Every year, scientists discover more and more potential applications for quantum computers, explains Scientia Professor of Physics and Laureate Fellow Michelle Simmons, the director of the CQC<sup>2</sup>T.

“A lot of the applications are mathematical, such as economic modelling, financial modelling and weather forecasting,” says Simmons, who was named NSW Scientist of the Year in 2011.

Other applications might include searching through large amounts of data, simulating natural phenomena and calculating the factors of very large numbers.

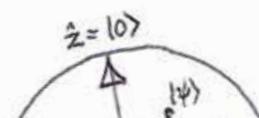
“There are mathematicians, theoretical physicists and computer scientists all over the world working on the development of these algorithms, although most people aren’t necessarily aware of it. If a quantum computer can do something in a week that would normally take two years, then suddenly everything changes,” says Simmons.

“Our qubits are essentially the best qubits available to mankind in solid state.”



▲ Team leaders ...  
Scientia Professors  
Michelle Simmons  
and Andrew Dzurak.

◀ UNSW’s ANFF  
lab. Photos: ANFF-  
NSW / Paul  
Henderson-Kelly





## THE QUBIT QUANDARY

That's the theory. In practice, constructing qubits has been a major scientific and engineering challenge. Building real quantum computers is decades behind the theoretical work.

That's because for a material to be useful as a qubit, it needs to have a number of unusual attributes. First, it must be capable of existing in multiple states that can be manipulated. Then, it must also be possible to isolate the element from interactions with the outside world for long enough to perform computations. There also needs to be a way for the qubits to interact with each other.

"The hard thing about quantum bits is they're very fragile," says Morello. "They interact with their environment and the quantum state gets destroyed. When you scale it up, the difficulty and the fragility increases exponentially, unless you use some clever techniques to correct for errors."

Despite these challenges, over the past decade many research groups around the world have found a number of ingenious ways to construct qubits. Among them: atoms suspended in vacuum chambers, particles of light (called photons) or impurities in diamond crystals.

In the strange, yellow-hued laboratory at UNSW, Fay Hudson is giving me a rare glimpse at how the UNSW researchers make their qubits.

The computer screen in front of her is displaying an image from a powerful microscope, focused on a piece of silicon that's smaller than a fingernail. Before putting the silicon into the machine, Hudson has already carefully printed an electrical circuit onto it, tinier than the eye can see.

She zooms in until at the centre of her monitor we can see the circuit, looking like something an ancient civilisation might have carved into rock, an angular pattern of shapes converging on a small, dark rectangle.

These are the aluminium 'wires' that make up a small electrical circuit, 1,000 times thinner than a human hair. They are so fine that as I look over Hudson's shoulder at the computer screen, I can actually see the shapes of the individual aluminium crystals that make up the metal.

But the real marvel on this silicon chip is still invisible at this extraordinary level of magnification, Hudson explains. Hiding in the darker patch where the aluminium electrodes converge, an area that is just a few billionths of a metre across, is a single atom of phosphorus introduced into the crystal structure of the silicon chip.

It's this single atom, buried inside the kind of silicon chip we use in our computers today, that serves as the qubit.

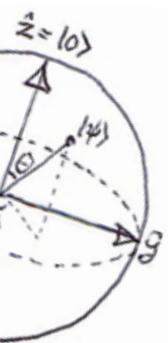
## STEADY PROGRESS

The quantum computing researchers at UNSW are all part of the interstate CQC<sup>2</sup>T.

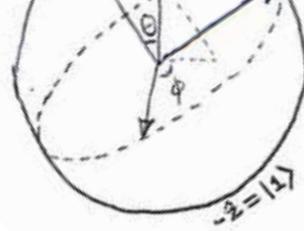
In recent years, they have published a series of important articles in the world's top scientific journals showing that using phosphorus atoms in silicon is an ideal way to build qubits.

The UNSW teams, led by Simmons, Professor Sven Rogge, Morello and Dzurak, have different methods to prepare these phosphorus atom qubits. In one approach they insert atoms into the crystal structure of silicon using an ion accelerator. This process, carried out by a University of Melbourne team led by Professor David Jamieson, is the industry-standard method to introduce other atomic species into silicon chips. In another, they place individual phosphorus atoms with atomic precision using a scanning tunnelling microscope. Both approaches are world-leading. Morello and Dzurak have also demonstrated methods for detecting the magnetic orientation (or 'spin') of the phosphorus atom and of a single electron orbiting the atom's nucleus.

This is critical as it is the spin that serves as the qubit. By using pulses of microwave radiation, the researchers are able



▲ In the lab ...  
Dr Fay Hudson.  
Photo: ANFF-NSW/  
Paul Henderson-Kelly



to switch the direction of the spin, moving the qubit between zero and one via all points in between.

Across the hall from the lab where Hudson works, Morello and his team show me how this is done.

Suspended from the ceiling is a two metre-long ‘arm’ bristling with wires, coils and machinery. At the lower end is a rectangular space where a small gold circuit board can be bolted into place. At the centre of this board sits a small silicon chip like the one Hudson is working with. Within the chip, of course, is a single phosphorus atom, isolated from the outside world by the rigid crystal structure of silicon.

To manipulate the qubit, Morello and his team lower this apparatus into a super-chilled compartment that brings the temperature of the chip close to absolute zero – more than 270 degrees Celsius below the point at which water freezes.

Scores of cables connect the chilled compartment to a bank of computers and other equipment that allow the scientists to read out and manipulate the spin of the atom. When its spin is measured as being ‘up’, an electrical current can flow along the circuit and when it is ‘down’, the current stops flowing.

Next, the researchers show me how they can switch the orientation of the spin by pulsing microwave radiation along one of the electrodes in the circuit. On the computer screen, the output is displayed as a sine wave oscillating as the microwaves push the spin from up to down and back again. The top of the wave represents a qubit readout of ‘one’, while the bottom of the wave is ‘zero’.

The fact the system is also reading intermediate points along the graph between zero and one shows the phenomenon of superposition in action, says Morello, who last year won a Prime Minister’s Prize for Science for his team’s quantum advances.

“Each single measurement is either zero or one,” he says. “But you can reconstruct what the quantum superposition was by repeating each measurement 200 times and looking at the statistics. That’s essentially what this is.”

In some ways, the UNSW team is playing catch-up with other groups that have already entangled much larger numbers of quantum bits. But Morello, Dzurak, Rogge and Simmons say their hardware will make it more amenable to building large-scale machines.

They say silicon offers an ideal means of protecting the qubit from interaction with the outside world, and should allow quantum computer circuitry to be built using many of the techniques the computer industry has already perfected.

Within the next few years, their plan is to build a small-scale quantum computer made up of 10 qubits. Says Morello with evident pride: “Our qubits are essentially the best qubits available to mankind in solid state.”

## CATCHING THE WAVE

Perhaps the biggest news in quantum computing has come from Canada, where a company called D-Wave has built and sold what it calls a ‘quantum computer’ to the new Quantum Artificial Intelligence Lab, a collaboration between NASA, Google and the Universities Space Research Association (USRA).

D-Wave has generated a lot of scepticism among the research community and it remains to be seen if their approach using superconducting qubits provides any speed-up compared to a conventional computer.

The D-Wave machine is said to contain 512 qubits, each of which is a tiny superconducting loop of flowing current, cooled to almost absolute zero. When the loops are cooled, the D-Wave scientists say, they enter a quantum state where the current flows both clockwise and counter-clockwise. When you feed this machine a task, it uses a set of rules to perform a calculation across these qubits, via a process called quantum annealing.

The fact these organisations were willing to invest in the D-Wave machine to explore areas such as machine learning tells you that quantum computing is of more than purely academic interest. It also raises the question – has this company already made the machine scientists around the world have been trying to build? The answer is yes, and no.

Morello, who visited D-Wave recently, was impressed with the engineering effort, but he points out the D-Wave machine has a limited range of applications compared to a ‘universal’ quantum computer.

Building a universal quantum computer – one that can execute any arbitrary quantum software – is a much bigger challenge, and probably still years away.

## THE NEXT GREAT LEAP

To get a sense of how far the quantum computing community has come, and how far it still has to go, it is worth contemplating the history of regular computers.

On a laptop in her office Simmons shows me a PowerPoint slide that charts the development of the silicon-based computer from 1947 when the first transistor was built, until today.

“The first commercial, integrated circuit based on that type of technology was 1964, so it took about 15 years from a single transistor to having a product you can sell,” she says. “In quantum computing that’s where we are, in that period.”

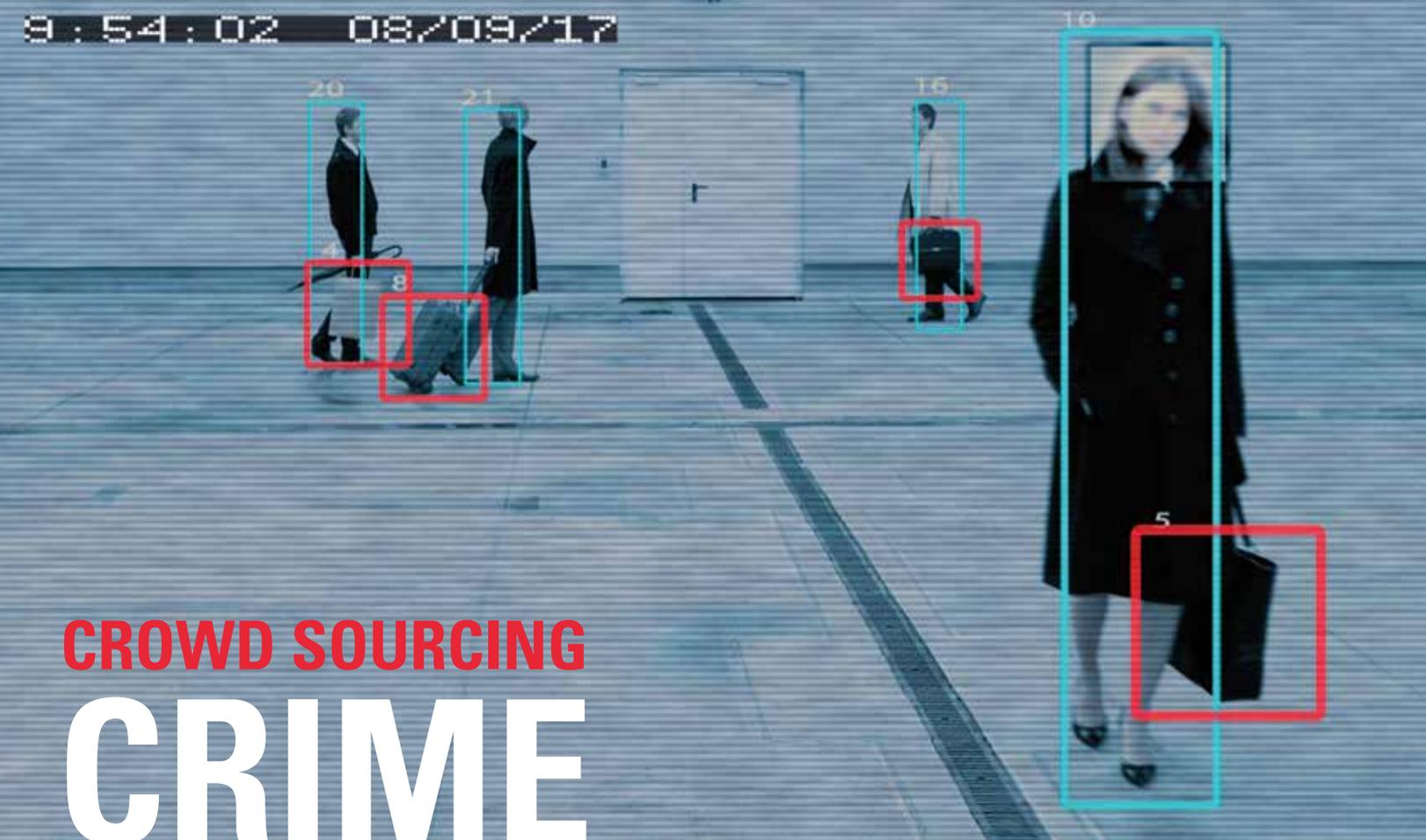
The difference is that while most people in the 1950s and 1960s were working on integrated circuits built on silicon chips, in quantum computing there are many different quantum computer ‘architectures’ being studied by different research groups around the world.

“There are all these different approaches, and some of them just aren’t going to scale,” Simmons says. “The game really is what is going to scale up, to lead to a practical system. Silicon is definitely the one we are betting on and, motivated by our results, a lot of people are now moving into this space.”

To make the leap to a useful, commercially saleable computer, the UNSW scientists need to build a method of combining multiple qubits into an architecture that allows them to communicate with each other, Morello explains.

“Essentially you want to wire up your quantum processing ... for us it’s three years, maybe, down the track.

“Once you’ve demonstrated [that],” he says, “... then you can start to build the Holy Grail, a universal quantum computer.”



## CROWD SOURCING CRIME

Police are embracing social media as a critical tool in modern-day crime fighting, but at what cost? By Linda McSweeney.

IN APRIL 2013, criminologist Alyce McGovern was sitting in New York City's Washington Square Park quietly scrolling through Facebook and Twitter when social media went into overdrive.

Bombers had struck the Boston Marathon killing three people and maiming more.

As traditional newsrooms scrambled to assign reporters to the story, the Boston police – armed with smartphones and Twitter and Facebook accounts – were flooding social media with updates.

By the time the manhunt was over, they had trumped traditional media, confirming the capture of the bombing suspect with the Tweet: “We got him.”

This transformation of the Boston police from a reactive agency dependent on the media as an intermediary, to one that controlled its message was no surprise to Dr McGovern, who is a senior lecturer in criminology in the Faculty of Arts and Social Sciences.

She had just penned the final chapters of her first book, *Policing and Media: Public Relations, Simulations and Communications*, co-written with her former PhD supervisor Dr Murray Lee.

The book outlines the changing pace of police media policy, arguing the use of social media and reality television is positioning police as publishers in their own right, sometimes even enabling them “to bypass traditional media altogether”.

It's a huge change from the days when police-media liaison meant journos meeting their contacts at the pub for a beer or attending stage-managed press conferences hoping for some detail.

McGovern, who once aspired to become a police officer but was persuaded by her father to get a university degree first, is floored by the pace of change.

“Police can now get on Facebook immediately and tell people what's happening and myth-bust to try to stop misinformation,” McGovern says. “That has never been possible before.”

Police also now use YouTube to post images of suspects, receiving responses with information that can lead to arrests within hours.

Few Australians will forget the CCTV footage of 29-year-old Jill Meagher talking to a stranger outside a bridal shop in Melbourne's Brunswick. The footage, released by Victoria Police on YouTube after her disappearance, was a calculated attempt to track down Meagher's killer and was ‘shared’ 7,500 times within two hours of its release.

“The rapid dissemination of CCTV footage was particularly useful in police identifying witnesses, and eventually the offender himself,” says McGovern. However, as much as social media assisted the police in the Meagher case, it also complicated it.

After a Facebook hate group against the accused attracted almost 18,000 ‘likes’, Victoria Police was forced to remind users it was “inappropriate to post speculation or comments about matters before the courts”.

“The Meagher case was interesting because the prolific use of social media had the potential to stop the accused from receiving a fair trial,” says McGovern.

Reliance on social media also backfired after the Boston bombings when some missing students were falsely identified as the bombers, highlighting the speed at which misinformation, as well as information, can spread.

“Police are still developing these capacities and because things move so quickly, it can make it difficult to determine the best strategy,” McGovern says.

And police are learning social media is not a one-way street. Officers caught on film acting inappropriately can be outed comprehensively via social media.

Last year, footage of a young man apparently being brutalised by police at Sydney’s Mardi Gras surfaced on YouTube. The vision went viral and sparked outrage. The incident remains the subject of an internal police investigation.

“Citizen journalism definitely makes police more accountable because they are now under far more public scrutiny,” says McGovern.

Aware of the need to tread carefully, the NSW Police media policy has gone from six pages a decade ago to around 30 pages today. NSW Police is also home to a television liaison office that includes its own camera crew.

Journalists are understandably sceptical about these changes and are concerned about being cut out of the picture altogether.



► Dr Alyce McGovern. Photo: Grant Turner/Mediakoo

Reporter Jordan Baker, who has covered some of Sydney’s biggest crime stories, says journalists often feel frustrated by PR talk and control of information.

“Sometimes being channelled through a media unit can make a journalist feel as though they’re not getting straight answers to straightforward questions,” Baker says. “When journalists are not getting answers to questions from the most authoritative source, they will go to other sources. At the end of the day,

the public would get better information if police simply gave straight answers.”

McGovern predicts the new media landscape will continue to offer both resistance and challenges.

“Police often want one thing and journalists another so they’re going to butt heads. But crime is newsworthy, so it’s going to be almost impossible for them to ignore each other,” she says.

*Policing and Media: Public Relations, Simulations and Communications* is published by Routledge.

## CRIMINOLOGY ON THE RISE

“PEOPLE ARE FASCINATED by crime,” says forensic psychologist Dr David Bright, referring to the popularity of undergraduate criminology degrees at UNSW. “Students always ask if a criminology degree is like the TV show *CSI* and I tell them, ‘No’, but I understand the connection. *Silence of the Lambs* was what first peaked my interest in forensic psychology,” he says.

Enrolments in undergraduate Criminology at UNSW have soared, with the program almost doubling in size in five years.

Bright, who is convenor of the program, says the strength of the undergraduate degree is its real-world application.

“Students learn to research and analyse crime and policy. Some of our graduates end up working in crime prevention, with the Australian Crime Commission (ACC) or Australian Federal Police,” Bright says. “There is a wide variety of job opportunities for criminology graduates.”

The only inter-faculty criminology program

in Australia, students are taught by academics from the Faculty of Arts and Social Sciences (FASS) and the Faculty of Law.

“Our criminologists tackle ‘real world’ social problems including youth offending, drugs and crime, Indigenous justice, cyber-crime, international crime and corrections,” says Bright, who spent a decade running the sex offender treatment program at Long Bay Correctional Centre.

UNSW’s criminology research was rated above-world standard in the 2012 Excellence for Research in Australia report.

The multidisciplinary Criminology and Criminal Justice Research Group at UNSW was established to foster industry linkages and research collaborations. The 30-strong group is led by Law Professor Janet Chan and aims to build on existing relationships with the Bureau of Crime Statistics and Research, police and ACC to advance criminology research.

The program’s research strengths have drawn Director of the NSW Bureau of Crime Statistics and Research and UNSW Adjunct Professor, Don Weatherburn and internationally recognised criminologist Professor Chris Cunneen to the group. Cunneen, who specialises in Indigenous justice, will return to UNSW later this year to take up a new joint appointment across FASS and Law.

Other members include FASS Deputy Dean Professor Eileen Baldry, who has led numerous major grants over the past 20 years and was awarded the 2009 NSW Justice Medal. Professor Julie Stubbs from Law brings her expertise as a Law and Justice Foundation board member, an adviser to the Institute of Criminology and VicHealth on violence against women, and a member of the Criminal Justice Reform Committee.

– Fran Strachan

# A COUNTRY OF CITIES

## HYPERDENSITY AND CIVIC DELIGHT

Forget Paris. We must look to the skies if we are to create 'delightful' urban centres of the future, says Columbia University's Vishaan Chakrabarti.

HYPERDENSITY – defined as density sufficient to support subways – contributes to the health, prosperity and sustainability of cities. Compared to most forms of human habitation, dense cities are the most efficient economic engines; they are the most environmentally sustainable and the most likely to encourage joyful and healthy lifestyles. So, how do we build delightful cities that make us more prosperous, ecological, fit and equitable? Here I will lay out the factors that impede hyperdensity in our cities today, and the conditions necessary to create hyperdense environments in the future, including great design, responsible preservation and sound urban planning.

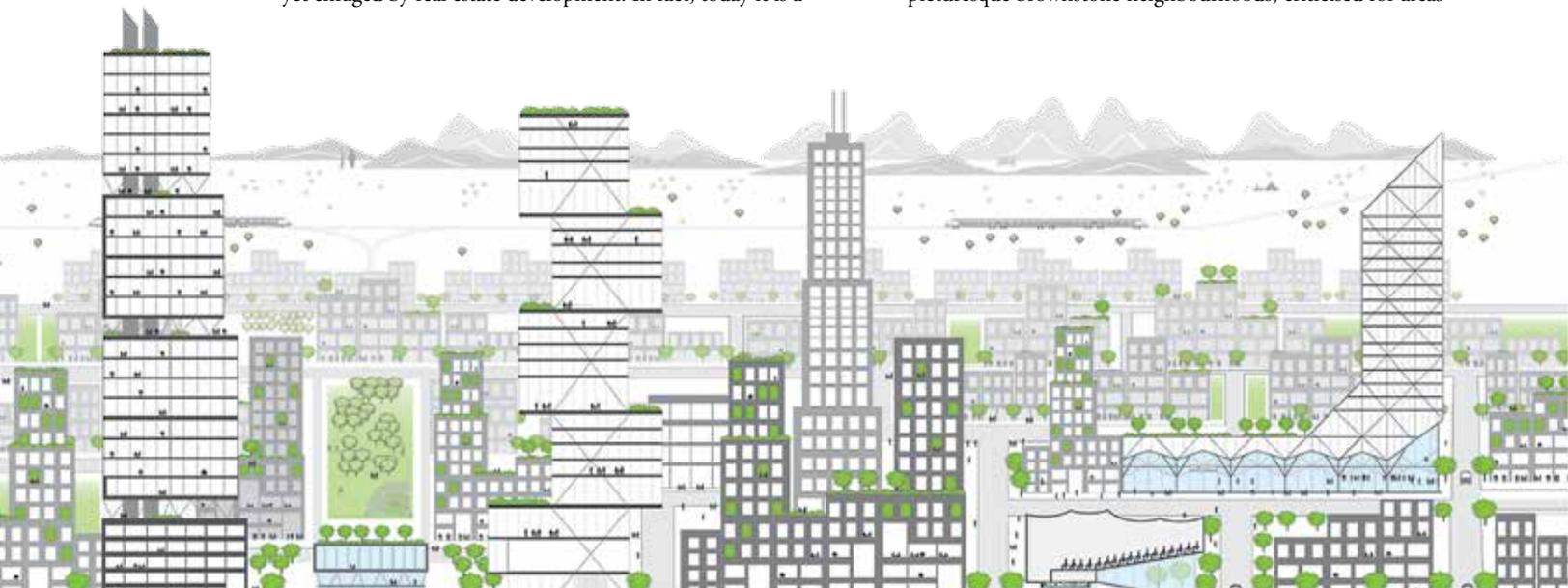
Sound urban development is the linchpin of the hyperdense environment. Yet public advocacy for high-density development is extraordinarily low, primarily because its merits are misunderstood. Even among those who appreciate cities, there is enormous confusion about how best to build density. This is largely because the rationale for hyperdensity is often lost on those who should be its strongest advocates. Paradoxically, many so-called urbanists – broadly defined as urban planners, architects engaged in city building and urban theorists – tend to be enthralled with density yet enraged by real estate development. In fact, today it is a

common trope in most schools of architecture and urban planning to believe density is good but development is bad.

Instead, many urbanists consider European capitals such as Paris and Barcelona as the exemplars of 'good density'. And, indeed, with city centres that support mass transit and walkable neighbourhoods built at more than 80 units per acre (200 units per hectare) – as is the case in Paris – these are some of the most densely built environments in the world. Since they achieve these densities without, as some would say, ugly skyscrapers built by ugly developers, these cities represent the meritorious urbanity – commonly known as 'low-rise, high-density' – championed by the design and planning fields.

These fields tacitly or explicitly consider the growing hyperdense cities of Asia as embodiments of 'bad density'. They generally deride places such as Tokyo, Hong Kong and Singapore as being too congested and characterless, the products of mindless real estate development, inept urban planning and impoverished civic culture. In fact many Asian cities are outpacing European capitals economically, but also in terms of cultural production, mass transit, environmentalism, racial integration and other key metrics. It is unrealistic and irresponsible for any true urbanist to embrace European capitals as models for future development when they are among the most segregated urban centres on Earth and have increasingly unstable finances characterised by debt-driven *grands projets*.

Cities such as New York, Chicago and Toronto fall somewhere between beloved and bemoaned urbanism: praised for their picturesque brownstone neighbourhoods, criticised for areas



where skyscrapers have been allowed to thrive. Brownstone Brooklyn, we are told, is sustainable, community based and charming. Midtown and Lower Manhattan, by contrast, are often derided as the amoral playland of ‘the 1%’, despite the fact those two business districts generate the majority of the tax dollars that fund the extraordinary array of social goods throughout New York City, including schools, parks and affordable housing.

Missing from these simplistic judgements about good and bad urbanism is an in-depth understanding of the origins of low-rise, high-density environments, not to mention an appreciation of the rationale that will necessitate high-rise, high-density environments in the future. The majority of the historic buildings in Paris, Barcelona and Brownstone Brooklyn were built by the private sector – yes, by real estate interests and wealthy businessmen. To be sure, as with any great city, these charming neighbourhoods are framed by grand public parks, lovely streetscapes, efficient transit systems and dignified foreground buildings. But the much-lauded ‘good density’ in such cities is the building stock itself, which was actually built by powerful development interests and typically fuelled by unsavoury capital, such as the spoils of colonialism or labour exploitation, and enabled by top-down government.

Today many planning professionals remain fixated on smaller-scale development. They tend to ignore that height limitations have held back the Parisian economy in comparison to the forward-looking redevelopment of London, both at Canary Wharf and within its city centre, which is now marked by a series of glistening and respectful new towers by Norman Foster, Richard Rogers and Renzo Piano. There is, in fact, a marked correlation between those European cities that have allowed skyscrapers and those that have successful economies.

Urban residents tend to balk when they hear about ‘development’ because they fear any change to their neighbourhoods. Every new proposal has come to be construed as a Robert Moses-like mega-project that will ultimately displace people and tear apart the urban fabric. In cities today many residents channel Jane Jacobs [author of *Death and Life of Great American Cities*] to fight dense, mixed-use, transit-based projects that any true Jacobs acolyte should support.

While adaptive re-use of truly historic buildings is essential, existing building stock alone will never accommodate the needs of evolving business or residence, particularly in light of rapid technological and social shifts. Surgical new development remains critical to the rebirth of neighbourhoods and the vitality of urban economies.

The design of new buildings has tremendous significance for cities. While sustainability and functionality are important

metrics, innovative architecture has proven to be a significant economic and social driver because of its ability to engender new forms for dwelling, work and repose. Smart architecture is as smart about money as it is about design. Yet the best urban architecture satisfies more than pragmatic concerns; our best buildings conjure civic delight.

Truly great architecture invites, uplifts and advances its city. A great building inspires people through its beauty and material qualities, while enhancing the coherence and contradictions of the street. A great building can reveal a city by exposing its urban structure in new and unfamiliar ways, creating a better collective understanding of its past – and future.

Good planning should be guided by desired objectives rather than prescribed physical outcomes; it should allow for flexible uses, densities and building form in response to evolving market conditions, architectural expression and availability of infrastructure such as mass transit. Cities should unleash the performance-focused power of municipal planning to create public policy and investment that spur private-market reaction, which, in turn, will generate invaluable tax revenues to fund public needs. This is precisely the

story behind some of the most successful recent policy-driven urban development, such as the preservation of New York’s High Line and its role as a catalyst for the mixed-use neighbourhood that surrounds it.

My advocacy for hyperdense, vertical cities should by no means be misconstrued as a prescription for everyone to live in an unyielding forest of skyscrapers. At Columbia University, my students and I have been working on a concept I call ‘cap and trade zoning’, which would allow the free flow of air rights within an urban district, with an understanding of the overall amount of developable area would be capped in relation to proximity to mass transit. This would result in hyperdensity, to be sure, but would also create a ‘high-low’ city of diverse heights, uses and ages.

Permitting the construction of hyperdensity creates what former New York City deputy mayor Daniel Doctoroff has called a “virtuous cycle of economic development”: new residents generate new taxes, which, in turn, equals better municipal services in the form of good schools, beautiful parks and effective policing. This better quality of life brings more new residents and workers, which requires even denser development, which ultimately results in sound municipal budgets, vibrant cities and round-the-clock ridership for public transportation.

This synopsis of UNSW’s 2014 Paul Reid/Utzon Lecture is adapted from Vishaan Chakrabarti, *A Country of Cities: A Manifesto for an Urban America*, illustrated by SHoP Architects (New York: Metropolis Books, 2013) and appears here with the permission of the author and publisher. Footnotes to the article appear online.

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“There is ... a marked correlation between those European cities that have allowed skyscrapers and those that have successful economies.”

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◀ Hyperdensity as good urban design. Image supplied by the publisher



# WE SHALL NOT BE MOVED

Planning policy relies on older people moving to smaller dwellings. But, as Susi Hamilton reports, downsizing is having little attraction for retirees.

IT MIGHT LOOK like an unassuming bungalow from the street, but John and Sandra Koolhaas' home has three spare bedrooms, a large entertainment area, a deck and garden: a house seemingly more suitable for a growing family than a retired couple.

"I always said I would move by the time I was 70, but that's long gone. As long as I can do the garden and maintain the place, we'll stay," says John of the Lane Cove house they have owned since 1970.

While he admits the extra space is "a waste", there is no incentive to move.

"We thought about downsizing, but I don't want to live in a unit," he says. "At our age, why would you move into a unit when in a few years you'll just have to move into a retirement home?"

It's a common sentiment among older Australians. Not even one in 10 people aged 50 or over moved to a smaller home during the five-year period 2006–2011, according to studies from UNSW's City Futures Research Centre (CFRC) in the Faculty of Built Environment.

It's a startling finding given much urban-planning policy is premised on the assumption an ageing population needs smaller dwellings.

The centre has identified the key barriers to downsizing: availability

of dwellings in suitable locations, financial disincentives and the psychological and practical challenges of moving.

"We could do so much more for older people, and help younger families at the same time," says the CFRC's Professor Catherine Bridge, referring to the knock-on effects experienced by younger Australians when their older counterparts stay put.

"When we help people to retire, we give financial advice, but it doesn't include advice about the house, which is their largest asset," Bridge says.

Until recently, capital from the sale of the family home could affect pension eligibility, but the federal government went some way to circumventing this by quarantining \$200,000 from the assets test to encourage moving and downsizing.

But the report found the majority of older people who do downsize do so for lifestyle reasons, often because they can no longer maintain the house or garden.

"What generally triggers people to think about downsizing is adverse life events, what we call the four 'ds': death, divorce, disability, debt," Bridge says. "We're finding the people who choose to move before an adverse life event are much happier with the move."

The report, funded by the Australian Housing and Urban Research Institute,

found those who do downsize are more likely to be older, single females of lower income and resident for fewer years in their current dwelling. One in five moved into retirement-village accommodation.

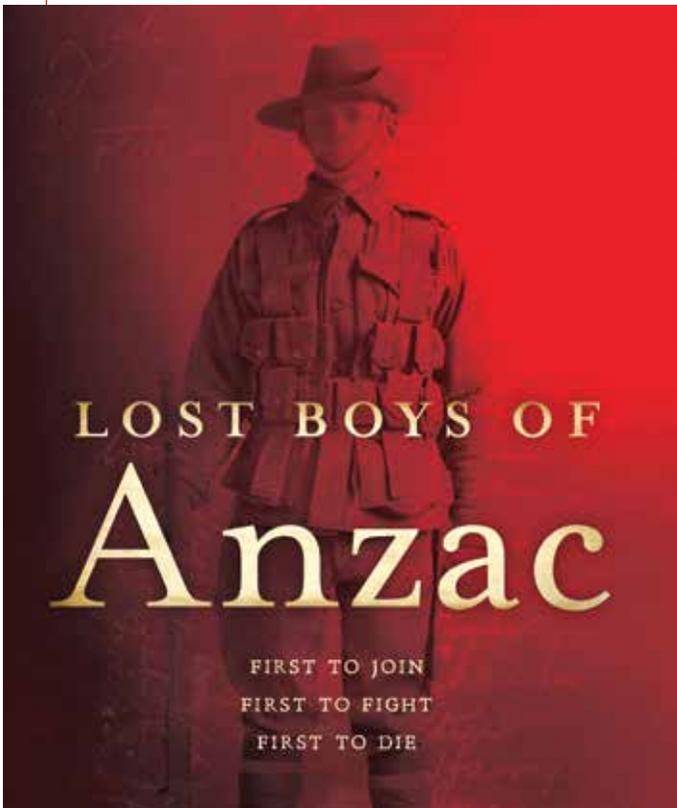
One of the solutions to the issue is more innovation from developers. The CFRC's Professor Bruce Judd says there's an undersupply of the right type of smaller accommodation in the right location.

Units are often presumed to be the best option. However, "people want an accessible home on one level, a small, manageable garden and plenty of living space, but these features are scarce in many new housing developments", he says.

Strata, too, can be a barrier. "If you are on a fixed, low income, then a rise in levies can be a big problem in later life," Judd says.

And most importantly, people don't want to change suburbs; they want to preserve familiar patterns of visiting the same doctor, chemist, friends and family.

That's something that resonates with Sandra Koolhaas. "We have been very happy here," she says of her four-bedroom home. "We're close to the shops, we're close to the kids. I don't think any of the new units would suit us: we want to potter in the garden. I think we'd feel hemmed in."



## PETER STANLEY, UNSW CANBERRA

AUSTRALIANS REMEMBER the dead of 25 April 1915 on Anzac Day every year. But do we know the name of a single soldier who died that day?

Peter Stanley, one of Australia's most active military-social historians, goes looking for the *Lost Boys of Anzac*: the men of the very first wave to land at dawn on 25 April 1915 and who died on that day. There were exactly 101 of them. They were the first to volunteer, the first to go into action, and the first of the 60,000 Australians killed in that conflict.

*Lost Boys of Anzac* traces who these men were, where they came from and why they came to volunteer for the AIF in 1914. It follows what happened to them in uniform and, using sources overlooked for nearly a century, uncovers where and how they died, on the ridges and gullies of Gallipoli – where most of them remain to this day. Stanley reveals how the Lost Boys were remembered by those who knew and loved them, and how they have since faded from memory.

Having published 25 books on Australian military history, Stanley felt a “human gap” existed in the conventional historiography of Anzac. Researching Red Cross records, previously unused by military historians, the author reveals how families learned about the deaths of their sons.

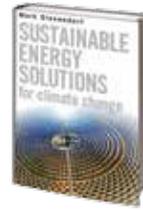
“They are very candid records and quite destroy any idea that the landing on Gallipoli was in any way glorious, but instead show how families learned the reality of what happened to their loved ones,” says Stanley.

“I’m trying to show that our Anzacs were ordinary young men, if we can understand that we can keep Anzac in perspective and understand Australia’s military history realistically and maturely.”

The author says the *Lost Boys of Anzac* represents a new approach to Australian military history that should be remembered during this year’s World War One Centenary.

“The Centenary celebrations will see an undue focus on men in uniform but sadly little attention devoted to war’s effects.” *NewSouth*

## BOOKS



### **SUSTAINABLE ENERGY SOLUTIONS FOR CLIMATE CHANGE:** MARK DIESENDORF, FACULTY OF SCIENCE

A call to action on climate change, Diesendorf’s book gives detailed information on the strategies we need to adopt to ensure a sustainable future for the planet. With an interdisciplinary approach combining technology and policy, Diesendorf provides a guide to our future energy options, outlining the enormous recent changes in the energy sector in Australia and internationally. The author argues that new technologies can transform our fossil fuel-based energy system into an ecologically sustainable one. *UNSW Press*



### **PENAL CULTURE AND HYPERINCARCERATION: THE REVIVAL OF THE PRISON:** EILEEN BALDRY, UNSW ARTS AND SOCIAL SCIENCES, DAVID BROWN, MELANIE SCHWARTZ, ALEX STEEL AND CHRIS CUNNEEN, UNSW LAW WITH MARK BROWN

Using Australian penal culture as a conceptual and theoretical vehicle, this book analyses international developments in penalty and imprisonment. Authored by some of Australia’s leading penal theorists, the book examines historical and contemporary influences on the use of prisons, with analyses of colonialism, post colonialism, race and the development of the phenomenon of hyperincarceration. *Ashgate*



### **OVERCOMING BABY BLUES:** GORDON PARKER, KERRIE EYERS AND PHILIP BOYCE, UNSW & BLACK DOG INSTITUTE

For some women, pregnancy and new motherhood is a time of unsettling mood shifts and uncertainty. One in 10 women experiences clinical depression during pregnancy or in the postnatal period, while the majority of new mothers face the ‘blues’, anxiety and other emotional changes. *Overcoming Baby Blues* shares intimate stories of mothers’ experiences combined with research-based guidelines on assessing moods, causes of perinatal depression, and effective management strategies. Safety of medications in pregnancy and breastfeeding is covered, as well as suggestions for adapting diet and lifestyle to reduce symptoms. *Allen & Unwin*



### **INNOVATION, STRATEGY AND RISK IN CONSTRUCTION:** MARTIN LOOSEMORE, UNSW BUILT ENVIRONMENT

Loosemore argues that the missing key to innovation for built environment professionals is adding greater adaptive capacity to their operations. With the subtitle *Turning Serendipity into Capability* the book integrates insights from business and government leaders, arguing that traditional business strategies that systematise innovation and eliminate uncertainty need to be balanced with more flexible approaches. The author proposes a simple model that allows managers to tap into the increasingly dynamic and interconnected nature of the construction industry. *Routledge*



# AUSTRALIAN MADE

A historical study of five of our most acclaimed artists aims to uncover the impact of copyright on our cultural identity. Steve Offner reports.

◀ Dame Nellie Melba. Photo: News Ltd / Newspix

THE YEAR IS 1904 and Australian diva Dame Nellie Melba, aka The Voice, is meeting in London with representatives of the Gramophone Company, later to become EMI.

Already an international star – her three-octave, pitch-perfect voice is described as “pure crystal” by French icon Sarah Bernhardt – Melba has her eye on the future.

Quick to recognise the potential of new technologies, Melba signs an agreement that will see her make more than 100 gramophone recordings over the next 15 years. Her polyvinyl discs are stamped with the distinctive mauve ‘Melba’ label and sold worldwide for a shilling more than those of other leading artists.

The contract is one of the earliest known for recorded music. It helps make the Gramophone Company a household name and cements the Australian soprano’s status as the most celebrated diva of her day.

The creative and business decisions of artists like Melba from the late 19th to the mid-20th centuries contributed to the development of Australian cultural identity and impacted strongly on the development of Australian copyright law, says UNSW Law Professor Kathy Bowrey.

“Melba had strong expectations of performance rights and was unusually strident in negotiating her terms of engagement,” Bowrey says.

Together with colleague Dr Catherine Bond, Bowrey is leading the first comprehensive history of Australian copyright law and its impact on our identity. The ARC Discovery project will look at five of our most acclaimed artists and “tackle front-on the vexed political question of how copyright works in practice to serve the mutual interests of Australian creators and media owners”.

Central to the study will be the UK’s *Imperial Copyright Act 1911*, which consolidated protection for literary, musical and artistic works. The Act remained in force in Australia until 1968 and “must have played a formative role in

establishing the Australian copyright industries and enhancing the bargaining positions of Australian creators”, says Bowrey. But to date little research has been done.

The artists chosen for the study are Melba; illustrator, writer and sculptor Norman Lindsay; filmmaker Ken Hall; composer Alfred Hill; and artist Albert Namatjira. Each is an icon in their field and international in scope. All were passionate supporters and promoters of Australian-made art and culture, and all left behind valuable copyright estates.

Lindsay’s remarkable and controversial career as a painter, etcher, cartoonist, writer, illustrator, war correspondent and ship-modeller, made him an obvious candidate, says Bowrey. There are numerous Lindsay biographies – including by COFA’s Associate Professor Joanna Mendelsohn, who will act as an expert cultural adviser on the project.

“Of those to be studied, Lindsay had the most intellectual approach to his art,” Bowrey suggests. “He engaged in what he called ‘journeyman work’ selling illustrations and stories for popular audiences to make a living, as well as engaging in higher-level discourse about Australian publishing and art; what Australian culture might be beyond the images of Billy Tea and gum trees and whether there could ever be a great Australian novel.

“His business relations were also managed largely by his family, and this raises typical copyright problems of artists as small business operators.”

Filmmaker and producer Hall initially made his mark remaking foreign films for Australian audiences in the late 1920s and early ’30s. Working as publicity director for Greater Union and the newly opened State Theatre in Sydney, he promoted Australian culture and film through works such as *On Our Selection* and *Strike Me Lucky*.

In 1925 he visited Hollywood and on his return set up highly successful film distribution networks. “His success contributes to concerns still current today about independent Australian filmmakers and how they can compete with Hollywood,” Bowrey says.

Hill was a major composer of Australian chamber music and was involved in the establishment of ABC Music programming when there was a lot of discussion about performance rights fees for broadcasting music. “His career raises questions about the rights of composers, public broadcasters and the role of collecting societies,” Bond says.

Perhaps Australia’s best-known Indigenous artist, Namatjira’s paintings “spoke of the Australian landscape and his success pushed along discussions about the legal status of Aboriginal people”, says Bowrey. “His is an interesting case study ... not in the least because he was granted Australian citizenship only as a result of his Australian and international profile as an artist.” His works have been widely reproduced for commercial sale as prints, yet there is no significant study of how the copyright



► Dr Catherine Bond and Professor Kathy Bowrey. Photo: Michele Mossop

was managed and who benefited.

Bond and Bowrey believe the combined case studies help to redress the traditional focus in copyright history on literary works alone.

“Crucially, all of the chosen creators engaged agents and managers here and abroad, leaving behind significant paper trails,” says Bond.

Following those trails will mean hours of painstaking work in public and private archives. The pair has already spent a week at the National Library in Canberra examining relevant materials including, notably,

a theatrical contract penned in the mid-1920s that refers to television.

“That shows that artists and managers were thinking strategically about setting up new cultural markets long before the technology’s full potential was known,” Bond says.

With Attorney-General George Brandis preparing to soon announce a comprehensive reform of the *Copyright Act*, the question of how copyright works to support Australian artists has gained added significance.

Bond believes a better understanding of copyright’s historic and cultural context can inform the conditions for commercial success today. Australian artists often earn very low incomes, with many living below the poverty line.

“A recent Australia Council study showed around a third of professional artists were members of copyright-collecting societies in 2010, but of these, over half did not receive any royalties in the previous 12 months,” she says.

An Australian Law Reform Commission inquiry into copyright law was recently tabled in parliament. Bowrey, who advised the inquiry, believes there are more complicated issues requiring attention than just piracy and movie downloading.

“Discussions about copyright shouldn’t be just about political agendas and the fights between Hollywood and Google,” she says.

What is brushed over most is the discussion of copyright’s cultural significance and how rights do and don’t work to support Australian cultural production.

“These stories we are putting together remind us that what artists think and do with their legal rights does ultimately affect Australian culture and how we, as Australians, think about our identity and our place in the world,” Bowrey says.

“Discussions about copyright shouldn’t be just about political agendas and the fights between Hollywood and Google.”

# THE ART OF WAR

Film developed for military surveillance gives a rose-tinted view of the conflict in Congo, writes Fran Strachan.

THE TRAGEDY OF WAR in the Democratic Republic of Congo is shockingly immediate when captured by the rose-tinted lens of photographer Richard Mosse.

The Irish-born artist has spent the past four years infiltrating armed rebel groups in the Congo, capturing their experiences in psychedelic colour on discontinued infrared film.

The resulting video installation, *The Enclave*, critically acclaimed at the 2013 Venice Biennale, is exhibited for the first time in Australia at the new Galleries UNSW.

*The Enclave* captures the violence and unexpected beauty of war on 16mm Kodak Aerochrome film. Originally developed for military surveillance, the film registers chlorophyll in vegetation rendering the Congolese rainforest as a surreal landscape of vivid magenta, pinks and reds.

Mosse says he was interested in the film's original purpose as a military tool, but was particularly drawn to its colour palette.

"I wanted to use the film as a way of thinking through this conflict and the rules and conventions of war photography," he says.

Visitors to Galleries UNSW at COFA will experience *The Enclave* via six double-sided, floor-to-ceiling screens and a multi-channel immersive soundtrack comprised entirely of Congolese field recordings.

The kaleidoscopic installation is intended to parallel the Congo conflict and encourages viewers to interact with the video from various vantage points.

Galleries UNSW director, Felicity Fenner, said Mosse's cinematic installation is the first international exhibition to be staged at the new venue, which opened last year.

"Mosse's innovative approach to documenting a complex and violent socio-political situation, together with the immersive environment of the multi-screen installation, will offer Sydney audiences an enthralling, though confronting, experience.



"COFA is proud to host *The Enclave* – it aligns with the research goals of our National Institute for Experimental Arts which aims to generate new insights into issues of global importance by bringing together art and technology."

Mosse hopes *The Enclave* will raise awareness of a "forgotten African tragedy" that has resulted in the deaths of at least 5.4 million people since 1998.

He told CNN he wanted to bring "two counter-worlds into collision: art's potential to represent narratives so painful that they exist beyond language, and photography's capacity to document specific tragedies and communicate them to the world".

Over the past decade New York-based Mosse has worked in Iran, Iraq, Ethiopia, post-tsunami Japan, the West Bank and Gaza, Lebanon, Syria, Cuba, Pakistan, Haiti and the former Yugoslavia documenting conflict zones and exploring themes of loss and memory.

COFA School of Media Arts Associate Professor Phillip George, whose own photography documents global conflict, says Mosse's work challenges accepted conventions of war photography.

"The landscape Mosse shows us is paradoxically beautiful, yet for those within it, toxic," says George.

"The surreal psychedelic palette acknowledges the psychosis, the catastrophe and the tragedy of a culture in collapse and Mosse demands us to witness the dissolve."

*The Enclave* runs until 7 June at Galleries UNSW, COFA.



▲ Portrait of Richard Mosse by John Holten, Goma, Nov. 2012.

► *Safe From Harm*, North Kivu, eastern Congo, 2012, digital C print, 48 x 60 inches. Member of Mai Mai Yakutumba, near Fizi on Lake Tanganyika, South Kivu. Photo: Image courtesy of the artist and Jack Shainman Gallery. © Richard Mosse.



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## MISSION POSSIBLE

UNSW researchers are leading the race to make the sci-fi world of quantum computing an everyday reality, writes Stephen Pincock.

FAY HUDSON is sitting in a narrow, ground-floor laboratory, peering at a fuzzy black-and-white image on a computer screen.

The long, windowless lab is lined with benches. Space is tight. Everyone wears white overalls, masks and goggles, like extras in some claustrophobic sci-fi movie.

Special lighting bathes everything in an eerie yellow glow to prevent ultraviolet light damaging

sensitive materials. From grills in the ceiling super-filtered air flows down to eliminate dust.

Hudson and colleagues at the Centre for Quantum Computation and Communication Technology (CQC<sup>2</sup>T) spend all day in this room, which is part of the Australian National Fabrication Facility (ANFF) at UNSW. The only thing that makes the trying conditions bearable is the knowledge they're at the cutting edge of science.

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