

R&D NOW



Curtin University

THE MAGAZINE OF CURTIN'S OFFICE OF RESEARCH AND DEVELOPMENT

WINTER 2015

If you start me app...

Is Perth Asia-Pacific's
answer to Silicon Valley?



Psychology

Understanding and eliminating human fear

Sustainability

Improving our long-term water security

Economics

The housing market and the Australian economy

CURTIN'S RESEARCH STRATEGY

Curtin is committed to achieving its vision for 2030: to be a recognised international leader in research and education.

Curtin will:

- strengthen as a research-intensive university
- attract and retain iconic scholars to undertake world-leading research in areas of global significance
- change lives in Western Australia, the nation and the world through high-impact research.

Curtin's status as a research-intensive university will be determined by the quality, scale and significance of its research, as assessed against national and international benchmarks.

The University will focus its resources to invest in areas of high-quality research and creative production that truly matter, generating outputs that have relevant and significant impact on communities. It will lead through the discovery and practical application of knowledge that addresses real-world issues and changes lives. It will excel in thought-leadership through creative expression and through our influence on public debates, changing the minds of decision-makers at all levels on issues that matter to society.

By increasing our investment in areas of strategic significance, Curtin will be home to a growing number of world-class researchers who will deliver research of greater global impact than ever before.

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OUR AREAS OF STRENGTH

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HEALTH

R&D WINTER 2015 OVERVIEW

Computational modelling, data analytics and visualisation will be fundamental to Curtin's research for the next decade.

As we await the Australian Research Council's Excellence in Research (ERA) report for 2015 – the first national audit of research performance since 2012 – we can reflect on some extremely encouraging results for Curtin from 2014 and early 2015.

Curtin's research income – one of the key measurements of research performance – increased approximately 12 per cent in 2014, to \$80.5 million. This represents the second year of growth over 12 per cent and in 2013, the last year that national data is available, Curtin placed twelfth out of the Australian universities in terms of research income. This was partly due to excellent growth in Australian Competitive Grants received, with a 34 per cent increase on 2013. Equally significant is Curtin's increased share in the total pool of research funding for the Australian universities, which will become an increasingly important indicator as we strive to be amongst the top ten universities in Australia for research.

Our improvement in research performance has been recognised by the Academic Ranking of World Universities, which promoted Curtin more than 100 places in 2014, to 303rd in the world, placing us in the top two per cent of universities worldwide.

Our growing strength in radio astronomy has been well documented, and has been one of the drivers for this growing international reputation.

As development continues on the world's largest radio telescope, the Square Kilometre Array (SKA), our expertise in the field is helping advance the related area of 'big data', which is critical to the success of the SKA, but also beneficial to many other research areas that require supercomputing. See page 2 for some of the projects that are benefiting from Curtin's supercomputing capability.

Indeed, computational modelling, data analytics and visualisation will be fundamental to Curtin's research over the next decade. The recently-launched Curtin Institute for Computation draws together expertise from across the University and will showcase Curtin's capabilities in these areas. See page 2.

I am also excited at the launch of the Cisco Internet of Everything Innovation Centre in July, which will have nodes at Curtin University and Sydney technology company, Sirca. The centre will create a 'connected community' focused on leveraging cloud, analytics, cyber security and Internet of Things network platforms. The initial focus will be to create solutions for important Australian industries such as resources, agriculture and astronomy.



The Cisco centre is just one example of innovation at Curtin helping to solve relevant industry problems. In February, Curtin spin-off company Renergi was awarded \$5.2 million to continue development of its liquid biofuels program, which will help to reduce emissions, improve energy security and contribute to regional development.

The team behind Renergi – Curtin's Fuels and Energy Technology Institute (FETI) – have more reasons to celebrate, with one of their postgraduate students, Xin Shao, winning the JCEC (WA) Postgraduate Research Excellence Award for 2015, which recognises the best chemical engineering research being conducted by postgraduates in Western Australia. Congratulations to Xin and his supervisors at FETI.

I would also like to congratulate Professor Fuming Jiang from the School of Management who was ranked number one in the world for research into China's outward foreign direct investment and Chinese multinational enterprises.

In geoscience, Curtin Professor Zheng-Xiang Li has been invited to lead a major international project titled, 'Supercontinent Cycles and Global Geodynamics', sponsored by UNESCO and the International Union for Geological Sciences. This is an outstanding achievement and follows the naming of Professor Li, along with fellow Curtin geoscience researcher Professor Simon Wilde, as one of only three Australian geoscience researchers on the Thomson Reuters Highly Cited Researchers list.

Our young scientists continue to impress, with Dr Eva Alvarez de Eulate, a research associate in the Department of Chemistry, and PhD candidate Mark Zammit from the Department of Imaging and Applied Physics, selected to join other top young international scientists at the Lindau Nobel Laureate Meeting in Germany in June.

Finally, Dr Gayle Maloney, Curtin alumna and Perth clinical psychologist, has been awarded a prestigious Fulbright Scholarship, which will see her travel to Yale University to conduct research into obsessive compulsive disorder (OCD). Congratulations Dr Maloney.

I hope you enjoy this edition of R&D Now.

Professor Graeme Wright
Deputy Vice-Chancellor
Research and Development

research.curtin.edu.au

Supercomputing

FROM THE MIDST OF MOLECULES TO THE ENDS OF THE UNIVERSE

At any one time, about 100 Australian science research projects are using the Pawsey Supercomputing Centre.

The new Pawsey Supercomputing Centre is a \$90 million resource that caters for the supercomputing, visualisation and data storage requirements of researchers across the country.

Located at Perth's Technology Park, the centre houses several high-end supercomputing and data storage units. Among these is the Magnus 'petascale' computer that recently debuted at number 41 on the world's Top 500 list of supercomputers.

Magnus hails from the latest generation of Cray XC40 supercomputers, and is currently the most powerful scientific supercomputer in the Southern Hemisphere.

"Supercomputing provides faster analyses and enables researchers to develop new approaches for particular tasks," says the centre's Executive Director, Dr Neil Stringfellow

"A system like Magnus allows researchers across the entire range of scientific fields to dramatically increase their research aspirations and the scope of their projects," Stringfellow says.

The new Pawsey Supercomputing Centre has emerged from the rebranding of the iVEC joint venture, which began providing researchers with advanced computing capabilities in 2000. iVEC was also responsible for managing and operating the Pawsey Centre that was established at Perth's Technology Park in 2011 with ongoing financial support from both the state and federal governments, CSIRO, Curtin University, The University of Western Australia, Edith Cowan University and Murdoch University.

A recent announcement by the WA State Government of a commitment of \$21.6 million will see the Pawsey Centre funded until 2021, a move extremely welcomed by the Western Australian scientific community.

pawsey.org.au

Not small at all

Even research at the molecular level can demand supercomputer power. John Curtin Distinguished Professor Julian Gale typically uses computer simulation to investigate molecular structures, dynamics and energetics. Because all of his research is computational, supercomputing facilities are essential to his projects.

Gale and Dr Paolo Raitieri, both from the Nanochemistry Research Institute, are currently undertaking fundamental research into the process of biomineralisation. At the Pawsey Centre, their group is running molecular dynamics simulations to study the formation of calcium oxalate, which is a common component of kidney stones, and the surface growth of carbonate minerals, which will inform processes such as long-term carbon sequestration.

Breathe in ... breathe out

Aided by the power of the Pawsey Centre, a Curtin project is investigating the internal flow patterns and deposition of particles in human lungs. Associate Professor Ben Mullins is an environmental engineer specialising in aerosol science. Based at Curtin's Department of Health, Safety and Environment, Mullins and his team are using computational fluid dynamic (CFD) simulations to study respiratory airflow.

Together with Dr Andrew King from the Fluid Dynamics Research Group, the team used 3D computed tomography scans to create 'breathing' models of lungs. Solving these models requires a supercomputer to cope with the computationally intensive calculations. The team's research will inform several areas of respiratory health, including aerosol drug delivery, invasive lung surgery and the deposition of air pollutants in lungs.

Wave on

Industry-led projects are also benefiting from the superior research capabilities that supercomputing enables. In addition to his work with the respiratory airflow team, Dr Andrew King is assisting Bombora Wave Power in its development of an innovative wave-energy system.

The system comprises a large membrane, air circuit and turbine to concentrate, collect and convert the ocean's wave energy into electricity. Using CFD simulations developed on the Pawsey Centre supercomputers, King is able to predict the pressures acting on the membrane, the effects on the wave field, as well as the power output of the devices.

Double data

The Pawsey Centre's first 'Big Data' user is the Murchison Widefield Array (MWA) radio telescope project, led by Professor Steven Tingay from the Curtin Institute of Radio Astronomy.

The MWA surveys the Universe from a site in WA's Midwest, and the vast data sets that are generated travel 800 kilometres over an optic fibre network to the Pawsey Centre. There, the data is archived and made available to international teams working on 24 large-scale projects in radio astronomy.

The MWA is the first precursor for the Square Kilometre Array (SKA) international mega-science project to be fully operational. When completed, the SKA's linked arrays will span Australia and South Africa, and create the world's most powerful radio telescope.

Supercomputing is critical for these next-generation radio telescopes, and the Pawsey Centre is expected to host the Science Data Processor for the Australian component of the SKA.

Curtin Institute for Computation

The Curtin Institute for Computation (CIC) has been established to bring together the University's range of capabilities in computation, and to harness the resources of the Pawsey Supercomputing Centre.

Computational chemist Professor Andrew Rohl has been appointed inaugural Director of the CIC. Through his six-year leadership of the iVEC – an unincorporated joint venture of Western Australia's four public universities and CSIRO – Rohl has been instrumental in establishing the world-leading Pawsey Supercomputing Centre.

"Large and complex data sets are providing new challenges and exciting opportunities to exploit the analytical and computational resources available," he says.

"The Curtin Institute for Computation provides an excellent opportunity to harness computational resources both in WA and internationally."

computation.curtin.edu.au

Energy

With newly-announced support from the Australian Government, Curtin spin-off Renergi is set to develop liquid biofuel technology in a state-of-the-art facility in Perth.

Curtin University spin-off company Renergi has been awarded a \$5.2 million grant by the Australian Renewable Energy Agency (ARENA) to design and construct an innovative pilot scale biofuel demonstration facility.

The company is currently developing energy-efficient biomass gasification for distributed power generation. The funding will allow the company to diversify into the production of liquid fuels.

The facility, which has an estimated cost of \$12.9 million, is expected to begin production in October 2017. It will use a specially designed and constructed pyrolysis unit, which will be able to convert

100 kg of biomass per hour. It will also be equipped with a supplementary 20-litre-per-hour biorefinery unit.

Lead researcher, John Curtin Distinguished Professor Chun-Zhu Li, from Curtin's Fuels and Energy Technology Institute, said the project aims to develop an advanced biofuel technology for the production of economically competitive, low emission, drop-in liquid biofuels from non-food biomass.

"Commercially competitive technologies that convert biomass into advanced biofuels and biochar could help to significantly reduce carbon dioxide emissions, improve energy security and contribute to regional development," Professor Li said.

"The information obtained during the project will be used in the future design and operation of advanced biofuel production systems that use the new technology.

"When commercialised, this new biofuel technology could significantly increase the production of advanced biofuels to meet Australia's needs for green liquid fuels and carbon emission reduction.

"The new technology will also help to make mallee planting an economically feasible means to combat dryland salinity that is a severe environmental problem threatening the future of Australian agriculture and regional areas."

Renergi Chairman Rod Hayes thanked ARENA for its strong support of Australian renewable energy technology and said the technology being developed was ideal for small-scale applications close to sources of biomass.

"Successful development of an effective bioenergy technology could have significant export potential as well as advancing the Australian biofuels industry," Mr Hayes said.

arena.gov.au

\$5 MILLION BACKING FOR LIQUID BIOFUEL

ABOUT RENERGI

Renergi is a start-up private company established in 2012 to commercialise a suite of energy technologies developed in the Fuels and Energy Technology Institute in Curtin University. The current technology foci in Renergi includes biomass gasification for distributed power and heat generation, biomass pyrolysis and refinery for the production of biochar, bio-oil and advanced biofuels, and co-firing of biomass with coal in the existing coal-fired power stations.



Sustainability

The quest for a climate-independent water source for Perth has generated new capabilities in analytical chemistry and increased public confidence in water recycling technology.

The Curtin Water Quality Research Centre (CWQRC) is being supported by the Australian Research Council (ARC) on a project that aims to improve rural long-term water security.

The ARC Linkage project, which also involves Western Australia's Water Corporation and Water Quality Research Australia Ltd, is studying recycled water in rural areas for non-potable reuse applications, such as irrigation.

The research will utilise a suite of analytical methods the CWQRC developed for determining micropollutants in source waters and treated wastewaters, which was enabled by an array of instrumentation acquired largely through ARC Linkage Infrastructure, Equipment and Facilities grants.

As an alliance between Curtin and Water Corporation, the centre contributes its analytical expertise to projects that inform water reuse options in WA.

Through a previous ARC Linkage project, the CWQRC was able to support Water Corporation's recent Groundwater Replenishment Trial (GWRT) with studies of chemical removal in key treatment processes.

The trial concluded a 10-year investigation into the feasibility for indirect potable water reuse (IPR) in Perth, and has led to the full-scale groundwater replenishment scheme that is now under construction.

Representing a new climate-independent water source for Perth, the groundwater replenishment process involves treated wastewater being further treated to drinking water standards, and then recharged into an aquifer for later use as potable water.

The Curtin team's contribution to the GWRT followed on from their role in a major collaboration to determine the monitoring requirements for wastewater treated with microfiltration and reverse osmosis (RO) for aquifer replenishment.

Supported by the Premier's Collaborative Research Program, the project involved the CWQRC developing analytical methods for more than 200 chemical micropollutants.

"This was the first project in Australia to study large-scale indirect potable water reuse," explains Associate Professor Cynthia Joll.

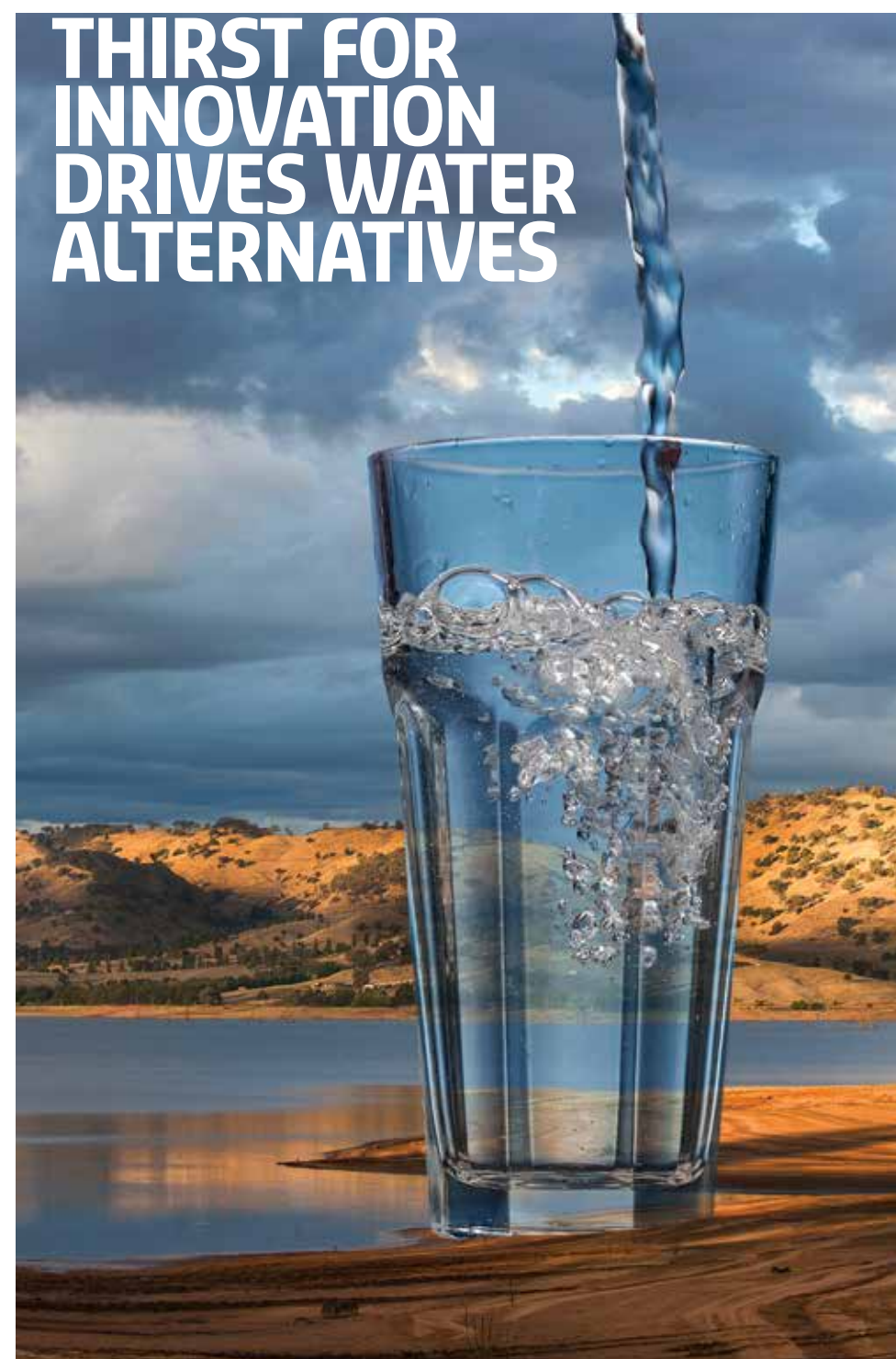
"Treated wastewater was characterised over two years for these micropollutants, and the data used to assess the chemical risk of this water type.

"The testing regime was also applied to a pilot RO-based system to simulate advanced wastewater treatment.

"It enabled the State Government to establish health and environmental specifications for IPR – the first in Australia, in fact – and demonstrated the viability of a GWRT."

The Curtin team is also working with researchers at the University of Queensland on new monitoring methods, using cell-based bioassays in tandem with chemical monitoring, to ensure that recycled water is safe for IPR.

cwqrc.curtin.edu.au



Profile

Professor Patricia Price

Principal Research Fellow at the
School of Biomedical Sciences
Faculty of Health Sciences

Professor Patricia Price joined Curtin's School of Biomedical Sciences in 2015 as a principal research fellow. She designs and conducts studies investigating individual differences in responses to an infectious agent, such as HIV, cytomegalovirus (CMV) and non-tuberculous mycobacteria.

Price is currently analysing the pathological effects of CMV on individuals infected with HIV. CMV is a common virus that is relatively benign to healthy individuals, but far more severe for those whose immune system has been compromised by HIV. She has primarily been conducting these studies in a developing world setting, where co-infection with HIV and other viruses frequently occurs.

Her most recent project, called JakCCANDO (Jakarta CMV, Cardiovascular, Antiretroviral, Neuropathy, Dental, Ophthalmology), is based in Jakarta and has been organised in collaboration with the University of Indonesia.

The project examines 82 HIV patients, testing their oral health, neurocognitive status, cardiovascular system and retinal health as they respond to antiretroviral therapy. The aim of the project is to detect CMV reactivation in HIV patients and to compare the state of their immune systems to healthy individuals. The project is scheduled to continue for three to four years.

Professor Price's research into cases of HIV could lead to improved care for HIV patients in Indonesia and countries with a similar patient profile, including the early identification of patients likely to have oral health, neurocognitive or cardiovascular problems as they respond to HIV therapy. As part of her research, she also trains Indonesian doctors and scientists so they can design locally relevant research projects.

Professor Price has received funding from the Goodeve Foundation, AbbVie and the University of Indonesia for JakCCANDO, while her Australian research investigating the role of CMV in the long-term outcome – including the development of cardiovascular disease – in healthy ageing and renal transplant patients has received National Health and Medical Research Council funding.

Professor Price received her PhD in immunology from The University of Western Australia (UWA) and has published over 200 papers in peer-reviewed journals. Prior to taking up her position at Curtin, Professor Price was employed at UWA, teaching the undergraduate immunology course and coordinating the honours course and master degree for the School of Pathology and Laboratory Medicine.

Psychology

NOTHING TO FEAR BUT FEAR ITSELF

Fear and phobias are the most commonly reported mental disorders in Australia. A closer look at the psychophysiology of fear is expected to lead to better treatments for anxiety-related disorders.

It is now well accepted that fear and other emotions are learned behaviours, which respond well to behavioural interventions such as cognitive behavioural therapy (CBT).

It is therefore perplexing and frustrating to clinical psychologists and their patients when treatment success is short-lived.

Professor Ottmar Lipp is analysing the basis of exposure-based treatments – an essential part of CBT – as a start to understanding why fears re-emerge some time after successful treatment.

“The rate of relapse is significant. The current explanation is that while a regime of ‘safe’ exposure provides a new, non-threatening association to the feared stimulus, it is an additional meaning that temporarily dominates but cannot eliminate the original fear memory,” he explains.

“However, recent findings challenge this view, and this is influential because key aspects of fear are not well understood.

“We need to revisit the theories on evaluative conditioning – how stimuli acquire positive or negative meanings – and the re-consolidation of fear memories.”

Lipp has a notable record of research in the field of psychology. In 1990 he left the University of Giessen in Germany for the University of Queensland, before joining Curtin's School of Psychology and Speech Pathology in 2014.

Lipp's current research on anxiety is supported by the Australian Research Council as a Discovery Project, and is the first project to use the new Psychology Experimental Research Laboratories at Curtin (PERL-C). With eye-tracking instrumentation and EEG equipment for recording brain electrical activity, PERL-C is an important resource for psychophysiological research.

At the laboratories, groups of participants will undergo various combinations of fear conditioning and extinction phases, involving visual and auditory stimuli, with assessments of electrodermal and startle responses providing the measures of fear learning.

Titled, ‘The extinction of human fear’, the project is important for several reasons.

“Our key aims are to understand why fears re-emerge, why some types of fears are resistant to extinction training from the outset, and why irrational fears persist over time,” Lipp says.

The findings may also explain why people are less fearful in situations that statistically pose a greater risk of harm (for example, road travel) than in those that actually pose little risk, such as encounters with spiders and snakes.

“Animal-based fears are more resistant to extinction than social-based fears and seem encapsulated from cognition. This suggests different learning processes for biological fears and social-based and other classes of fear,” Lipp says.

“This is basic research, but it will lead to the development of better clinical treatments for anxiety-related disorders.”

UPWARDLY MOBILE

Associate Professor Mike Dockery's research is challenging the belief that high levels of mobility among Aboriginal people in remote Australia reduce their educational, employment and housing opportunities.

A labour-market economist at Curtin Business School, Dockery believes that mobility is important for the self-identity and wellbeing that is fundamental to socioeconomic participation.

"For generations, governments have dispensed remote-area policies from Canberra through conventional models of service delivery that don't accommodate population mobility," he explains.

"But, in empirical terms, not enough has been known about temporary mobility, and policies are under-informed and perhaps in some cases even misdirected."

As part of the Cooperative Research Centre (CRC) for Remote Economic Participation, Dockery is managing a 'mobility survey' of more than 500 people from 20 remote Aboriginal communities based around the Alice Springs Region of the Northern Territory.

The project was established under the CRC, which is overseen by the organisation Ninti One, with Dockery subsequently appointed as Principal Research Leader.

Quarterly surveys commenced in mid-2014, in collaboration with local Aboriginal community researchers, and will continue until the end of 2016 when the final data analysis will commence. However, Dockery believes the project's evidence to-date can now prompt an appraisal of policies that impact mobility.

"If we accept that, overall, policy objectives are to optimise capacity, empowerment and wellbeing, mobility must be legitimised and accommodated," he says.

"Periodic travel isn't 'idle wandering'; it is connected with visiting homelands – which are well-defined geographic areas, visiting family and friends, attending cultural events, and hunting or collecting bush tucker.

"Kinship, culture and country remain central to mobility, and legitimising mobility will enable improved planning and decision-making by communities, service providers and employers."

He emphasises the need for policies that foster employment opportunities in local industries that can accommodate mobility, such as art and tourism, and those that strengthen locally staffed services.

One policy area relates to the difficulty in acquiring and retaining a driver's licence, which bears strongly on job prospects.

"Remote-area services is another area for attention," Dockery says.

"Changes to health services are having a major impact because fewer local Aboriginal staff are employed in health facilities, and people refrain from seeking treatment from unfamiliar, high-rotation staff flown in and out from distant towns."

Titled, 'Population Mobility and Labour Markets', the project is supported by the Tangentyere Council, Central Land Council, Northern Territory Government, Charles Darwin University, University of South Australia, Australian Bureau of Statistics and Australian Government Department of the Prime Minister and Cabinet.

crc-rep.com/research/regional-economies/population-mobility-and-labour-markets
nintione.com.au

Professor Simone Pettigrew is investigating what can be done to encourage more intense physical activity amongst seniors.

We have an ageing population. Medical advances have increased longevity and improved survival rates for historical killers such as cardiovascular disease and cancer. Unfortunately the social and economic ramifications of a large retired population are only starting to be felt.

It makes sense for our ageing population to stay active, healthy and as functional as possible: there are obvious quality of life benefits for the individual, and economic benefits such as reduced medical costs and higher productivity for society as a whole.

Physical activity is recognised as a critical component of healthy ageing, providing benefits including better working memory, lower risk of Alzheimer's disease, reduced risk of depression, and lower risk of cardiovascular disease, diabetes, cancer and hip fracture. Active seniors are better able to perform the functional tasks of daily living, recover more quickly from illness and surgery, and have higher rates of survival.

Professor Simone Pettigrew, in Curtin's School of Psychology and Speech Pathology, and Director of the Western Australian Cancer Prevention Research Unit, is studying the mental, physical

and emotional health of our seniors. By tracking a cohort of 400 participants over the age of 60, she will assess their levels of physical activity against population averages and Australian guidelines, and gather evidence on the most effective ways to encourage the adoption of lifestyle behaviours that reduce their risks of ill health. She is particularly interested in working out what health promotion messages seniors are taking in and acting on, and what can be improved.

Although only in the initial stages of her ARC-funded project, some trends are already emerging. "Many seniors have quite low assumptions about the required level of physical activity. You say 'exercise' and they think 'walking'. Virtually all of the activity they do is light intensity. They have internalised the message that moderate or vigorous activity is not for their age group. Whereas their hearts, bones and muscles will all benefit from more intense exercise, as long as they can work into it safely," explains Pettigrew.

"There is also a huge evidence base identifying a need for weight-bearing, resistance exercise – activities that improve muscle and bone density. But that message isn't out there either. So we'll be investigating better ways of communicating and encouraging that."

"One issue working against us is that society as a whole is telling seniors to slow down, to 'take it easy'. We build retirement lifestyle villages with no steps, no slopes, everything on hand. We're basically de-skilling our seniors. We need to encourage not just older people, but also their families and communities, to make an effort to improve their physical activity."

THE HILL OVER JOGGING



CLARITY BEGINS AT HOME:

THE LINK BETWEEN HOUSING > AND THE AUSTRALIAN > ECONOMY

With mortgages and rent making the greatest demand on Australian wages, it may come as a surprise that the relationship between housing and the economy hasn't received the attention it deserves. Associate Professor Rachel Ong's research aims to address that.

While the UK and other countries have completed timely assessments on the impact of housing on their economies, Australia has been more interested in the social objectives of housing policy.

"Australia lacks in-depth assessments of housing policy issues within an economic framework," explains Associate Professor Rachel Ong, at Curtin Business School.

"It's clear that housing contributes more to Australia's monetary position that it did 10 years ago – because the RBA [Reserve Bank of Australia] talks more about house prices than it did 10 years ago.

"But policymakers have not paid enough attention to the role of house prices and rents and housing supply and demand, and their interrelationship across markets," she says.

Now, Ong is now leading a comprehensive research program into the links between housing and economic growth.

The research will study a complicated web of mechanisms, including employment participation, mobility, housing supply and wealth effects. Accordingly, the inquiry has a multidisciplinary, 18-member team of economists, urban planners and sociologists.

The project is being funded by the Australian Housing and Urban Research Institute, and is expected to provide the empirical evidence to support housing policy reforms.

"The research is critical in stringent fiscal times, as we currently have, because governments will prioritise sectors they expect to impact economic growth in well-defined ways," Ong says.

"Housing is having an increasing fiscal impact in Australia, and wide-ranging housing policy reform is needed. This will, in turn, promote labour force participation and economic growth."

Teams drawn from the Bankwest Curtin Economics Centre, Curtin's School of Economics and Finance, RMIT, Sydney University and Reading University in the UK will undertake several interlinked strands of research.

The first strand will study the links between housing and the labour market, including the impact of housing on the acceptance of job offers and the capacity to relocate for employment.

The second strand will study the impact of housing supply on economic growth.

"This is a complex area," Ong says. "What planning regulations, for example, are hindering or promoting growth?"

"There are challenges for townships that are hosting employment but not the housing of workers. This may be due to company employment practices, or a lack of quality housing, or construction issues such as cost and availability of materials and labour."

"The impact of housing on a 'distant' labour supply – fly in, fly out, for example – has consequences for personal wellbeing and mental health, and this may affect workforce participation."

The third strand will study the macroeconomics of housing market processes. A key focus will be the broad welfare role of housing in Australia.

"The primary home is the greatest financial asset of most home-owners, and housing wealth accumulation is influential," Ong says.

"It enables homeowners to increase their borrowing to finance consumption; but does this reduce economic stability, as evidenced by house-price volatility during the Global Financial Crisis?"

"In addition, large capital gains from housing – which the baby-boomer generation has acquired – are a likely contributor to early retirement and labour force reduction."

The fourth strand will consider the relationship between housing and the economy through a governance framework.

"We need to assess how Australia's three-tier system of governance influences the ways in which housing affects economic growth," Ong explains.

"Then we can determine how housing policy can be harnessed at multiple levels to improve economic productivity."

ahuri.edu.au/publications/2015_research_projects

Profile



Associate Professor Rachel Ong

Principal Research Fellow
Bankwest Curtin
Economics Centre

Associate Professor Rachel Ong is an expert in policy areas of housing, ageing and labour economics. Internationally regarded, she has collaborated on UK and Canadian projects, and is currently serving on the steering committee for the Asia Pacific Network for Housing Research.

In Australia, Ong is known for her research on the effects of housing affordability and tenure on retirement wellbeing, child development and economic participation.

She is particularly interested in economic policies relating to older Australians, including the impacts of the tax and welfare system on their workforce participation, and the use of housing equity for consumption in retirement.

The Australian Housing and Urban Research Institute has funded much of the research Ong has undertaken following her PhD in Economics from Murdoch University in 2005. Since joining Curtin Business School in 2007, she has amassed 28 peer-reviewed journal articles, including a 2014 paper on the loss of home-ownership of older Australians, published in the international A*-ranked Urban Studies.

With Australia's ageing population a key consideration for many areas of federal and state economic policy, Ong's expertise is in demand. She is currently serving on the Commonwealth Treasury's Housing Research Panel.

In 2014, Ong was an invited participant at the Canberra symposium on 'Population Ageing and Australia's Future' hosted by the Academy of the Social Sciences in Australia.



IF YOU START ME APP...

Four years ago, Curtin initiated and sponsored WApps, a competition between the four Western Australian public universities to recognise and support entrepreneurial talent in digital technologies. Fast-forward to 2015, and the awards, now known as the OzAPP Awards, have grown to become a significant focal point for the startup community in the Asia Pacific.

Held in February, the 2014/15 OzAPP Awards featured 210 startups from across Australia and eight countries in South East Asia. Competition judges from the US, Hong Kong, Singapore, Indonesia, Thailand and Australia had a difficult time choosing between the most exciting and innovative mobile, web and cloud app concepts.

Winners Kindy took out the QPrize Australia, a USD \$100,000 convertible note from competition sponsor Qualcomm Ventures, helping them to further develop their business into the global marketplace. In addition to winning the biggest prize for a startup competition in the region, Kindy will now have the opportunity to pitch against other regional startup winners for the global QPrize in San Diego, California in September.

The competition aims to foster dialogue and collaboration between innovators, researchers, entrepreneurs, investors and industry, and to further stimulate innovative business culture, particularly in the digital and ICT space, around Australia.

The success of the awards inspired Curtin to launch the West Tech Fest: an event that includes the OzAPP Awards judging, presentations from globally recognised speakers, angel investment dinners, innovation roundtables and a startup village.

The West Tech Fest partners with Mai Tai Australia, a community of entrepreneurs, innovators and athletes, founded by Silicon Valley angel investor Bill Tai and professional kitesurfer Susi Mai, that has launched more than 20 startups in the past two years.

ozapp.com.au

Search YouTube for West Tech Fest

Kindy

Kindy is the simplest way to find quality, affordable and local childcare. Parents can post their requirements and search by location, budget and a range of preferences such as age, experience and qualification level. Background checks are automatic, as are notifications of potential matches. Bookings and payment are simple clicks, and local carers and parents can connect with messaging and group chat.

kindy.com.au

Freight Exchange

Freight Exchange is a digital marketplace where freight transport carriers can sell excess capacity to businesses that need to ship goods. Thirty per cent of freight capacity in Australia is unused, but the carriers travel the route regardless: Freight Exchange helps fill their loads, lowering industry costs across the board.

freightexchange.com.au

Joy Sprouts

Joy Sprouts is a games and activities app that develops a range of important skills for children, encouraging total childhood development and giving preschoolers a head start on successful learning. Personalised reports give parents a better understanding of their child's unique learning behaviour and progress.

joysprouts.com



APE Mobile

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apemobile.com



JOBDOH

JOBDOH is a location-based, on-demand mobile platform to book best-fit temporary workers. It targets the food and beverage, hospitality and exhibition industry in Hong Kong.

jobdoh.com

搵兼職



LOOKING WEST
THE TELL-ALL TALE OF WESTERN AUSTRALIA

A collaboration between Curtin University and literary magazine Griffith Review has produced a book exploring the complex dynamics of Western Australia.

The new publication, *Griffith Review 47: Looking West*, focuses on the shifting pace of change in the west, reappraises what makes Western Australia distinctive and speculates on how the future of the state may unfold.

Looking West brings together the work of 42 contributors who provide rich insight into the history, environment, politics and creative impulses that inform and define the state.

The book features renowned writers including Curtin academics Professor Kim Scott and Dr David Whish-Wilson, and alumni Brooke Davis and Tim Winton (in interview), contributing to a mix of essays, memoir, reportage, short fiction and poetry.

Co-editor of the book, John Curtin Distinguished Professor Anna Haebich, says the new publication will challenge readers' views as to what they think about WA.

"*Looking West* features an eclectic range of essays exploring the development and the dispossessed; immigrants and Indigenous;

corruption and conservation; creativity and isolation all the way through to WA's iconic Christmas trees; AFL football and sharks," Haebich says.

Through some of the state's most talented writers and commentators, *Looking West* examines WA's past, present and future.

"WA is central to national prosperity, and Perth has grown into a boom town the likes of which Australia hasn't seen since the 1850s, so it is important to try to understand the complex dynamics of the state, beyond the headlines," Griffith Review Editor Professor Julianne Schultz says.

"In 2013 Griffith Review published *Tasmania – The Tipping Point?*, which went on to become our bestselling edition to-date, it made sense of Tasmania to locals and others, and we expect the interest in *Looking West* to be just as strong."

The Governor of Western Australia, Her Excellency the Honourable Kerry Sanderson, launched the book in February.

Looking West is on general sale across Australia, for \$27.95 (print) with digital editions available from Griffith Review online.

griffithreview.com



Through 3D visualisation of 'risk maps', Professor Fran Ackermann is helping project managers keep complex projects on track.

Complex construction projects such as airports or railway lines are often in the media for all the wrong reasons: substantial delays and massive cost overruns.

Dean Research and Development of Curtin Business School Professor Fran Ackermann began modelling disruption and delays in complex construction projects in an attempt to help project managers understand how overruns can grow well beyond anticipated contingencies, even though the 'problems' are often understood.

"It is difficult to work out the escalatory nature of construction delays," Ackermann says.

"But we could see that triggers such as the delayed provision of materials, information or approvals, or changes of scope, interacted with many other activities and led to dynamic patterns of behaviour. Most risk management techniques work on the assumption that risks exist independently of each other, but they are often interdependent, and exponential in impact."

Ackermann has since developed a range of tools to better support complex decision making in project management. She runs risk workshops both before and during projects that go beyond the usual consideration of technical and financial risks. Problems arising from different perspectives, politics, organisational goals and working cultures are captured from engaging all stakeholders, from suppliers to consultants, governmental authorities and the general public.

Participants anonymously contribute their ideas through a laptop with the material being displayed on a public screen in a clustered format.

"This is much more efficient as everyone is contributing at the same time, and it also provides a richer, more 'honest' set of risks, because people feel they are in a safer environment to discuss potential problems," says Ackermann.

Seeing risk clusters developing also prompts participants to make further contributions as new topics are generated and missing areas become obvious. Participants then explore how the various risks impact on each other: a supplier going out of business may impact on engineering design, or a change in government may affect

funding allocation. The risks become a network of interrelated possible events, creating a 'risk map'.

The mapping technique captures multiple perspectives in a structured manner, developing a comprehensive and shared view of the situation. The resulting map allows managers to easily analyse the risks and prioritise tasks accordingly.

Ackermann has recently begun to visualise risk maps in three dimensions using Curtin's HIVE facility.

"You can see discrete branches develop bounded areas that should be easy to parcel off and manage as a related set of risks. 'Hot spots' are obvious – pivotal events where the domino effect through the rest of the network is massive. As the facilitator with access to the complete dataset, I can also identify when a problem emerged, whether it is a universally held view, or limited to a particular group of stakeholders."

"Being able to visualise the risk network, the interdependencies, is a very powerful tool. It is great for getting people to engage and build consensus as to how to manage the truly critical risks."

TITLE
RISKY BUSINESS

Author: CURTIN UNIVERSITY

Date: JUNE 2015

Research area: PROJECT MANAGEMENT

Drawn by:
PM

Checked by:
JL & AS

Scale 1:1000 @A4



Q+A

with **PROFESSOR PETER MOORE**

In 2014, Professor Peter Moore was appointed as the Executive Director of Strategic Engagement for Curtin Business School. This follows an earlier appointment as Chair of the Curtin Graduate School of Business. His role is crucial in linking Curtin with senior levels of business and government in WA – in particular, the oil and gas sector.

Professor Moore holds a PhD from the University of Adelaide and an MBA from the Mount Eliza campus of Melbourne Business School. Before joining Curtin, he was an executive vice president at Woodside.

After a long, successful career in the oil and gas industry, what do you hope to achieve for Curtin?

After spending the best part of a 35-year career across three companies – six years in the Cooper Basin, 12 years at Exxon and 15 years at Woodside – I want to give something back to the industry and the general community, and working with the university is a good way to do this. It allows me to pass on some of the business experience that I gained over a lifetime.

A core interest of mine is linking universities more closely with business and Curtin is an excellent place to do this. Another way I can help is to look across all the oil and gas activities at Curtin and unite them in a common focus around delivering excellence in oil and gas to a state and nation that really needs it.

Have you always had a passion for establishing a dialogue between industry and academia?

Education is a long-standing tradition in my family. A generation before me, my family was at university, my brother had a life-long involvement with university and I enjoyed studying for a PhD, publishing quite a lot at the time. I subsequently studied an MBA. At Exxon, I was the head of Global Studies and worked closely with organisations like the Energy Geoscience Institute, one of the biggest university-based institutes in the US focused on oil and gas; and we would look for new science advances and new opportunities around the world. It was incredibly interesting and I've always strived to maintain a link between industry and research. Another strong link was my role within Exxon's Exploration Technology Division, which was focused on technological implementation, working closely with their pure research arm, EPRCO.

As someone who's had the opportunity to sit at the other side of the table, how is Curtin regarded in the oil and gas industry?

Very well. It's well known that our Faculty of Science and Engineering is one of the largest in the country. At Curtin Business School, we have Australia's only MBA in oil and gas. In the Faculty of Humanities, we are very strong in *Lean* construction and building information modelling (BIM). We have strengths in petroleum engineering, chemical engineering, corrosion, and we're probably the strongest in the country in terms of pure geophysics. Our graduates are known to be geologically, mathematically and geophysically strong, and certainly at Woodside, Curtin was a preferred candidate for supplying these high-end graduates.

What does the recent downturn in oil and gas mean for the tertiary education sector?

The oil price used to be around A\$115 a barrel, and now it's around A\$60. It's certainly a challenge, and everyone's trying to predict how long the downturn will be, but it's also a great opportunity, because during times of great profits and easy money, companies are often more inclined to do their own thing and don't feel the need to collaborate.

I sense a change in that attitude – a tremendous need to collaborate within the industry and with academic bodies like Curtin to provide research around improving productivity and lowering costs. Developing new technologies will help make things more efficient and safer, generally improving business economics.

What are some of the key oil and gas technologies that will be a focus for Curtin?

The oil and gas 'Plant of the Future' won't just have better pipes: it will be more intelligent, self-monitoring and self-adjusting. It will have better sensors and better connectivity, yielding up big data that needs sophisticated data analytics. It will need some of the sensors that our BIM researchers are developing, it will need to detect corrosion earlier, it will need advanced mathematics, and it will need the advanced computing similar to what we have available through the Pawsey Centre.

These integrated projects are very complicated, but they give the opportunity for Curtin to work with companies like Cisco, Woodside, Chevron and Shell as just a few examples, combining our skills in the humanities, business and engineering disciplines to produce a superior outcome.



INSTITUTES & CENTRES

UNIVERSITY RESEARCH INSTITUTES

Australia-Asia-Pacific Institute
Australian Sustainable Development Institute
Curtin Health Innovation Research Institute – Biosciences
Curtin Institute for Computation
Curtin Institute of Radio Astronomy
Curtin University Sustainability Policy Institute
Fuels and Energy Technology Institute
International Institute of Agri-Food Security
Nanochemistry Research Institute
National Drug Research Institute
The Institute for Geoscience Research

UNIVERSITY RESEARCH CENTRES

Centre for Culture and Technology
Centre for Infrastructure Monitoring and Protection
Centre for Population Health Research
Centre for Process Systems Computations
Centre for Research in Applied Economics
Centre for Smart Grid and Sustainable Power Systems
John Curtin Institute of Public Policy

EXTERNAL COLLABORATIVE RESEARCH CENTRES

Australasian Joint Research Centre for Building Information Modelling
Australia-China Joint Research Centre for Energy
Australia-China Joint Research Centre for Tectonics and Resources
Bankwest Curtin Economics Centre
Centre for Crop and Disease Management
Centre for Marine Science and Technology
Centre for Sport and Recreation Research
Curtin Corrosion Engineering Industry Centre
Curtin Water Quality Research Centre
Curtin-Monash Accident Research Centre
National Centre for Student Equity in Higher Education
Sino-Australian Joint Research Centre for Ocean Engineering

CENTRES OF EXCELLENCE

ARC Centre of Excellence for All-sky Astrophysics
ARC Centre of Excellence for Core to Crust Fluid Systems
Centre of Excellence for Science, Seafood and Health

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Australian Housing and Urban Research Institute
Centre for Data Linkage
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Centre for Microscopy Characterisation and Analysis
International Centre for Radio Astronomy Research
John de Laeter Centre for Isotope Research
Pawsey Supercomputing Centre
Planning and Transport Research Centre
Sustainable Built Environment National Research Centre
Western Australian Energy Research Alliance
Western Australian Marine Science Institute
Western Australian Satellite Technology and Applications Consortium

COOPERATIVE RESEARCH CENTRES

Antarctic Climate and Ecosystems Cooperative Research Centre
Australian Seafood CRC
CRC for Contamination Assessment and Remediation of the Environment
CRC for Greenhouse Gas Technologies
CRC for Living with Autism Spectrum Disorders
CRC for Low Carbon Living
CRC for Remote Economic Participation
CRC for Spatial Information
CRC Mining
Deep Exploration Technologies CRC
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