VENTURE

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MedCorp alters patient care

Nation faces a digital divide

Apprentices score hat trick

EYE ON THE UNIVERSE

21ST CENTURY SCIENCE





PROFESSOR
ARUL ARULRAJAH
COFFEE GROUNDS
TURNED TO ROADS



DOCTOR

DAN GOLDING

CHALLENGES THE

WORLD OF GAMING



PROFESSOR

SALLY McARTHUR

REVEALS NEW \$6.5M

INNOVATION PRECINCT

SWINBURNE UNIVERSITY OF TECHNOLOGY



One qualification A world of connections Swinburne Alumni



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Together we design, develop, resource and deliver solutions that benefit business, our community and society.

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VENTURE

2016 EDITION

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COVER STORY **CATCHING THE** GRAVITATIONAL WAVE

Swinburne scientists are involved in leading Australian pulsar science research.

by NARRELLE HARRIS

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22 GAME CHANGERS

A book co-authored by media and communicatons lecturer Dr Dan Golding and fellow academic Leena van Deventer has shone a light on the male-dominated world of online gaming.











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am delighted to be sharing with you an especially exciting issue of *Venture* that captures our internationally recognised work in shaping the future of industry.

In 2016 and beyond, we are working with our partners to bring together design capability with automation and data exchange, cloud-based computing and The Internet of Things. This is Industry 4.0.

Our contribution is to develop research and education that meet the needs of business and students as our communities come to grips with continued and rapid change.

The growth of the education sector, our focus on internationalisation and the growing diversity of our staff and students create new opportunities for us to solve the challenges of the future.

Our new Innovation Precinct will position Swinburne as a centre of entrepreneurial activity, integrating research, new business development and commercialisation.

The precinct brings a start-up mentality into the university by housing entrepreneurs such as a Swinburne Product Design Engineering graduate, Jacqueline Savage and her fledgling business, MedCorp.

Ms Savage, recognised as Victorian Entrepreneur in the 2016 Telstra Business Women's Awards, is improving the medical industry through product innovation.

Swinburne is committed to developing innovative technologies that have significant social and economic impact.

We are collaborating with industry to provide the most detailed snapshot yet of Australia's online participation. The release of the first Australian Digital Inclusion Index shows that while digital inclusion is improving, digital ability is emerging as a key barrier to preventing some sections of the community from maximising the benefits of online participation.

Our Geotechnical Engineering leader Professor Arul Arulrajah's investigation into how coffee grounds might be used in road infrastructure demonstrates how our care for the environment connects us with international partners, in this case in Thailand and China.

"Swinburne people embrace the future. We strive for excellence and value inclusivity."

With groundbreaking work in research, education and community, it is no wonder that we remain in the top three per cent of universities globally.

Our focus and capability in science, technology, business and design are having an impact. The future is bright.

Swinburne people embrace the future. We strive for excellence and value inclusivity. Our campuses – in Melbourne's East, Sarawak and online – are places where technology and humanity intersect.

As I look ahead to the coming year, when we celebrate 25 years as a university, I am confident that Swinburne will continue to create a vision for the future.

Professor Linda Kristjanson

Vice-Chancellor and President Swinburne University of Technology





MEMOBOTTLE

Combining a Product Design Engineering Degree with his passion for the environment, Swinburne graduate Jesse Leeworthy co-founded memobottle and a multimillion-dollar company that is tackling one of the world's biggest environmental issues. The premium, re-usable, slimline water bottle, which mirrors the dimensions of an A5 or A6 piece of paper, is sold online. Through international aid agency water.org, \$1 from every order provides access to safe water for one person for 10 months.

memobottle.com.au

Rehab robots

Swinburne is leading the research and development of artificial intelligence software that will enable robots to help children undergoing rehabilitation. In partnership with the Royal Children's Hospital, the Transport Accident Commission and educational and healthcare supplier The Brainary, Swinburne computer scientists have been developing software for NAO, a humanoid robot capable of enhancing therapeutic outcomes for children.

ald.softbankrobotics.com/en/cool-robots/nao



Alumnus Olympian Matt Levy

Bachelor of Business graduate and elite swimmer Matt Levy won a bronze medal in the 200-metre individual medley at the Rio Paralympic Games. Matt, 27, who completed his degree

online while working and training for the Games, is a four-time Olympian and was awarded an Order of Australia Medal in 2014.

"Swimming has taught me discipline. Studying taught me time management - to get assignments done by a specific time and manage my sport and professional life as well."

MATT LEVY OAM





WINE WASTE

SWINBURNE and CSIRO researchers have developed a technique to convert wine-production waste into compounds for biofuels or medicines. The waste – skins, pulp, seeds and stems that remain after pressing – contains tartaric acid, which is unsuitable as animal feed or compost. The technique produces alcohols, acids and simple sugars with industrial and medicinal applications. It also extracts the tartaric acid, which can be reused in the acidity balancing process.

BRIGHT FUTURE FOR GREENHOUSES

SWINBURNE researchers are leading a greenhouse revolution that could improve energy use and crop productivity.

In a joint project with Horticulture Innovation Australia (HIA), the researchers have developed semitransparent solar glass that, when used with solar panels and LED lights, could boost plant health.

HIA chief executive John Lloyd says glass-based protected cropping allows growers greater control.

Swinburne lead researcher Associate Professor Baohua Jia, from the Centre for Micro-Photonics, says the focus is on solar glass and semitransparent photovoltaic glass.

If the glass is deemed viable for industry use, the second phase of the project will trial cost-effective solutions at commercial sites in Victoria. "The research will have an impact on glass industries and greenhouse facility manufacturers all over the world," Professor Jia says.

Photography: iStockphoto, Getty Images

Making safe sex better

ALMOST 100 years after it was invented, and despite sales of \$27 billion a year, the condom might be set for even further popularity, thanks to Swinburne researchers.

In collaboration with the University of Wollongong, a Swinburne team is testing a new, thinner, stronger hydrogel material designed to improve sensation and ultimately increase condom use around the world.

Despite those apparently buoyant sales figures, it is estimated that only five per cent of men worldwide use condoms, which are 98 per cent effective at preventing unwanted pregnancies and the spread of sexually transmitted diseases, including HIV.

The hydrogel material is similar to the material used in contact lenses and is said to feel just like skin.

results of 135 studies conducted

18 that specifically focused on

over time.

how a MedDiet affects the brain

between 2000 and 2015, including



To measure preference for the new material, Swinburne's Dr Joseph Ciorciari, Director of the Brain and Psychological Sciences Research Centre, is using electroencephalography (EEG) to measure how pleasurable the hydrogel is, compared to the latex now used to make condoms.

"The EEG allows us to measure the brain's subconscious responses to the material, removing any subconscious bias," Dr Ciorciari says.

The trial is funded by the Bill & Melinda Gates Foundation.

#GET OFF YOUR PHONE

Tackling the issue of mobilephone use while driving helped Swinburne Communication Design student Chloë Young win a roadsafety competition.

Young drivers are overrepresented in road fatalities and research suggests mobile phone use while driving reflects a larger issue mobile-phone addiction.

Ms Young's innovative approach was a highly emotive video in a competition run by RACV, Transurban, TAC and the National Road Safety Partnership Program.

As part of her award, Ms Young received funding to activate her idea at Swinburne's Hawthorn campus, as well as an internship at brand communications company Hard Edge.





FAST TRACK TO LEGAL PRACTICE

Swinburne Law students could be admitted to legal practice the day they graduate under a new partnership with the Leo Cussen Centre for Law, an independent non-profit centre for practical legal training in Melbourne.

Swinburne is seeking accreditation to fast track its Bachelor of Laws (LLB) graduates directly into the profession, rather than completing a further four-to-six-month course of practical legal training.

Swinburne Law School Dean Professor Dan Hunter says the partnership will offer students a tailored program during the final year of their degree.



foods, such as leafy greens, fresh fruit

and vegetables, cereals, beans, seeds,

nuts and legumes. The diet is also low

uses olive oil as its major source of fat.

in dairy, has minimal red meat and

Australian scientists are involved in groundbreaking research that takes Einstein's theories to a new level.

n January 2017, the Australian
Research Council's (ARC) Centre of
Excellence for Gravitational Wave
Discovery – or OzGRav, if you're
in a hurry – will begin operation.
The Centre is not a place, but
a collaboration of teams from six
universities operating under the
leadership of Professor Matthew
Bailes at Swinburne.

OzGrav will capitalise on more than 30 years of Australian expertise in gravitational wave and pulsar science to explore the extreme physics of black holes and warped spacetime.

The other universities involved are: Australian National University, the University of Western Australia, University of Adelaide, Monash University and the University of Melbourne.

OzGrav was one of only nine Centres of Excellence to win \$31.3 million funding from ARC. Its 566-page application, co-ordinated by Professor Bailes, was given a timely boost late in the submission phase by the breakthrough detection of gravitational waves in September 2015 by the Advanced Laser Interferometer Gravitational-Wave Observatory (aLIGO) in the US. Until that announcement, the existence of gravitational waves was purely theoretical.

"We were very fortunate that the detection of gravitational waves was published just prior to the final interviews," Professor Bailes says. "That was vital timing for us."

PICTURED

Illustration of two black holes orbiting each other. Eventually the black holes will merge, an event that will produce gravitational waves.

Astrophysics

by NARRELLE HARRIS

Several Australian scientists were involved in building the aLIGO detector and its elements. With expertise in the instrumentation side, Professor Bailes went on to build a team to analyse the masses of data gleaned from the operations (collated with the use of supercomputers) and to comprehend its astrophysical implications.

"Part of my role as director is to ensure we focus on large, significant projects and that we use our critical mass to solve problems while they're topical," he says.

Professor Bailes' other aim is to ensure the teams collaborate effectively. "I want to create a champion team as opposed to a team of champions."

21st century science

Dr Yuri Levin from Monash University is one of the members of the team. "Ultimately, my interest is the life story of these black holes," Dr Levin says. "How did they come to be where they are? Are they hairy or not hairy?"

"Hairiness" refers to the no-hair theorem, the conjecture that black holes have only three externally observable characteristics – mass, electric charge and angular momentum. They are otherwise "bald", with all other information trapped behind a black hole's event horizon.

Dr Levin has no doubts about the importance of OzGRav's work. "The detection of gravitational waves will probably be the defining moment for 21st-century science," he says.

"It opens up a whole new world of science, which means new technologies, new skills and new applications – good for the understanding of the universe, and good for the broader world of industry and technology in which we live.

"This is an incredible training ground for the engineers, physicists, chemists and data analysts of the future."

"It's a wonderful thing to lead a massive national centre to undertake the first detections of gravitational waves and understand what they mean for the universe."

PROFESSOR MATTHEW BAILES



PICTURED (opposite) Answering some of the big questions thanks to the OzGRav collaboration and the detection of gravitational waves using the aLIGO detector, Professor Matthew Bailes [left] and Associate Professor Jeff Cooke [right]. (below) A stylised rendering of a "death spiral" caused by the merging of two black holes.

Deeper discovery

Associate Professor Jeff Cooke, a Swinburne astrophysicist whose expertise lies more with galaxies and supernovae than black holes, is working with OzGRav from another angle.

He's part of a major project called Deeper, Wider, Faster that is working to find counterparts to fast radio bursts and other extremely fast and transient astronomical bursts of energy. Gravitational waves do not emit light, but some transient phenomena – including supernovae and their smaller cousins, kilonovae – can emit both light and gravitational waves.

"Certain supernova explosions are also expected to cause a gravitational wave when the core collapses," Dr Cooke says.

"The Deeper, Wider, Faster program searches for the fastest explosions in the universe. We focus all kinds of telescopes – gamma ray, X-ray, ultraviolet, optical, infrared, radio, both ground- and space-based telescopes, everything – on a section of the sky and look for these explosions, which can be over in milliseconds."

While all of these telescopes are focused in one direction, they pick up a range of signals, he says.
"We get all this data from looking at massive volumes of sky and we find things like supernova shock breakouts, kilonovae, flare stars and other exotic events."

This is where it all comes together with OzGRav. When the gravitational wave teams detect an event, they can get Dr Cooke's team to accurately locate it,

learn its distance, and to see what other signals surround it. It's possible that so many other telescopes trained on the site will find other tell-tale astrophysical features that accompany, or are caused by, the waves.

"But that's a reactive stance," Dr Cooke says. Observations can go the other way, too. If his team detects fast transient events such as kilonovae – which can also produce gravitational waves – they can alert the gravitational wave team to recheck its data for information that might have initially been dismissed as insignificant.

New ideas

OzGRav is an opportunity to be involved in exploring new ideas in extreme physics and new ways of thinking about the universe. It's a chance to work with the best people from around the world in a field Dr Cooke refers to as "essentially astronomy reborn".

The study of gravitational waves is the exploration of whether Einstein's theories hold, and what that means for understanding the universe.

For Professor Bailes, involvement in OzGRav is the culmination of a career that began with studying Einstein's general theory of relativity.

"In 1984, there was very little hope in the near future of ever detecting gravitational waves. Thirty-two years later, it's a wonderful thing to lead a massive national centre to undertake the first detections of gravitational waves and understand what they mean for the universe."

WHAT ARE GRAVITATIONAL WAVES?

Swinburne astrophysicist Jeff Cooke says that the detection of gravitational waves is "essentially astronomy reborn".

But what are they?

Gravitational waves are caused by the stretching (and compressing) of spacetime from massive objects in motion. They are strongest for major catastrophic gravity events – such as two black holes merging into a spinning

orbit around each other, in what is colourfully called a "death spiral".

According to Einstein's Theory of Relativity, gravity warps space and time (which are so deeply inter-related that astrophysicists refer to them collectively as spacetime).

When two black holes begin a death spiral, gravitationally warped spacetime ripples through the gravitational fields of the universe at the speed of light, creating detectable waves. Gravitational waves are not made of light, however, and therefore have previously remained undetected by existing technology.

A hundred years ago, Albert Einstein's mathematics insisted they were out there. In September 2015, aLIGO found them. Now the OzGRav Centre of Excellence aims to discover more about them.

Why are these waves such a big deal?

To begin with, they enable us to "see" objects and cataclysmic events that can't be seen with light alone.

Exploring the extreme physics of such huge events offers new insights into the workings of the universe. A whole new type of physics is being created, requiring new technologies, sophisticated supercomputers and specific expertise in data analysis, which will have applications beyond its astronomical uses.

Wear it well

Swinburne mentors and research facilities are helping to develop a wearable innovation for hospital patients.

winburne graduate
Jacqueline Savage wants
to make the world a
better place.

"I lost a close friend at the beginning of my studies and knew that I wanted to make a difference," Ms Savage says.

It was the reason she aspired to a career in healthcare and, inspired by Swinburne's Professor Sally McArthur, Ms Savage decided to follow the path of biomedical engineering.

After graduating from Bachelor of Engineering (Product Design) (Honours) in 2013, Ms Savage founded MedCorp Technologies by commercialising her final-year Product Design Engineering project.

Fuelled by her desire to make change, she spent a few years working in biomedical technologies and had designed an ambitious, wearable patient device that would integrate remote drug delivery and monitoring.

But Ms Savage was at a crossroads. Her idea was too complex and her efforts to secure ties with an investor had stalled.

"I emailed (Swinburne's Vice-Chancellor and President) Professor Linda Kristjanson out of the blue explaining to her what I wanted to do, and that I wanted Swinburne to be involved," Ms Savage says.

The project quickly gathered momentum with the help of Professor Kristjanson and a team of Swinburne mentors. They helped Ms Savage secure more funding, provided guidance and gave her team access to the Factory of the Future, a part of the Innovation Precinct.

Ms Savage altered her design and focused on the patient-monitoring aspect, designing a wearable patch that monitors a patient's core body temperature.

"Going back to Swinburne and having Professor Kristjanson champion me and facilitate those connections was exactly what I needed," she says.

"I want to use what I've learnt to develop products that contribute positively to society. I hope to improve the medical industry through product innovation."

Ms Savage also won this year's Victorian Entrepreneur

Award in the
Victorian Telstra
Business Women's
Awards. She is in
the running to
win the national
award.





The technology is here

Ms Savage's team, which includes fellow Swinburne graduate James Bell, is working hard in the Factory of the Future to complete the MedPro monitoring device. The space has been designed to provide industry and organisations such as theirs with state-of-the-art facilities to explore concepts for manufacturing next-generation products.

"The facilities are hands-down fantastic," Ms Savage says. "Having access to the range of equipment available is key to what MedCorp does. It's very much industry-relevant equipment that I think students need to be exposed to."

"I want to use what
I've learnt to develop
products that contribute
positively to society.
I hope to improve
the medical industry
through product
innovation."

JACQUELINE SAVAGE MEDCORP TECHNOLOGIES

"In terms of the digital revolution that we're dealing with, more and more students need to be getting hands-on experience and more involved with electronics, software programming and flexible printed circuit boards," she says.

This digital revolution, otherwise known as Industry 4.0, occurs where automation and data exchange become the norm in manufacturing technologies, including the use of cyberphysical systems and cloud computing.

"To create a space where students can come in as a team, to have access to prototyping and product development at this level is unprecedented. You can't get that anywhere else. You couldn't get that experience if you went and worked for a big multinational."

Ms Savage hopes the next step for Swinburne will be to give current students more access to the space and technologies, providing them with the tools for more projects and work. She is looking forward to more people joining the Factory of the Future. Her dream is to have a space full of smart people to bounce ideas off each other and create new technologies.



Business by ALYX WILLIAMS

Master the future

Graduates will benefit from a new focus on entrepreneurship.

winburne will offer a suite of entrepreneurship and innovation-driven courses when its Australian Graduate School of Entrepreneurship (AGSE) is relaunched in 2017.

The courses will be led by the refreshed Master of Entrepreneurship and Innovation (MEI) and complemented by other postgraduate courses within the Faculty of Business and Law.

The MEI will combine design-thinking, creativity and technology transfer, opportunity discovery and business-model innovation. The collaborative nature of the course will allow students to do field work with industry mentors and be supported as they launch their own ventures.

Faculty of Business and Law Executive Dean Professor Michael Gilding says the AGSE courses will be relevant to startups, small to medium enterprises, large corporations, social enterprises and notfor-profit organisations.

"The course is structured to be practical, with many students using the subjects offered as a way to develop, improve and validate their new ideas."

Professor Gilding says the school will draw on its years of entrepreneurship education experience and its value to the innovation economy.

"Swinburne introduced entrepreneurship education in 1975 and AGSE was Australia's first dedicated school when it opened in 2001.

"Our industry links are extensive and

our courses are taught by academics who are still practising in their field. This is a huge benefit to students who are creating business solutions or developing new business ideas."

Supportive environment

The refreshed courses in the AGSE will include short introductory modules designed to get students up to speed with postgraduate study.

"We understand that, for many students, going back to university can be a daunting thought. We want students to feel supported right from the start," Professor Gilding says.

Students also will be offered oneon-one career planning meetings with academic staff, as well as networking opportunities, events and seminars.

"So much of a course in entrepreneurship is about the people you meet and the networks you form. The Australian Graduate School of Entrepreneurship is a hub for collaboration, where you can develop your own set of contacts."

Networks

The AGSE is a hub for collaboration, helping students launch their own ventures.



David Nicolaides saw his first architecturally designed modular home office studio arrive at the docks in late October. The re-engineered shipping container's wiring and luxurious, modern interior was manufactured in Malaysia; its external timber cladding will be added onshore in Melbourne and the completed product will be delivered by crane into his first customer's back yard.

The modular construction business is a career reinvention for the former mechanical engineer and property developer, who enrolled in Swinburne's Master of Entrepreneurship and Innovation (MEI) course when his 15-year career with Holden came to an end.

"I had been working as an engineer in product development at the Port Melbourne centre, but I had to find a new plan,' Mr Nicolaides says.

He did some career counselling and decided to see the bombshell as an opportunity. "I did the first two subjects while I was still working at Holden. The MEI gave me the framework and the support to develop my initial business idea into a realistic, affordable launch product that minimised risk and maximised opportunity. I wouldn't be where I am without it," he says.

"The whole course is geared towards innovation and really encourages participants to think about global business opportunities."

PICTURED Master of Entrepreneurship and Nicolaides [left] says the course was invaluable.

Mr Nicolaides has two Malaysian co-founders helping to develop the business, Tessellate Modular, which promotes sustainability by converting used shipping containers to office studios. The offices come complete with LED mood lighting, ethernet wiring, a 32-inch computer monitor and speakers.

"The idea came from my own experience. I had been involved with several property projects over the years and found the industry did not often offer consumers convenience, professionalism and value for money," he says.

"Our studios are designed for people who need a more effective space at home to work; whether they run their own business or just spend a lot of time outside of office hours working at home.

"The process is easy for customers. You order it online, it's delivered into your backyard and within a couple of days it's ready to be used."

The next stage in Mr Nicolaides' business plan is to add products such as holiday houses, hostels and motels to its range.

He knows that might take time, but the Swinburne course has taught him that entrepreneurs possess resilience and persistence.

"Through the Swinburne course, I've learned entrepreneurship is about using your ideas, your skills and your networks and putting together something completely new," he says. 🐶

Social research

by GARY TIPPET

THE DIGITAL DIVIDE



More and more of us are conducting our lives online. But a national study of the digital world reveals that significant sections of society are missing out.

or those of us merrily posting on social media, talking to distant relatives on Skype, doing our banking on the internet, or ordering the weekly shopping online, digital technology is a boon, and a way of life.

But consider the computer habits of students without reliable internet access, the over-65s with a mistrust of computers, disabled people seeking funding assistance, people living in remote indigenous communities, schools with outdated computers, or the homeless, and a different picture of the digital age emerges.

As digital technologies become increasingly central to everyday life, the disadvantages of not being connected, or of not having the ability or the confidence to operate online, are growing.

The release of the first Australian Digital Inclusion Index, based on research undertaken by the Swinburne Institute for Social Research and the Centre for Social Impact at Swinburne, has provided both good and worrying news.

Across Australia, digital inclusion – basically, ensuring people are able to access and take advantage of digital technologies and their benefits – is improving. But digital ability – having basic online skills and the ability to use them – is often a barrier to many Australians maximising the benefits of those technologies.

Centre for Social Impact Director Professor Jo Barraket says the Australian Digital Inclusion Index is a powerful tool that will help understand the drivers of digital inclusion and exclusion in Australia. She says the research shows many Australians are missing out on the social, health and financial benefits of being online.



We really do want everybody to get the benefits of an increasingly digital world and to make sure no Australian is left behind.

PROFESSOR JULIAN THOMAS DIRECTOR SWINBURNE INSTITUTE FOR SOCIAL RESEARCH

KEY FINDINGS OF THE AUSTRALIAN DIGITAL INCLUSION INDEX



Digital inclusion across Australia is improving. People are spending more time online and doing more online.



Digital ability is emerging as a key area in need of national improvement and a barrier to Australians maximising online benefits.



Economic impact
Australians with low levels
of income, education
and employment are
significantly less
digitally included.



Affordability mattersWhile the value of online

services is improving, people are spending an increasing proportion of household income on digital products.

The research by Professor Julian Thomas (left) and Professor Jo Barraket (right) was conducted in partnership with Telstra and Roy Morgan Research.



"Digital ability - which includes online skills, attitudes and knowledge - is emerging as a key impediment to inclusion," Professor Barraket says. "This is particularly true for some groups, including people with disabilities, and those on low incomes."

Less face-to-face

The research, undertaken in partnership with Telstra and Roy Morgan Research, provides the most detailed national picture of online participation. Swinburne Institute for Social Research Director Professor Julian Thomas, who led the project, says it shows a gap, or digital divide, between people participating online and people who aren't.

"The gap is narrowing but deepening," he says. "That's what worries us: there are fewer people who aren't connected but the costs of not being connected are increasing and substantial."

"If you didn't have an email address 20 years ago, it might not have made much difference to your life. But not being able to get online now severely limits access to government information and the ability to handle transactions with governments, businesses, banks, community services, education and health organisations."

Professor Thomas says many service providers now expect that people will interact with them online.

"There's less and less face-to-face, less turning up at the local office," he says. "The problem is that the people who really depend on such government and community services are the very folk who are least likely to be confident about going online."

Digital inclusion – and by implication, exclusion – throughout Australia follows clear economic and social contours, the index reveals.



In general, those with low levels of

The least digitally included Australians, perhaps not unexpectedly, are those over 65, who score 12.9 points below the index's national average. That age gap has remained relatively steady over time.

"That's a real concern," Professor Thomas says. "Many of them are receiving pensions or benefits, are recipients of health and community services and so on. They really depend on those things that are increasingly online, but are the least likely to be confident and able to use them."

Connections

Digital affordability has improved since 2014, the index shows. But while the cost of internet services has generally fallen, Professor Thomas says – "you're getting more data for your dollar" – households are spending a growing proportion of their income on them.

The implications of the digital divide are many, he says. Digital inclusion goes beyond simply owning a computer or smartphone. At heart it is about social and economic participation, making sure all Australians can use digital technologies to manage their health and well-being, access services and organise their finances, and connect with friends, loved ones and the world beyond.

"It's a social justice and social equity issue, because we really do want everybody to get the benefits of an increasingly digital world and to make sure no Australian is left behind."



Geographical gaps Disparities exist, with some areas showing higher digital inclusion than others, including capital cities.



People aged 65-plus are Australia's least digitally included demographic.



People with a disability have a low level of digital inclusion, but the divide is shrinking.

Coffee grounds go underground

Melbourne is a city of coffee lovers, and we are not alone. Millions of tonnes of used coffee grounds end up in landfill across the globe every year.







winburne's Professor
Arul Arulrajah, an avid
coffee drinker, leads the
geotechnical group at the
Centre for Sustainable
Infrastructure at Swinburne.
One area the group investigates is
the use of recycled materials, such as
crushed brick or glass and concrete,
in road construction.

"I saw baristas throwing away used coffee grounds and I thought, 'why not look at this as an engineering material?'," Professor Arulrajah says.

A typical café in Melbourne produces about 100-150 kilograms of coffee grounds each week. Professor Arulrajah estimates that about 50,000 tonnes of used coffee grounds are disposed of every year in Melbourne.

His team, which includes PhD candidate Teck-Ang Kua, began collecting used coffee grounds from cafés near Swinburne's Hawthorn campus.

They dried the grounds in a 50-degree oven for five days and then sieved the material to filter out lumps.

Various ratios of slag were mixed into the grounds and the mixture was compressed into cylindrical blocks strong enough to use as the material that sits under a road surface.

"We estimate that the coffee grounds from Melbourne's cafés could be used to build five kilometres of road per year," Professor Arulrajah says. "This would reduce landfill and the demand for virgin quarry materials."

Researchers from Suranaree University of Technology in Thailand, Southeast

University and Shanghai Jiao Tong University, both in China, were also involved in the research.

"Research partners based in other countries have similar issues with wasted coffee grounds and intend to internationalise this research in partnership with Swinburne," Professor Arulrajah says.

"Low-carbon infrastructure with spent coffee grounds diverts wastes from landfill; there will be significant international environmental and economic benefits as this is presently a waste product around the globe."

PICTURED (above left) Professor
Arul Arulrajah has developed international
partnerships that will ensure coffee waste
is used to create a new building material.

Vocational education

by STEPHEN A RUSSELL

PICTURED Ongoing support and mentoring have given (right, top to bottom) Steven Jeffrey; Chris Henbery (with his son Max); and Melinda Lethbridge, the framework for success.

TRADIE HAT TRICK

For three years running, Swinburne students have taken home the Victorian Apprentice of the Year award.

CARPENTRY / STEVEN JEFFREY

Carpentry apprentice Steven Jeffrey is the third Swinburne University student to be named Apprentice of the Year at the Victorian Training Awards in as many years. Now he has his sights set on the national competition in Darwin this year.

For as long as he can remember, Mr Jeffrey wanted to be a builder. He says Swinburne encouraged him to work hard, never letting his dyslexia get in the way.

"The skills and knowledge I've been taught have given me the confidence to challenge myself and continually push for excellence," he says.

Mr Jeffrey says he's honoured to have taken the title and Swinburne was behind him all the way. Now he's looking forward to paying back a little as an ambassador for Vocational Education Training (VET).

"Swinburne has set me in good stead for a successful future," he says. "Winning apprentice of the year three years in a row speaks for itself with Swinburne's record."

HORTICULTURE / CHRIS HENBERY

Last year's winner, horticulture apprentice Chris Henbery, went on to compete at the national awards. He now has an Australian Apprenticeships Ambassador role that takes him all over the country.

"Winning has opened up so many opportunities to meet great people, share my apprenticeship journey and hopefully inspire others to choose a career and apprenticeship they love," he says.

Originally from London, Mr Henbery gave up a banking career to move to Melbourne in 2011 with his Australian wife and their young son. He says Swinburne gave him all the support he needed to follow his passion for horticulture.

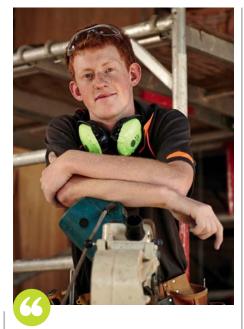
"Swinburne offered the best facilities and subjects and had teachers with great experience and connections," he says. "They have a genuine desire for their students to succeed."

MECHANICAL ENGINEERING / MELINDA LETHBRIDGE

Fitter and turner Melinda Lethbridge, who began her Certificate 3 in Engingeering – Mechanical Trade at Swinburne's Wantirna campus in 2011, scooped the award in 2014. In October, she won the 2016 WorldSkills Australia competition in the fitting-and-turning category. She now has the chance to compete in the international competition being held in Abu Dhabi next year.

Ms Lethbridge works for Hargo Engineering in Croydon where, these days, she's the one leading the training. She says she would never have applied for either award without the support of Hargo and Swinburne.

"Swinburne has been behind me every step of the way, obviously through my training, but now, even three years after formally completing my studies, I've enjoyed ongoing support and mentoring," she says. "Swinburne's culture allows people to excel."



Swinburne has set me in good stead for a successful future

STEVEN JEFFREY
CARPENTRY APPRENTICE





by JAMIE FARNELL

EARTHLIGHT DEVELOPERS SAY THE GAME SHOULD BE READY FOR PLAY **BY THE END OF 2016**. THEY ARE HOPING TO RELEASE IT EARLY IN 2017.

VIRTUAL WORLD

One small step for man, one giant leap for the team at Opaque Media.

elbourne-based game
developers had an
out-of-this-world
experience when they
were invited to tour
NASA's Johnson Space
Centre earlier this year.

Working as Opaque Media Group, founded by Swinburne graduates are the developers of virtual reality game *Earthlight*. It takes players on the journey of becoming an astronaut, then sends them on missions at the International Space Station. The game has gained international attention, and NASA was curious.

Swinburne Bachelor of Arts (Games and Interactivity) graduate Emre Deniz, the project lead for *Earthlight*, says the idea was simply to make a game about space.

"It was weird seeing private messages on Reddit from NASA, we didn't expect it at all," Mr Deniz says. "It was a way to exchange expertise between our team and NASA's laboratories. Finding out the intricate details to human space flight – for example the jiggling of tools on a space suit – these are all specifics we are putting into Earthlight.

"We want to create game-play artefacts that we can deploy in virtual reality. This will add sincerity to Earthlight and develop the perfect balance between game play and experience."

The team showcased the latest version at the PAX West (Penny Arcade Expo) event in Seattle, which generated excitement and positive feedback from the media and developers.

"We demonstrated Earthlight in a closed-door private format," Mr Deniz says. "We were being conservative; we should have really targeted a public demonstration as the feedback we got was highly useful. The team has already started implementing it into the game."

The visit also built relationships with high-end tech partners, including Epic, HTC and Oculus. The team is working on other projects involving companies such as Microsoft and Google.

"There is an endless list of how you're able to provide beneficial uses of putting a physical person into a visual environment, which is why this sector is so exciting and rapidly growing," Mr Deniz says.

The team is hoping to have a version of Earthlight ready for play by the end of 2016, and a commercial release date for the game early in 2017.

With international success and interest continuing to flourish, Mr Deniz believes the future at Opaque Media is bright.

"We're currently engaged in development for a variety of platforms. We're working in virtual reality, augmented reality and a range of other devices to find innovative solutions to unconventional problems," he says,





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Research & innovation

by AMY FELDTMANN

groundbreaking
Swinburne project is
coming to life behind the
red brick façade of the old
William Street fire station
in Hawthorn. Swinburne's
initial \$6.5-million
investment in its Innovation Precinct
will position the university as a centre
of entrepreneurial activity, integrating
research, new business development
and commercialisation.

The plan for the Precinct, announced in March, will bring together Swinburne's Design Factory Melbourne, its Digital Innovation Lab and its Factory of the Future, hosting events and workshops and providing opportunities for sharing ideas and expertise across diverse industries.

Professor Sally McArthur, its inaugural Director, says most universities promote some form of innovation centre on their campuses, but "at Swinburne the entire university is the Innovation Precinct, and the fire station, off Burwood Road, is simply the front door".

"People and companies will be based in the fire station but the expertise extends beyond those walls: opening the university up and creating an imperative for people to come," Professor McArthur says.

"The heritage of the building is another reminder that innovation isn't new to Swinburne, but now we are bringing everyone together to ensure we get the best outcomes and impact for the problems we are solving for industry and community."

Space to grow

When finished, the multistorey building will offer approximately 1000 square metres of space to students, staff, industry partners and start-ups. Within the Innovation Precinct, the Business Incubator will support at least 10 resident start-up companies each year, and the precinct will encourage connections as well as offering a new Innovation minor for students from any course at the university.

"We are quite serious about having all of our students involved - whether that is through extracurricular workshops, or though the new Innovation minor that will bring people from different



ABLAZE WITH IDEAS

An old fire station gets a new life as an innovation hub and ideas centre.







PICTURED (left)

Swinburne's \$6.5-million Innovation Precinct will support at least 10 start-up companies each year, says its Director, Professor Sally McArthur.

disciplines together to learn more about ideation and innovation," Professor McArthur says.

"We will also have a cycle of start-ups moving through our various accelerator and incubator programs, building our pipeline of exciting research translation and investment opportunities."

Global vision

The value of innovation precincts, and their power in bringing academic, industry and community expertise together, is being increasingly recognised by universities in Australia and overseas. There has been a notable increase in developing them recently, although the Massachusetts Institute of Technology's Kendall Square precinct was established in Boston as far back as the 1950s.

Kendall Square's "anchor-plus" model is similar to Swinburne's; it creates and establishes the space, leads the collaborations, and inspires a growth of start-ups and other businesses, either within or nearby. Innovation precincts create value for the anchor and its partners, and help to transform the local community and economy.

Thinking bigger

The precinct is one of the initiatives featured in the ambitious Swinburne University Research and Innovation

Strategy 2020, launched in June 2016 by Deputy Vice-Chancellor Research and Development, Professor Aleksandar Subic.

"We are focused on the multistorey building lifting the level of will offer approximately research and 1000 square metres of innovation, thinking space to students, bigger, and opening staff, industry partners our campus and our minds to partners and their needs," Professor Subic says. "Our strategy is focused on real impact that transforms industries, shapes lives and communities. Impact is achieved outside of the boundaries of academia through collaboration with our partners, which is Swinburne's core business."



At Swinburne the entire university is the Innovation Precinct, and the fire station, off Burwood Road, is simply the front door.

PROFESSOR SALLY MCARTHUR

Swinburne is committed to creating a culture of innovation across its campuses, disciplines and research-led programs, "by creating an innovation ecosystem that engages students, staff, alumni, industry and business in diverse and seamless ways through co-location, innovation projects, joint ventures, start-ups, and other entrepreneurial schemes", Professor Subic says.

Ready for action

1000m²

When finished,

and start-ups.

Professor McArthur says a team of talented staff will help bring the precinct to life and plan the first rollout of activities. "It is a great opportunity and honour to lead the team bringing this to life – I'm proud that Swinburne University is bringing its innovation prowess to the next level." she says.

> While much will start to take shape in 2017, Professor

> > McArthur says the university is ready to partner with industry.

"I think one of the most fantastic things about the Innovation Precinct is that although we have a vision for it. it is the people who come to collaborate from inside

and outside the university who ultimately will shape what it becomes. How exciting is that?" 🚺

For more information on to: swinburne.edu.au/innovation-precinct/



Media and

by JOHANNA LEGGATT



A book by two Swinburne lecturers sparked change in the male-dominated gaming world.

edia and communications lecturer Dr Dan Golding always suspected the gaming world was a male-dominated echo chamber. but it wasn't until he started researching a book on the topic that it really hit home.

The book, Game Changers, which he co-wrote with fellow academic Leena van Deventer and released earlier this year, shone a light on the culture of misogyny in the gaming world.

"It was about the gaming culture that has found itself at the heart of an aggressive male culture that imagines the only legitimate players are straight, white, young men," Dr Golding says.

"I remember there was one gaming company that hired its first female employee and they had to have a discussion about adding a female toilet. I don't think I have ever been to a gaming industry event where there has been childcare."

Game Changers also looked at the abuse meted out to female gamers, particuarly



Change is definitely coming. That's why there was such a large push back ... if they weren't scared they wouldn't care.

LEENA VAN DEVENTER

those who made their views public. Dr Golding and Ms van Deventer, both gaming enthusiasts, expected backlash — and they were right.

"Some of the gamers would see us on TV talking about the book and they would leave comments on social media about our appearance, or say we were just pushing a pre-existing narrative," Dr Golding says.

Ms van Deventer says she was shocked by the hypothesis that the pair must have been romantically involved.

But both were heartened by responses from other gamers, who endorsed the book's findings.

"People who we had interviewed for the book told us how much they appreciated their stories being told." Dr Golding says.

He presented their findings to a Senate inquiry into Australia's video game development industry in March.

'One of the recommendations was not to fund gaming companies that only hired men," Dr Golding says.

Ms van Deventer says she believes change is definitely coming. "That's why there was such a large push back directed towards the book. If they weren't scared of change they wouldn't care," she says.

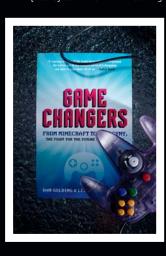
Dr Golding says the Lara Croft character in Tomb Raider was designed for men but has been championed by women. "An ABS survey a few years ago found that women made up just 8.9 per cent of the Australian gaming industry, which is worse than mining. But I think those stats have improved since then," he says.

Ms van Deventer says the book has taken its toll, but has inspired her to roll up her sleeves and work harder to advance women in the industry.

Meanwhile, Dr Golding is researching virtual reality devices and the way they replicate gendered norms from the early cinematic devices. \checkmark



(below) Game Changers shone a light on the culture of misogyny in the gaming world. [above] Co-author Dr Dan Golding.





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