As a research student at ECU, you’ll extend your knowledge and have the ability to make a real difference to the lives of others. You’ll be part of our vibrant research community with an extensive training program, have access to excellent facilities and highly qualified supervisors. According to the 2017 International Student Barometer, our Graduate Research School has been ranked amongst the top three in Australia in each year since 2011 with satisfaction of 95% or higher. ECU aims to support research that contributes to both Australian and State Government identified priority areas. Some of ECU’s key research areas include:

- Clinical Sciences
- Cybersecurity
- Ecology; Environmental Science and Management
- Engineering (Chemical; Electrical and Electronic; Materials)
- Exercise Medicine
- Neurosciences
- Nursing
- Oncology and Carcinogenesis

For more information and to find out how you can make a difference, visit: ecugetready.com.au/research
Contents

12 The secrets your body gives away

4 In Brief
7 You study what? The genealogy of torture
8 Life Hacks
9 5 minutes with... John Hurney
10 Community – Gains from the game
11 Big Data – Research by the numbers
24 The future has arrived and it looks smart
28 Lightbox – Everything old is new again
31 Alumni – Claire Martin
32 Events
34 The Last Word – Making sense of teenagers

16 Beyond Utopia
20 Getting the world on its game
Massive carbon release at Shark Bay

Researchers have found the loss of seagrass at Shark Bay after the 2010/11 marine heatwave released up to nine million metric tons of carbon dioxide into the atmosphere, the equivalent of 1,600,000 cars driven for 12 months.

"When you have an event such as the losses at Shark Bay, you not only lose the seagrass as a way of removing CO2, you see sequestered gas released back into the atmosphere during decomposition," said Dr Oscar Serrano, from ECU’s School of Science, a member of the international research team.

Blood test breakthrough

Professor Ralph Martins is part of a global team that made a major breakthrough in the search for a blood test to detect Alzheimer’s disease. The test, which is still in its early stages, could detect the deadly disease 20 years before symptoms appear.

$50m Cyber Security Centre open for business

ECU is now home to one of the world’s leading centres in the fight against cyber criminals after the Federal Government officially launched the Cyber Security Cooperative Research Centre at the Joondalup Campus.

WA’s dining industry grew by $4.8 billion during the boom.

Mining boom fuelled dining boom

ECU researchers have run the numbers and found that the Western Australian mining boom added $4.8 billion to the State’s dining industry between 2004 and 2015. An additional $900 million was added by a growing coffee culture and lifestyle changes.

“WA’s dining boom was almost double that in the rest of Australia and had twice the growth of the State’s grocery industry,” said Professor of Finance Robert Powell, from ECU’s School of Business and Law.
New appointments

Professor Dylan Edwards and Professor Hongqi Sun have been appointed Professorial Research Fellows. Professor Edwards joins the School of Medical and Health Sciences from Harvard University, where his research has focused on motor recovery after neurological damage including adult stroke, spinal cord injury, and cerebral palsy. Professor Sun, who works in the field of chemical engineering, has joined the School of Engineering.

ECU an employer of choice

For the second year in a row ECU has been named an Employer of Choice by the Workplace Gender Equality Agency. The citation recognises ECU’s push for gender equality, with recent initiatives including paid parental leave for both men and women, flexible working and a parents’ room.

New home for WA’s emerging filmmakers

ECU is backing the next generation of home-grown filmmakers with a major upgrade of the WA Screen Academy’s facilities, which opened at the start of semester.

“Students will have access to the most advanced training facilities in Western Australia,” the Academy’s Dr Cathy Henkel said. “They can learn and experiment with the latest ARRI Alexa Cameras, Panther Dolly, virtual reality equipment and a state-of-the-art output room and post-production facilities, enabling them to produce high quality work and be competitive at international festivals.”

Georgia Nottage in the new WA Screen Academy facilities.
WA tourism needs more beer

New research suggests promotion of WA’s ales, pilsners and lagers could help the State Government achieve its goal of raising the value of tourism to $12 billion by 2020. However feedback from commercial and craft brewers identified distance and a lack of critical mass as challenges for the sector.

“Both groups indicated that the craft brew experience would work best in combination with other activities, whether that is gourmet food, wineries or things like festivals and sporting events,” School of Business and Law’s Nevil Alexander said.

Progress with Alzheimer’s disease

Eating a diet high in protein could reduce the risk of developing Alzheimer’s disease. Research Fellow Binosha Fernando found that people who ate at least 118g of protein each day were 12 times less likely to have high levels of amyloid-beta, a precursor to Alzheimer’s disease, in their blood.

Honorary doctorates

Comedian Adam Spencer received a Doctor of Science degree from ECU in February, recognising his passionate promotion of maths and science. Other prominent Australians to receive honorary doctorates at the graduation ceremonies included Graeme Innes AM (disability advocacy), Graeme Simsion (author), Rosemary Bryant (nursing), David Singleton (Austal Ltd), and husband and wife team Jill Perryman AM MBE and Kevan Johnston OAM (performing arts).
It sounds like the worst kind of horror novel, but a new book on the genealogy of the torture taboo is anything but, writes Lisa Shearon.

Post-Doctoral Research Fellow Dr Jamal Barnes, from Edith Cowan’s Centre for Global Issues, has torture as his particular area of expertise — and it is the subject of his new book.

In *A Genealogy of the Torture Taboo*, Dr Barnes looks at how society’s moral aversion to torture has evolved from the 18th century through to the present day.

With a PhD in international relations, Bachelors degrees in Politics and International Studies, and First-Class Honours in Security, Terrorism and Counterterrorism Studies, Barnes developed an interest in the murky world of state-sponsored torture.

“Since completing my PhD I have come to specialise in a few areas, in particular, human rights, torture, security and international relations normative theory, and the study of international norms,” Barnes says.

His interest in the genealogy of torture was piqued while analysing the counterterrorism policy of the George W. Bush administration during his Honours.

“As part of that I did a brief section on the administration’s use of torture in the ‘war on terror’,” Barnes says.

“When researching the section, I thought it was not only interesting but extremely important.

“Through conversations with my PhD supervisors, we decided that conducting a history of the torture taboo would not only be a unique contribution to the field, but would be fascinating to research, which it was.”

His research considers whether the normal pressure not to allow torture changed once states violated that norm.

And while the ongoing use of torture under different names might suggest otherwise, he believes the taboo against torture remains strong.

Rather than openly engage in torture, he says, states do everything they can to hide it, deny it, or redefine and outsource it.

“States do this because they know that using torture is wrong and so they hide it to avoid being criticised and stigmatised as a pariah,” he says.

“If the taboo did not retain its potency, there would be no reason for states to take such measures.”

It’s not the most light-hearted subject, Barnes concedes, but it has led him on to other new and interesting avenues of research.

“I’m now looking at the relationship between torture, migration and asylum seekers or refugees,” he says.

“And I’ve got a project examining the detention policies of states during counterterrorism operations and war and the challenges of upholding the torture taboo during this time.”
Let your kids play video games

Teenagers benefit from social connections while playing video games online, especially when they are part of a team, according to ECU School of Arts and Humanities Communications Professor Lelia Green. She says it is still important for teens to balance online games with schoolwork, but parents could encourage in-person video game weekends to support the development of well-rounded friendships.

Eat your greens

Eating a diet containing nitrate rich vegetables such as spinach and lettuce reduces your chances of suffering a stroke or heart attack. ECU School of Medical and Health Sciences lead researcher Dr Catherine Bondonno studied the diets of 1000 women and found those who ate lots of nitrate-rich vegetables had a 40 per cent lower risk of heart disease or stroke.

Have a cuppa

Drinking black, white or green tea can help prevent Alzheimer’s disease and diabetes, according to Dr Binosh Fernando from the ECU Centre for Excellence for Alzheimer’s Disease Research and Care. She reviewed more than 100 studies examining the health benefits of tea.

Don’t take testosterone boosters

ECU Exercise and Sports Science lecturer Dr Krissy Kendall says there is little evidence to back claims that testosterone supplements can help build bigger muscles.

Take a plant to work

A bit of greenery can make a big difference according to PhD Candidate in Biodiversity and Human Health, Danica-Lea Larcombe. They can improve your mood and can even scrub the air of pathogens and improve the office’s mix of bacteria, according to a NASA study.

Life Hacks
John Hurney has spent much of his life trackside. He recently sat down with David Gear to chat about how he helps “grease the wheels” for the student team who design, build and compete in a new race car each year.

Q. Where did your love of motor racing first develop?
My earliest memories are of going down to the old Sydney Speedway with my dad when I was about five years old. It’s not there anymore, but I have such fond memories of the place. Then, when I was about 10, we moved to Perth and I began attending the old Claremont Speedway and the Caversham race circuit.

Q. How did you become involved with the ECU Motorsports team?
When I heard the Bachelor of Technology Motorsports course was being established in 2006 I was serving as the President of the WA Sporting Car Club. So I phoned Head of the School of Engineering, Professor Daryoush Habibi, to see if there was anything I could do to help. A couple of weeks later he offered me a job — so in a way, I am still here helping out more than a decade later.

Q. What’s your role today?
My main role is to mentor and support the students and grease the wheels of the team, so to speak. I also liaise with industry and the wider motor racing community on behalf of the team as well as supervising testing of the cars down at Barbagallo Raceway.

Q. What has kept you coming back for more than 10 years?
Well, the money that I can spend on my own personal race cars is nice, but really the best thing about the job is undoubtedly the students. We always have such passionate, dedicated and hardworking students coming through the course. I learn so much from them. There isn’t a day that goes by that I don’t learn something from them about engineering.

Q. What is the most memorable moment for you as part of the team?
My top memory would be when we were over in the UK in 2016 to compete in the Formula Student event at Silverstone. It was in a little carpark at the University of Hertfordshire in the chilly UK twilight that we got the car running for the first time. I clearly remember reflecting on how this short test run, many thousands of kilometres from Perth, was the culmination of all the work put in by the students not just on that team, but all the ECU Motorsport folks who had gone before them.
Community

A football science program that engages young indigenous players with life at university is having implications that extend beyond the game, writes Tiffany Fox.

Dr Fadi Ma’aya had never seen an AFL game until he moved from Jordan to Australia in 1996, but now the sports sciences and football course coordinator is using the popular sport to inspire indigenous youth to undertake higher education.

Through the Study Hard Play Hard program, Dr Ma’aya has teamed up with the Djinda Falcons Aboriginal Football Program for the past four years, with the aim of building Aboriginal students’ aspirations for their future.

Under Study Hard Play Hard, players take part in football science workshops to improve their understanding of how science could be applied in their sporting careers. High profile West Coast Eagles and Perth Glory coaches and players also regularly give talks.

Dr Ma’aya also invited more than 160 players and their families on to ECU’s Joondalup campus last year to present the Djinda Falcons’ Academy Awards. The choice of venue was no coincidence however. He wanted to ensure the athletes received a first-hand look at university life.

“We try to inspire those children to take on higher education because there is a big gap and they get caught in poverty,” Dr Ma’aya said.

“If you improve their education you can improve their health, their outcomes, their children and you break that cycle.

“My involvement is about using football to inspire them to think about the future and think about study, career pathways to university and career pathways to TAFE ... because if you make it as a footballer then that is fantastic, but you still need to study because you might retire and you need a job at the end of the day.

“If you don’t make it as a professional you need a Plan B to improve your life, your income and your community.”

Dr Ma’aya attributed the program’s success to Djinda Falcons’ founder and manager Sharon Kenney’s commitment to fostering strong ties between the University and the Aboriginal community.

Ms Kenney said the Djinda Falcons program was unique because it engaged parents, siblings, caseworkers and carers, not only ensuring the boys were supported, but giving families access to resources and opportunities.

Ms Kenney said all of the participants studying Year 12 last year either graduated high school or secured an apprenticeship. Her own son, Brody, had completed a cadetship with WA Police and enrolled at the Police Academy.

As a result of the Study Hard Play Hard program, three parents, including Ms Kenney, and one sibling, had also enrolled at ECU for further study.

The football program will be made available to girls in 2018, with about 50 young people expected to take part.

“It is showing people what they can do for themselves if given the opportunity,” Ms Kenney said.

“The research is great, but what we have set up at the Djinda Falcons and the support we get is also benefitting the whole community.”
Research by the numbers

25% of Australian women believe wolf-whistling is inappropriate.¹

20% of juvenile burglars break into houses for food. (8% percent steal toys).²

Just 11% of park visitors use park-based exercise equipment regularly. However, two thirds think the equipment is a good investment and positive addition.³

54% The proportion of small business owners aged over 60 who feel they are not on track or only somewhat on track to having sufficient funds for retirement.⁴

2. N. Gately, J. McCue and S. Ellis. (2017) Young Offenders on Offending: Voices of young people who offend, insights into modus operandi and lived experiences. A report prepared by Edith Cowan University for the Western Australia Police and the Children’s Court of Western Australia.
The secrets your body gives away

The human brain has developed exceptional skills in analysing the movements and faces of other people — but machines might be even better. Hillary Henry looks at the secrets your body shares and how this data is being used, now and in the future.

When John McCarthy coined the term Artificial Intelligence (AI) in 1955, few could have conceived the impact it might have on life in the 21st Century — and on our privacy. Yet the frontiers of how technology watches us now shift daily. We have Alexa and Siri listening out for commands (and other conversation) at home, Facebook automatically face-tagging us in photos and self-driving cars. Cameras scan our public spaces, our data accumulates on the servers of strangers and casual retinal scans are no longer merely the stuff of big-budget movies.

But the tension lies between the intrusive nature of some advances and the health, security and convenience benefits offered by machines that watch our every move.

So, what are the secrets your body is sharing about you?

More than meets the eye

Eye-tracking is not a new technology — the first eye-tracking device was developed in 1908 — but as a technology it’s about to explode. US tech giants Apple, Google and Facebook have all bought eye tracking start-ups. Swedish eye-tracking firm, Tobii, is integrating eye-tracking technology into modern life, from reinventing computer game experiences in virtual reality to helping market researchers and advertisers to inform the placement of online ads and the design of real-world shops.

But the technology has value beyond games and retail and offers new horizons to those living with physical disabilities. Last year Tobii collaborated with Microsoft to adapt eye-tracking technologies to personal computing, and users can now control devices with eye movements alone. The potential for people living with severely limited mobility is nothing short of revolutionary.
Dr Shane Rogers of ECU’s School of Arts and Humanities is using Tobii devices to understand human social behaviour by studying the patterns in our personal interactions.

The findings could be used to help detect autism, Parkinson’s, Alzheimer’s and schizophrenia, and potentially ADHD and dyslexia.

“The findings could help in a diagnostic setting, understanding the starting points of normal behaviour and using it to determine disorders or diseases that have symptoms affecting eye patterns,” he says.

Beyond health research, Dr Rogers is also looking at how eye movements might assist in the social and working interactions between humans and robots.

The eyes are not just windows to the soul, in this case, but also a potentially confusing interface for a robot trying to anticipate what the person wants.

With robots now being used in carer-support functions, improving responsiveness is going to be important, particularly for vulnerable patients unable to communicate verbally.

“Humans tend to do a little dance where we look away from a person’s face, then look back, in order to help signal turn-taking to help conversation flow,” Rogers says.

“Understanding behaviours like these will help us develop more intuitive, more productive, robots.”

Facing facts

Humans intuitively understand our dancing eyes, and have similarly advanced ability to read and recognise each other’s faces.

But the competition from Artificial Intelligence is growing.

At one extreme, Google recently released an app that can compare any face to a catalogue of famous paintings, matching a selfie to its art doppelganger.

Disney has new algorithms which not only recognise expressions on the faces of test audiences but predicts how those expressions will change through the film.

Facial recognition is also being used by business to enhance performance, productivity and profit.

The newly-public Amazon Go app uses in-store cameras and sensors to offer shopping with fewer lines, cashiers or hassles, while a Paris business school plans to use facial recognition to determine when online students are paying attention and set quizzes accordingly.

And while Facebook’s use of automatic tagging has raised many privacy concerns, the company that provided Facebook with phototagging power is now developing Face2Gene, an app combining facial recognition AI with genomic data to improve the diagnosis of 7,000 rare diseases.
ECU researcher and lecturer Dr Syed Shamsul Islam is using similar technology to develop diagnostic tools for the most remote and disadvantaged communities.

Islam and his colleagues first combined ECU’s in-house AI facilities with 3D imaging and machine learning to research ways to better diagnose sleep apnoea.

Now the team is working with Princess Margaret Children’s Hospital to develop new screening tools, especially for children in remote communities, to make a diagnosis online via video or photographs.

“The incidence of rare diseases in Aboriginal children is increasing and when they’re located in areas where access to specialists and experts is limited, some kids can go undiagnosed and not receive appropriate treatment,” he says.

**A trade off with privacy?**

While these forms of AI don’t sound like robot tyrants bent on controlling the human race, the pace of advances inevitably raises questions of privacy.

What are the risks of being seen and known by machines? Who gets to decide how your biometric data is used?
Islam’s background includes using biometrics for security and warns that it is surprisingly easy to fake details about facial features or even fingerprints, making the world of biometric information fraud an untapped opportunity for organised crime and terrorism.

He believes that more unexpected forms of AI identification such as analysing the shape of ears or other parts of the body might be needed to create complex and safer biometric profiles.

But he says the responsibilities and risks of AI need to be taken seriously.

“Artificial Intelligence in many aspects can help people, however, there are challenges and we need to mitigate those as much as possible,” he says.

“New laws and policies will help.”

ECU’s Dr Rogers agrees, believing this is an exciting and positive stage in our history.

“In the past AI was developed really rigidly, but thanks to many advances in the last decade, it has become much more flexible and that’s why we’re all getting really excited,” he says.

“It’s a massive step forward to be able to develop Artificial Intelligence in ways that are more like people — AI that is flexible in its thinking. This is something we should all be excited about.”

Working with the Western Australian Academy of Performing Art’s elite ballerinas, Dr Luke Hopper is using advanced motion analysis technology to figure out exactly how tiny movements help ballet dancers keep their balance, even while turning spectacularly on one leg.

A lecturer and director of WAAPA’s Dance Research Group, Hopper uses ECU’s unique motion capture laboratory at the Mount Lawley campus to collaborate with ECU dance academics, and draw on his own biomechanical expertise to help understand how the best dancers achieve such feats.

His research aims to strengthen the quality of dancers in Australia and gain career-saving insights into the causes of dancing injuries and how they can be prevented.

“Ballet dancers often have to turn three, four or even five times in one pirouette while balancing over one foot,” Hopper says.

“When a ballet dancer does a pirouette it often looks like they’re a spinning top over their leg but in fact they have to be continually adjusting their posture to maintain balance through the turn.”

The motion capture laboratory’s world-class analysis can give dancers fresh insight into how they’re moving, which helps improve technique and prevent injury, and helps ballerinas better understand the mechanics of their bodies.

Cassie Tattersall, a student and ballet dancer at WAAPA, credits Hopper and the motion capture laboratory in understanding her own body and improving her dancing.

“Being able to perform a movement and then see it through the motion lab screen is so helpful in visualising how I am able to correct myself,” Tattersall says.

“The technology shows how my body is stacking and where my weight is sitting, and from there I’m able to see what physically needs to change to improve the movement.”
Beyond Utopia

WA is at a crossroads for infrastructure, with hopes a new independent organisation will reshape the planning agenda as well as the skyline of Perth. As Connie Clarke writes, it’s time to go beyond the politics of big projects.

It was the moment Western Australian sports fans had waited a decade to see. Despite naming rights debates, a final cost of $1.5 billion, and delays and cost blow-outs on the yet-to-be completed pedestrian footbridge, Optus Stadium was officially opened in mid-January — ahead of time.

Punters and pundits alike praised its form and beauty, declaring it an admirable engineering and technological achievement that would finally give the State a world-class sporting venue.

The consensus was that the new Perth stadium was the best sporting venue in the land, surpassing even the iconic MCG and the SCG, and would help bring global sporting events and thousands of visitors to Perth.

It was a rare moment of agreement about a piece of infrastructure, in a policy area marred by debate, delays and debacles. Whether it is a budget blow out or an unusable children’s hospital, infrastructure developments are frequently condemned before they can be praised.

Australia’s slapdash approach to infrastructure is so notorious it spawned a television comedy in *Utopia*, and almost no-one is surprised when projects land nowhere near the initial figures forecast as their cost.

But does it have to be that way?

Not according to experts in best practice for infrastructure, who see innovation, careful planning and an apolitical approach as key to success.

Director of ECU’s Centre for Innovative Practice Professor Kerry Brown says that although delivering major infrastructure projects on time and on budget is challenging, Western Australia is in the box seat to transform into a major city.

The answer, she says, lies in developing strong road and rail networks that will create vibrant, healthy, well-connected communities, not just in the CBD and around the Swan River, but in urban areas.

But she warns that having too many projects overlapping can create a situation where too many builders, designers and architects are needed at the same time.

“The layering of projects on top of one another in quick succession can create a crisis of capability,” she says.

“It draws too much on the resources of a local community, contributing to both time and cost over-runs.”
"The State's ambitious infrastructure program during the past decade — including Elizabeth Quay, several new hospitals, the Perth City Link and the expansion of the Riverside entertainment precinct — has attracted good expertise into the State, but there is still a lot to learn in delivering value-for-money projects."

Brown believes WA needs to keep pushing for innovation in developing the city of the future, and that smarter ways to do things should be the priority for the big city-based projects on the horizon.

Chief among these is METRONET, the ambitious vision that will connect a rail link to Perth’s airports with extensions to the north, south and east of the city, a host of new stations, and an entirely new Morley to Ellenbrook line.

With 72 new kilometres of rail and 18 new stations, the project is also planned as a catalyst for intensive land development in transport hubs.

“We are the most isolated major city in the world and we need a culture change because we are quick to jump in our cars,” Brown says.

“METRONET is a sensible response to our growing transport requirements and it will be an opportunity to draw on smart and innovative ideas from other cities.

“The Gold Coast’s light rail project is a good example of how we can change the way we think about commuting, and how technology and innovation can play a big part in that culture change. Driverless cars and alternative technologies will play a big role in the coming decades.”
The State Government is already liaising with housing, urban development and property groups in gleaning high-level advice on METRONET projects, and has set up a private sector reference group to help advise on complex planning issues.

METRONET is the State Government’s number one priority, says Transport and Planning Minister Rita Saffioti. “This is the first time in WA history that there are five rail projects either underway or in planning,” she says.

“We will be taking industry with us each step of the way, whether it’s for manufacturing rail cars, undertaking design and engineering or building within the many METRONET precincts that new train stations will enable. “It’s important we get this key body and future infrastructure projects right in planning for the State we would like to leave our children and grandchildren.”

With the scale of investment at stake — METRONET will be the biggest capital expense the State Government has embarked on in two decades — it’s important to get the details right.

He points to a 2016 report by the Grattan Institute, that found Australian governments spent $28 billion more on transport infrastructure than they told taxpayers they would during a 15-year period — a common story when it comes to exceeded budgets. The report found 90 per cent of Australia’s cost overrun problems could be explained by 17 per cent of projects — which each exceeded their promised cost by more than half.

That’s where some oversight can be useful and Fitzhardinge welcomes the announcement of a new independent body to be called Infrastructure WA, designed to take politics out of planning.

A key goal of IWA is to create a unified infrastructure blueprint that is immune from the pet projects that plague election cycles.

It will comprise a panel of private and public sector experts tasked with developing a 20-year plan for WA’s key projects. If legislation is passed in the Upper House, IWA should be up and running by 2019.

“Consultation is a crucial part of long-term planning,” Fitzhardinge says.

Chris Fitzhardinge, chair of the WA Infrastructure Coalition and director of Berkelium Consulting, says consultation between government, industry and the community is essential if the city and other parts of the State are going to achieve their goals.

“If the community understands why and how a project will be implemented, it is more likely to be accepted. A body like IWA can provide the independent link between industry groups, governments and the communities.

“People should have the opportunity to shape projects. With the population growth we are experiencing, now is the time for roads, airports, freight routes, railways, ports, water technology and public transport to be transformed, and for people to play a part in that transformation.”

The IWA can aid planning and setting of priorities, but the third challenge for infrastructure developers remains price. Fitzhardinge believes the focus should shift from how much a project costs, to whether these costs can be justified in the life-cycle of the piece of infrastructure.

Venues like Perth Arena – widely criticised for its time and cost overruns during construction phase – had been better accepted after its first five years of operation, once adjustments had been made to car parking provisions. Other venues could be adapted over time, giving them a second or even third life.

“We are fortunate that we have plenty of cities in Australia and around the world that we can learn from,” Fitzhardinge says.

“Cities like Vancouver and Toronto have very sound transport systems, and we can learn a lot from Melbourne’s inner-city transport systems, port infrastructure and water management.”

“The community should have the opportunity to shape projects.”
State manager of Consult Australia Steve Coghlan says that if truly independent, the IWA will be a great step forward for the State.

“We have a massive opportunity to shape the way that we live and work,” Coghlan says.

“We have to remember that we can’t keep building along the coast and we will now be able to review the planning of infrastructure projects with five-year plans, like other states do.”

Engineers Australia WA general manager Susan Kreemer Pickford is also looking to the future, believing an integrated approach between agencies and long-term planning of 15 years or more will help avoid the effects of the boom-bust cycle common in WA.

Longer timeframes for planning reduce risk and can attract investment — as well as providing more secure employment options for young engineers, who take seven years to train.

“If we have an effective blueprint for base infrastructure, which is strongly connected to a clear vision, and we know which facilities we require first, we can work on building a sustainable water future, focus on renewable energy solutions and build smart cities,” she says.

“We can grow safe, liveable places to in which to work and play, and these satellite cities, if planned properly, can retain and attract the right talent without the cost blow-outs.

“We can look for alternate funding models, build stronger links with Infrastructure Australia and start to attract investment from the banking sector.

“IWA can help in building that vision. Having an integrated plan independent of government and planned beyond the election cycle is crucial to our future.”
Getting the world on its game

Behind every great modern sporting performance is a team of sports scientists. David Gear and Lisa Shearon spoke with some of the people trusted with a sports star’s physical performance.
When the difference between glory and obscurity can be measured in millimetres and microseconds, professional athletes must strive for every advantage on the field. This means that to succeed, modern sporting teams work closely with sports scientists who are continually developing new ways to push the boundaries of human capability.

It’s a role that requires remarkable trust, says Professor Rob Newton, Associate Dean of Medical and Exercise Sciences at Edith Cowan University. For an athlete whose physical performance means everything — and whose body is their greatest asset — all the measurements in the world are meaningless if scientists can’t develop strong relationships with both athlete and coach.

“It takes a huge amount of trust for an athlete or coach to follow your advice as a sports scientist,” Newton says. “The main way to develop this trust is to be able to answer the questions that athletes and coaches have.

“Rather than going in and telling them what we want to study, a better approach is for coaches and athletes to drive the research questions that will enable them to improve their performance.”

Newton says this is the approach preferred by ECU sports scientists, who have now helped athletes across the globe get on their game. Researchers have helped make Australian and international athletes stronger, faster and more durable — a record that has seen the school ranked in the top 20 sports science research teams in the world.

“We are always ready to engage with industry collaborators and elite sporting clubs from the West Coast Eagles to teams in the NBA and NFL in the United States,” he says. “People find us very accessible and easy to work with. Most importantly, we have demonstrated in a very large number of different sports, and at levels from juniors right through to international elites, that we can really make a difference in terms of improving performance and reducing injury.”

Accelerating the game at Perth Glory

Staying ahead of the game in a sport that gets faster every year is something Dr Fadi Ma’ayah spends a lot of time thinking about. The coordinator of ECU’s Sports Science and Football course, the only course in Australia to offer students a specialisation in either AFL or soccer, has been working with the Perth Glory squad since 2011.

His work with the team has focused on improving a player’s running speed, acceleration and stopping times — all vital for excelling in the fast-paced modern game.

“All the research and data shows that the game is getting faster and there are more periods of high intensity,” Ma’ayah says. “The modern game is more compact but the point of play switches all the time and players need to move quickly to reposition.”
Hitting harder for softball
With softball returning to the Olympics for the 2020 Tokyo games, there is renewed interest in the sport in Australia.

Associate Professor Sophia Nimphius has been working with the WA Flames women’s squad in the lead-up to selection of the national team later this year.

“Working with the Flames, we were able to increase the batted ball velocity (how fast that ball flies off the bat) by about 9 per cent, or 8km/h, which obviously puts a lot of extra pressure on the defence,” Nimphius says.

“From a throwing perspective, we increased velocity by 6 per cent, or 5km/h, and sprint speed to second base also improved by 2 per cent.

“That doesn’t sound like a lot but means getting to the base 0.6m faster, which in a close play is the difference between safe and out.”

Leaping for greatness in badminton
Work conducted by biomechanics lecturer Dr Jodie Cochrane Wilkie is beginning to pay dividends on the badminton court.

A talent identification program she developed several years ago has helped to identify Australian badminton star Gronya Somerville.

Now ranked 25th in the world, the badminton doubles specialist works with Cochrane Wilkie to help her reach her goal of winning a medal at the 2020 Tokyo Olympics.

“Last year at the Australian Institute of Sport we used reflective markers and infrared cameras to complete a full 3-D motion analysis of each athlete,” Cochrane Wilkie says.

“We looked at joint angles and velocities and assessed their movements, which then enabled us to provide feedback on improvements to each athlete’s jump-smash and serving technique.”

Studying success at the AFL
It’s not just established sports science researchers helping athletes achieve seemingly superhuman feats.

Each year a select group of Football Science undergraduate students work with the West Coast Eagles’ performance management team, getting hands-on experience with the highest profile sporting team in Western Australia.

In 2017 ECU signed a 10-year agreement with the West Coast Eagles that has confirmed the opportunity for students to work with the club, while allowing the team to tap into ECU’s world-class sports science researchers.

The students help track the activity of athletes, learning not only about the process of measuring performance but gaining insight into what makes AFL players most successful.

Luke Hyde is the Performance Analysis Manager for the West Coast Eagles.

“Whilst at the Eagles the students perform numerous tasks in supporting the club’s performance analytics team, collecting and interpreting data, and filming and coding vision as required,” he says.
Building strength in rugby

Professor Ken Nosaka has turned his expertise in eccentric exercise into support for the Malaysia National Rugby Sevens team.

After working extensively with the National Sports Institute of Malaysia, Nosaka was asked to help the team prepare for the 29th South East Asia (SEA) Games, which was held in Kuala Lumpur in August 2017.

To improve muscle function, especially speed and power, Professor Nosaka put the team through a nine-week eccentric resistance training program before the SEA Games.

“Eccentric exercise is where the load is placed on the muscle when it is lengthening rather than shortening,” Professor Nosaka said.

“I set up a program where the players performed leg presses, but the focus was on lowering instead of lifting the weight.

“The athletes became faster and more agile. Importantly, the team won the gold medal for the first time in the SEA Games.”

The research that results from these athlete and team partnerships can be highly useful and applicable across sports and training regimes, opening up new options for improving athlete performance.

“ECU’s exercise and sports science research has been highly recognised in the world,” Nosaka says.

“We have been producing cutting-edge studies in relation to athletic performance, injury prevention, health and fitness, exercise medicine and basic exercise science for almost 20 years.”

Timing for strength in America’s NFL

When the Jacksonville Jaguars wanted to improve the ways they trained their players, and to ensure they were at their strongest in critical moments during the NFL football season, they turned to ECU’s Associate Professor Greg Haff.

The Jaguars were particularly interested in Haff’s expertise in the training paradigm known as periodisation.

“Periodisation is a very careful and calculated way of planning an athletes’ training regime,” Haff says.

“It takes into account not just the strengths and weaknesses of the particular athlete but also considers recovery, nutrition, and the impact of travel during the competitive season — essentially anything that can impact their performance in even a small way.

“It also involves a lot of testing and monitoring to ensure that what you are doing is having the desired effect.”

Haff, who also serves as President of the National Strength and Conditioning Association, says his work seems to have paid dividends, with the Jaguars making the NFL Conference Finals for the first time in ten years in 2017.

“It is likely that our work was a part of the overall transformation of the team,” he says.

Bridging the sports data gap

Six ECU sports science researchers have worked with 184 top Sri Lankan athletes in a research program led by Associate Professor Sophia Nimphius.

With the goal of familiarising Sri Lankan coaches with the data that could be collected by sports scientists, the athletes were run through a battery of tests using specialised equipment brought from Australia not normally available in Sri Lanka.

“Sports scientists can collect all the data in the world, but if coaches aren’t able to use and interpret that data to help them make better decisions then it is of very limited use,” Nimphius says.

“So we were keen to expose the Sri Lankan coaches to all of the information that can be collected when testing athletes.

“We wanted to help show them how they can make use of that data to make informed choices about how they coach and develop their athletes.”

A second trip to Sri Lanka is being planned for late 2018, where researchers will be accompanied by 20 undergraduate sports science students.

“This is a fantastic opportunity for our students to put everything they are learning into practice,” Nimphius says.

“Having to test athletes, produce a meaningful report for coaches and be able engage with a team, is exactly the type of experience that employers are looking for.”
The future has arrived and it looks smart
The concept of a smart city may conjure visions of a Jetsons-inspired city of the future, but many features of what makes a city smart are already part of everyday life.

Our televisions are linked to the internet, fridges can order groceries from the supermarket, voice-activated assistants play our favourite music and answer questions on demand, buses can be self-driving and drones are used for everything from delivering packages (at least in the US), to coastline patrols, to filming footage for the nightly news.

But as cities become more connected and increasingly reliant on technology cyber security becomes a significant risk.

ECU School of Science cyber security senior lecturer Dr Zubair Baig says many cities, including Perth, are already semi-smart, constantly exchanging data and storing information in the Cloud.

But his latest research paper looks at how the same connectedness that will transform the way we live of lives also underscores the challenge that cyber threats pose for the four key components of a smart city — smart grids, building automation systems, unmanned aerial vehicles and smart vehicles — given their reliance on the Internet of Things and cloud platforms.

Baig says that these components are increasingly becoming a target for cyber security threats.

“Everything is digitised, and data is being generated by these devices and wirelessly communicated for storage to a centralised location,” he says.

“If you look at it from cyber security and a forensic viewpoint, it is essential that this data is not leaked to hackers, sold in the digital black market, or deliberately modified. It must be transported in a secure manner across any two points.”

Baig says mobile phones present the most vulnerable target because they contain so many apps that are poorly secured, providing a potential backdoor into personal home networks.

It was essential phones were protected by a password and only secure and verified apps downloaded, he says — and third-party apps that could contain malware should be avoided.

“In a nutshell, it is about ensuring private communication in a public world,” he says. “It is hard, but it is important.”

Smart grids

To picture the smart city of the future, it is worth starting at the most fundamental connection — the power that keeps the lights (and internet) on.

The smart grid marks the evolution of the electricity network, with smart meter technology scheduled to be available in Perth this year, after pilots of smart meters in a range of locations.

The technology enables consumers to share information about their power usage, turn it on or off, through smart meters.

“In a smart grid, a smart meter monitors your electricity usage and can provide a breakdown of the number of watts consumed by your household at various times of the day,” Baig says.

Advanced meters are due to be installed widely by Western Power this year, allowing West Australian homeowners to take on new technologies such as peer-to-peer energy sharing.

The advanced meters will also collect data about the connection to a home or business, providing an early warning system and allowing for early maintenance, potentially preventing faults.

But, for smart grids to remain secure, Baig says information collected, stored and communicated by smart meters and the utility provider must be encrypted, and only accessed by authorised people.
Automated buildings

The smart grid will help keep the power on, but a smart city needs the buildings connected to the grid to be smart as well.

To achieve the vision of a smart city, Baig says common building systems such as air-conditioning, elevators, closed-circuit television, lighting, water and energy can be integrated with sensors to allow real-time reporting.

The building’s operations can then be managed automatically, depending on the needs and usage of tenants, and observed remotely over the internet — making it possible to watch the operation of entire blocks from a single dashboard.

But the increased connectivity of building systems means they are exposed to the same cyber-security threats as traditional IT networks, and Baig says governments need to engage with industries to ensure data security.

Governments could develop and implement policies that required appropriate security in all smart devices sold.

Unmanned aerial vehicles

In the skies above the smarter buildings fly another form of smart device.

Drones have become widely available commercial tools and recreational novelties, and it’s likely they will provide a platform for services to gather data in an interconnected city.

But studies have shown civilian drones often lack encrypted communication between the controller and the device, making them susceptible to remote hijacking and video interception.

Baig says this challenge can also be addressed if buyers are proactive.

“You have to prevent them from failing by being hacked, because if they fail they will crash – possibly hitting someone,” he says.

“As a user, you should buy these devices from known, established vendors, ensuring they store data securely and that it can be safely transmitted.”

Smart vehicles

On the roads of the smart city are smart vehicles — and the promise of being able to read your texts in peace while your car navigates the way home.

The RAC trial of the fully automated, driverless Intellibus in South Perth is a glimpse of the future of transport — and a future getting nearer every day.

Baig says today’s modern vehicles already feature smart components such GPS, diagnostic systems and integrated infotainment systems, and regularly report their coordinates to base stations.

It is just a small step for the car to speak to road-side sensors about factors on the road, including speed limits, traffic conditions and the number of passengers in the car.

The integration of smart vehicles with the cloud would allow drivers to access real-time information while driving a smart vehicle, as well as providing a wealth of information to investigators if the vehicle was used in a crime.

Once again, though, there is the risk of a cyber attack, and the prospect of weaponised traffic doesn’t bear thinking about.

Baig says more work is needed to develop methods for handling incidents involving smart vehicles while preserving the personal privacy of drivers.
Internet of Things sensors

To keep the drone in the air talking to the car on the ground about the roadworks ahead on the road, enter the Internet of Things or IoT.

IoT is an enabling technology for smart cities, providing the option of connecting nearly any device to the internet, whether that is a road sensor indicating when a bridge is under stress or a street light that adapts to the weather and brightens an overcast day.

Baig says everything from fridges and televisions to power points and gates can be linked to online accounts and controlled remotely, increasing cyber security risk.

Before buying smart appliances like a fridge or TV, consumers need to confirm the device receives regular software updates to ensure the most up-to-date cyber protection, he says.

“You have to ask yourself, ‘is my router secure?’ ‘Did I secure all the other devices on my home network – my iPad, my Xbox, my smart washing machine?’” he says.

“If a device cannot be updated then it becomes a channel for an adversary to enter your home networks and becomes a launch pad to an attack on other home systems.”

In the cloud

Invisible but everywhere, the last essential component of the smart city is the cloud – where the data generated by a smart city and its millions of inhabitants is stored and transacted.

Given the potential for vulnerabilities in the different components, however, there is the potential to affect data stored using cloud computing.

Cloud security is primarily the duty of service providers responsible for safeguarding the information, Baig says, but with greater connectedness came greater risk that an attack on one part of the network could have implications for other parts.

“The enabling technology to protect data is already here,” he says.

“The question is whether the devices are secure enough or can be secured before they are deployed in the smart city network.”
Contemporary fashion can reflect the past, writes Tori Pree.

These ECU Contemporary Fashion student eco designs include repurposed tablecloths, reworked woven cloth, hand-printed natural dyes and zero-waste cutting methods.

However, Course Coordinator Justine McKnight says creating sustainable fashion is not just about using recycled or repurposed materials.

“It’s about the attitude to the making process, with attention to detail and a focus on well-made garments that will last,” McKnight says.

“Many of our students go on to do their own collections and are fully aware of being sustainable, it’s not just about the environment but, economically, it also makes sense not to waste materials.”
6. D’Arcy Coad.
Photo by Songy Knox

Photo by Songy Knox

Photo by Songy Knox
In the 14 years since Martin completed her Bachelor of Communications degree, majoring in photography, her career has gone from strength to strength.

The award-winning, internationally acclaimed photojournalist said she had always had a strong commitment to social and environmental causes. Photojournalism gave her the opportunity to give those stories a voice and, after graduating, she spent four years travelling through Canada and the US where she honed her skills.

“I didn’t try to jump into being a professional photographer too quickly,” she says.

“I just wanted to take some photos that I was proud of, that engaged me and my imagination.”

Entering international photography competitions opened the doors to networking opportunities and helped her set up her career. Winning first prize in the Sony World Photography Awards for an Emerging Portrait Photographer took Martin to Cannes, France, where she met editors and professional photographers from across the globe.

This provided valuable contacts in the industry and she soon joined the Australian photography collective Oculi, which helped her secure freelance work via an agency in Europe and America.

“You do one assignment and then they just start rolling in,” she says.

Martin’s works have been published in publications across the world including Vanity Fair, National Geographic, Monocle magazine, The Wall Street Journal and Time.

She says her favourite editorial commission was an environmental climate change story in Kiribati, in the South Pacific.

“I was working with Bloomberg for an amazing editor,” she says.

“Since I was a teenager, I have always been an environmentalist, so it was amazing to work on something I cared about in such a stunning, amazing place on a message for our time.”

Living in a squatter community in the Colorado Desert in California, where she produced a series of works titled, ‘Slab City,’ was another favourite.

The squatters had created a home among abandoned concrete slabs left behind from a World War II base, and the focus of her works was drug addiction and mental illness.

“I loved Slab City because it gave me such a different perspective,” she said.

“The people there have found joy and pride in their lives that they were able to achieve because they have isolated themselves from a society that labelled them problematic.”

To view her portfolio, visit www.clairemartinphotography.com

If you’re an ECU graduate, you can take advantage of a range of benefits available to the ECU alumni community. See www.ecu.edu.au/alumni
Events

MAY
ECU LECTURE SERIES
Mount Lawley Campus
25 May
Hear from one of ECU’s newest Professorial Research Fellows, Paul Arthur, Chair in Digital Humanities and Social Sciences.

JUNE
BREW HA HA
State Theatre Centre
9 June
Laugh along with a host of entertaining comedians at this exclusive ECU Alumni event.

WAAPA’S MID-YEAR MUSICAL CAROUSEL
Regal Theatre
16-23 June
See the stars of tomorrow perform this timeless musical.

JULY
NAIDOC WEEK EXHIBITION
Mount Lawley Campus
9 -14 July
Experience an exhibition celebrating Aboriginal and Torres Strait Islander culture.

JOONDALUP OPEN DAY
Joondalup Campus
22 July
Access all-areas of the Joondalup Campus, meet with lecturers and get a taste of uni life at the first of ECU’s three Open Days.
AUGUST

MOUNT LAWLEY OPEN DAY
Mount Lawley Campus
12 August
Take a look behind the scenes at WAAPA and learn about other courses on offer at ECU’s Mount Lawley Campus.

STUFF HAPPENS
Roundhouse Theatre
24-30 August
Inspired by US Secretary of Defense Donald Rumsfeld’s comments in the aftermath of the invasion of Iraq, Stuff Happens explores the rationale behind the 2003 war. The show is performed by third-year WAAPA Acting students and directed by Gregg T. Daniel from the USC School of Dramatic Arts.

SOUTH WEST OPEN DAY
South West Campus
26 August
Meet the lecturers and explore the facilities at ECU’s campus in Bunbury.

SEPTEMBER

ECU GRADUATION CEREMONIES
Perth Convention and Exhibition Centre
9 September
Another cohort of successful ECU graduates will be farewelled, joining ECU’s network of more than 130,000 alumni around the world.

RESEARCH WEEK
Joondalup, Mount Lawley and South West Campuses
10-14 September
Marking its 10th year, ECU’s Research Week celebrates how ECU research is making a difference.

For more information on ECU events, visit www.ecu.edu.au
James McCue looks at the key steps parents can employ to encourage their teenagers to make good decisions.

1. Be aware of upcoming events that may present teenagers with decisions that need to be made. Listen to their expectations about the events (such as whether they expect to drink alcohol).

2. Pose scenarios that may present a risk, or will require a decision (such as missing the train home, friends becoming intoxicated) to explore healthy, or safer choices.

3. Encourage your teenager to stop and think. Help them recognise how to remove themselves temporarily from a tense situation, in order to make decisions away from direct pressures (whether it is going to the bathroom, making a phone call, texting a friend).

4. Provide a decision-making compass. Although teenagers cannot consider all the potential consequences of a situation, get them to consider whether they would tell you about their decision (“would I want mum/dad/grandma/grandpa to know about what I’m about do?”)

5. Remind teenagers to ask for help. They don’t have to make choices alone. Ensure they save contact details of people who can be available to talk through options if they’re in a difficult situation.

6. Use mistakes as learning opportunities. Teenagers may make wrong choices. Use these lived experiences to generate discussion about where the decision making went wrong, and how to make better choices in the future.

James McCue is a Lecturer in Psychology and Criminology, Edith Cowan University. This article was first published on TheConversation.com.au.
With our reliance on internet-based technology, there's never been a greater need to protect Australian businesses, government and the community.

ECU offers the largest cyber security and research program in Australia. In 2017, ECU was granted close to $1 million by the Australian Federal Government as one of just two Academic Centres of Cyber Security Excellence in Australia. Also the Federal Government recently announced that ECU’s Joondalup Campus will house the Head Office of a new $50 million Cyber Security Cooperative Research Centre (CRC).

ECU’s Security Research Institute (ECUSRI) offers world-class teaching and research in Cyber Security, Critical Infrastructure Security, Digital Forensics and Human Security, and has a history of delivering successful research projects for Federal and Defence agencies. Two of the ECU Cyber team are Interpol recognised Cybercrime experts. We also incorporate teaching from research collaborations with security industry partners.

At ECU, we offer a range of industry-relevant undergraduate and postgraduate courses in Cyber Security, Computer Science, Counter Terrorism Security and Intelligence, Information Technology, and Security.

ECUSRI welcomes the opportunity to discuss research collaborations with public and private businesses and individuals who have a shared interest in the security industry.
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