Adelaidean

News from the University of Adelaide

Spring/Summer 2015 | FREE publication

HOW FAR CAN WE GO?

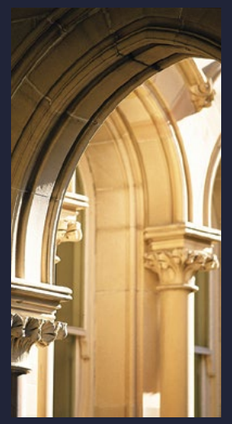
FROM MARS TO LIVING TO 1,000

On your bike, Adelaide

Saving those who serve

Small advances, huge difference

THE UNIVERSITY of ADELAIDE



INSIDE THIS EDITION OF ADELAIDEAN

In just 165 years, humans have doubled their average life expectancy, and more people than ever are living to 100 and beyond. Could we ever live to 1000 years?

The future of fertility technology is looking bright for couples wanting children, thanks to the work of the Robinson Research Institute. They're also tackling the world's biggest killer of children under the age of five: pre-term birth.

Adelaide could become the cycling capital of Australia if Dr Jennifer Bonham has her way, but what's stopping us?

Professor Bob Hill explains how the rise of an Aussie icon – the gum tree – is closely linked with another mainstay of our landscape, the bushfire.

And Sonic Arts students in the Elder Conservatorium of Music are winding back the clock to receive a unique educational experience.

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READER SURVEY

To be in the running to win one of five $100 vouchers for the Adelaide Fringe 2016, please fill out our online reader survey by 5.00pm 31 December 2015: bit.ly/adelaidean2015

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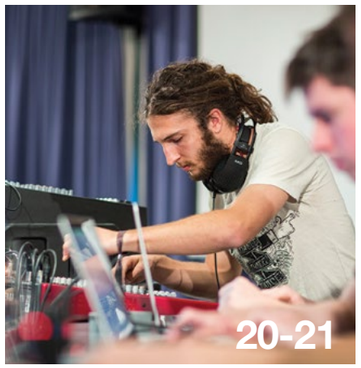

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BUILDING BETTER CATTLE FROM THE GENES UP

The new J.S. Davies Research Professor, John Williams, has a distinguished career in the genetic improvement of livestock animals for agricultural production. His background is in ruminant research – cows, sheep, goats and buffalo – with a particular area of expertise in cattle. But it almost didn't end up that way.

When he left secondary school to study at King's College London, Professor Williams' first love was physics. "I knew I wanted to be a scientist but as I got further into my studies I realised I was developing a stronger interest in biology," he says. This culminated in dual Honours of physics and biology.

Inspired by his experiences at King's with Nobel Laureate Maurice Wilkins, Professor Williams undertook a PhD in Biochemistry at the National Institute for Medical Research, London. After studying gene expression in the aquatic frog species *Xenopus*, he then moved to the University of Edinburgh to work with *Drosophila* fruit flies. Professor Williams found his expertise in the underlying genetics of animal disease leading him to agricultural science.

He moved to the Roslin Institute in 1986 to work on tropical diseases and spent a period working on secondment in Kenya. At Roslin, Professor Williams was Head of the Cattle Blood Typing Service and Head of the Bovine Genomics Section. Then in 2005 he took on a short-term contract at the Parco Tecnologico Padano in Italy – but stayed as Science Director for almost 10 years, where he was involved in establishing a start-up diagnostics company.

"Much of my career has been spent working in agricultural research organisations that have started small but have grown substantially. At the Roslin Institute, their animal breeding programs were initially focused on traditional genetics, but we expanded that to cover molecular biology and genomics, and I was involved in translating this into services for industry. I had a similar experience at Parco Tecnologico Padano, which grew to have an international research impact," Professor Williams says.

He sees his new role in the University's School of Animal and Veterinary Sciences as in keeping with these past experiences. "I'm very excited about being here at the University, at a time when we're looking to establish the J.S. Davies Animal Research Centre.

"To be building on the outstanding work that's already been conducted at the Roseworthy campus, and helping it to develop, is a great opportunity," he says.

"To be building on the outstanding work that's already been conducted at Roseworthy is a great opportunity."

PHOTO

Professor John Williams at the Roseworthy campus

SMALL ADVANCES, HUGE DIFFERENCE

RESEARCHERS ARE WORKING TO PREVENT HEALTH CONDITIONS AT THE EARLIEST STAGES – EVEN FROM THE POINT OF CONCEPTION.

Professor Sarah Robertson is on a personal mission as well as a professional one.

As one of the world's foremost experts in reproductive biology, and Director of the University's Robinson Research Institute – leading 400 researchers working on pregnancy and infant health – she is keenly aware of the huge responsibility such work carries with it and its ability to transform people's lives.

At a time when she was transitioning from the field of immunology to reproduction in the late 1980s, a close friend had delivered a baby boy at only 28 weeks of gestation. He weighed 850 grams.

"He was so tiny; plus he was underweight for his gestational age because my friend had pre-eclampsia. It was a life-threatening situation and a shattering experience for the family," Professor Robertson says.

Each year, 15 million families around the world experience a pre-term birth (at less than 37 weeks' gestation), and one million of those babies die. Pre-term birth is now the world's biggest killer of children under the age of five, and prevents many more reaching their full life potential.

"Pre-term birth results in major issues for the infant and the family, with health and developmental consequences that can stay with the child for life. It is very motivating when you can see in your own family and friends the distress that illnesses of pregnancy cause," she says.

It's two years into Professor Robertson's directorship and the Robinson Research Institute is having continued success across each of its research themes. Many members of the Institute are now preparing to move down North Terrace to the University's new Adelaide Health and Medical Sciences building in the city's West End. The move to new, state-of-the-art laboratories will be crucial to the future of the Institute's work, and will accelerate capacity to make significant inroads into the causes of preterm birth and other conditions that affect infant and child health, such as a recent finding about the biological factors that influence the timing of birth.

"For us, it's not just about providing better treatment and care for children who are born too soon, but also finding ways of predicting risk, and ultimately preventing pre-term birth. This is one area where even small advances would make a huge difference, in Australia and globally," she says.

Another key focus of the Institute's work is unravelling the complex biology that results in parents – both mothers and fathers – transmitting information to their offspring at the time of conception, effectively setting their child up for a lifetime of good, or poor, health.

Professor Robertson says she's positive that future research developments will impact not only people's ability to have a child, but to help ensure their child has optimal health.

"There will be some very exciting advances in the near future," she says. "We will have amazing technologies for assessing and responding to health conditions before they can be transmitted to the child, with much better preventative health measures.

"For example, we're going to see remarkable capacity to assess and improve people's reproductive competence, particularly the status and quality of eggs and sperm. In the past, tests for male fertility have been relatively simple – they've been based around measuring sperm counts and sperm mobility. But in the future we're going to be measuring the role of tiny molecules, such as non-coding RNAs (ribonucleic acids), and we'll be looking at the molecular composition of seminal fluid.

"We will also assess the egg mitochondria (the critical energy-producing 'organs' within living cells), which play an important role in transmitting metabolic information from the mother to the child. There's also the potential for stem cell technology to be used to develop healthy eggs and sperm," she says.

She says IVF technology will improve to better replicate the real environment of conception and maturation of an embryo. "We'll be looking to develop nanoscale, microfluidic systems for a real-time adjustment of the IVF culture to match the individual embryo's needs. This is within our reach, and it's part of what we're working on in the Institute."

Professor Robertson says improvements in real-time sensing will also have a major impact. "Being able to monitor the status of a pregnancy, particularly when we talk about the threat of pre-term birth, and to measure the development of the fetus over the course of pregnancy will give us the opportunity to intervene much earlier."

However, Professor Robertson cautions that technological changes are only a part of the story. "There will be fantastic developments emerging from reproductive medicine in the decades to come, but we also have to change people's mindset around the solution not always being a magic pill. The solution is often in your own reach. If you care for your health and maintain it, that will have the greatest impact on your fertility and the long-term health of your child.

"I would really like to see a future in which all aspiring parents have a greater sense of ownership of their own reproductive capacity and their reproductive 'careers', if you like. I'd like to see school students educated to understand the incredible privilege and value of their capacity to reproduce, even many years before the time when they might want to start a family.

"And it's not just about the biology and our genes, it's what I describe as 'from cells to cities'. Better nutrition, exercise, better workplace and cleaner built environments, these all play a role in creating a healthier society for future populations."

"There will be fantastic developments emerging from reproductive medicine ... but we also have to change people's mindset around the solution not always being a magic pill."

PHOTO

Professor Sarah Robertson

ON YOUR BIKE, ADELAIDE

WHAT WOULD IT TAKE FOR ADELAIDE TO BECOME ONE OF THE WORLD'S GREAT CYCLING CITIES? JENNIFER BONHAM EXPLAINS WHY WE SHOULD LEARN TO LOVE THE "LYCRA SET".

"It's become easy for motorists to think of the streets as their space alone, that cyclists don't have a right to be there."

PHOTO
Dr Jennifer Bonham

It could be argued that Adelaideans are easily influenced by all things wheels: the roar of V8 engines during the Clipsal 500 car race is echoed by rev-heads' burn-outs in suburban streets; the rush of the peloton as it gusts by during the Tour Down Under stirs locals to squeeze into lycra and venture forth in their droves. For a couple of weeks at least.

And while it's the car culture that has emerged victorious in Adelaide – as in so many other western cities over recent decades – it doesn't have to be that way, according to the University of Adelaide's Dr Jennifer Bonham.

A senior lecturer in Geography, Environment & Population, Dr Bonham is one of Australia's leading researchers looking at issues of cycling and human mobility in urban areas. It's her hope that Adelaide can become a great cycling city, helping to address a range of social problems along the way.

"Cities around the world are grappling with issues of traffic congestion and urban sprawl," she says. "In most Australian cities there's the question of: 'Can we continue to expand into the urban outskirts, eating up agricultural land?'

"Once governments implement policies aimed at achieving higher urban densities, moving towards more compact cities, then we must accommodate more people on existing road infrastructure and, following from this, we need to diversify our travel options."

Dr Bonham says in higher-density cities, cycling becomes a comfortable option for travelling distances of around 7.5km. "That's what the Dutch refer to as a 'short journey'," she says.

The Netherlands is Dr Bonham's shining example of a country that's got its cycling policies and infrastructure right. In the 1970s, the Dutch started planning to become more heavily reliant on cycling. Now about one third of the population travels regularly by bike, and in cities such as Amsterdam more than 60% of journeys are made by bicycle.

"The Netherlands rejected what was going on elsewhere in the world, including Australia. We'd developed a culture in which car driving had become seen as the only viable mode of transport," Dr Bonham says.

"In our society, cycling has been gradually marginalised out of mainstream transport. In the 1950s and '60s there were still a lot of people riding their bikes for everyday journeys but that was never included in any of the transport studies of the time.

"Over the years it's become easy for motorists to think of the streets as their space alone, that cyclists don't have a right to be there," she says.

While the Dutch have led in this field, the Danish city of Copenhagen has around 50% of its population regularly cycling, with Strasbourg in France at around 30%. How does that compare with Adelaide?

"For the daily journey to work, less than 2% of people in Adelaide are cycling," Dr Bonham says. "In some inner suburbs, of Unley and Norwood, you've still only got about 5-6% of people cycling to and from work. So while it seems like cycling is becoming more popular in Adelaide, we've still got a long way to go.

"That's 5-6% of people cycling when there hasn't been a lot of effort put into it. So if we were to take a concerted approach to the issue – such as improving infrastructure, improving regulations, and promoting cycling – things would change."

Dr Bonham says Australian cities should be able to reach at least 15% of cycling participation. The City of Yarra in inner Melbourne is close to hitting that mark. "They've been working for more than a decade to 'invert the hierarchy' – rather than prioritising motor vehicles on the street, they've prioritised movement of pedestrians, cycling and public transport. These innovations are proving to be a success," she says.

"In Adelaide, it's not unrealistic to expect that within 20 years, 25-30% of inner suburban journeys could be made by bicycle. Adelaide could be an ideal cycling city, especially if we have good road design and good regulations."

Dr Bonham is co-editor with Marilyn Johnson of a new book, *Cycling Futures*, from University of Adelaide Press. The book captures the current state of cycling research from Australia and New Zealand, with contributions from engineering, architecture, social sciences, the humanities, health, economics, and many other fields. Dr Bonham says she hopes the book "will give the broader community an idea of how serious this form of mobility is, and the knowledge that it's here to stay".

She's also quick to point out that that there are many women who have a passion for cycling conducting research into this field. "Cycling in Australia is often considered a very masculine pursuit. In some sections of the community it's still seen as 'blokes in lycra on weekends'."

And while the "lycra set" are often derided, what does Dr Bonham think of them?

She laughs. "Many people may not know this, but the lycra set are good for the local economy – just ask any café or bakery! And I think: at least they're out there on bikes."

SAVING THOSE WHO SERVE

THE MEDICAL PROFESSION HAS KNOWN FOR OVER A CENTURY THAT WAR CAN DAMAGE PEOPLE'S MINDS – WHEN THE BATTLES STOP, FOR MANY THAT'S WHEN THE REAL STRUGGLE BEGINS.

Australians have understood the psychological consequences of combat since World War I.

In the late 1930s, 20% of the Commonwealth budget went towards pensions for widows of veterans and veterans who were physically and mentally damaged by war service.

A century on, we still need to know more about how ongoing service affects military personnel, particularly when they return to civilian life. This is the aim of a new federally funded $5 million study of nearly 60,000 recently discharged plus still serving Australian Defence Force (ADF) personnel, led by the University's Dr Miranda Van Hooff.

"The majority of veterans get through with remarkable resilience," says Professor Sandy McFarlane, head of the University's Centre for Traumatic Stress Studies, where the research project is based.

However, there is a real challenge in making sure services reach those who need them. To begin, veterans often have a stoic attitude and also the psychological impact of exposure to horrific events can take years emerge. A previous survey of still-serving personnel found 24% of officers and 27% of other ranks would not seek help for memories they struggle to deal with, lest they be seen as "weak".

"The challenge is to get care early before a person's social relationships fragment and secondary problems such as alcohol abuse emerge," Professor McFarlane says. He points to studies of Australian deployments overseas in the last 25 years to demonstrate that the absence of combat does not mean someone is not a risk.

"The similarities of traumatic exposures during modern peacekeeping operations are often greater than the differences experienced during deployment in a declared combat zone; the rates of psychiatric disorder in veterans following the two types of deployment are therefore quite similar," he wrote in an August editorial for the *Medical Journal of Australia*.

This makes recognising and reducing what Professor McFarlane calls "barriers to care" a core problem in helping veterans. They are barriers that must be better understood to be changed: "Younger ADF personnel have higher depression rates than the general community. If they leave service without getting assistance, they're the ones who are at risk and likely to benefit from treatment. The study will look at rates of suicide and suicide attempts; this is one focal point," he says.

The aftershocks of traumatic stress extend well beyond the military. Professor McFarlane has worked for decades with survivors of bushfire disasters and his centre has a long established interest on the consequences of traffic accidents for victims. But in this new project, the focus is on creating a benchmark study to establish needs and service delivery among, and for, veterans. This is especially important now that it is understood that post-traumatic stress disorder (PTSD) can take years to appear.

> "There is an obligation to care for those who care for the community."

A widely published and internationally recognised expert on PTSD, Professor McFarlane has worked with the Australian Department of Veterans Affairs, consulted to the United Nations, and been involved in litigation against the UK government by veterans of the Falklands and Gulf wars and those deployed to Northern Ireland.

The problems many veterans face are now known to extend far beyond the need to deal with the memory of appalling events. Certainly post-traumatic stress activates fear mechanisms and disrupts parts of the brain which modulate behaviour but it also affects people's basic biology. Professor McFarlane also warns PTSD sufferers therefore have heightened risks of cardiovascular and autoimmune diseases. "This is a disease that affects the body not just the mind."

The survey, now underway, has six core objectives which will make it one of the largest studies of military personnel ever undertaken. Professor McFarlane and Dr Van Hooff and their colleagues want to know about the physical and mental health of veterans who transitioned out of full-time service between 2010–2014 and they're interested in the trajectory of mental health symptoms and disorders. Thus the survey will ask about physical problems, such as recurrent pain and difficulties sleeping, and health risk behaviours, including alcohol, tobacco and drug use, and put everything in context by relating people's conditions to their experiences while serving, and when they returned home.

The challenge is getting veterans to respond. "Some leave Defence and just want to forget. They do not always want to engage with surveys about their welfare," Professor McFarlane says. It's also essential that they understand that while federally funded, the survey is independent of government. "Many vets just don't trust bureaucracy," he adds.

Veterans are often the last to admit they may be struggling, hence families are crucial both in encouraging participation, and reporting behaviour. There is also a separate study on the impact of service on families.

The findings of such work have broad relevance going beyond those who have served in the military, particularly emergency services staff. "The people most at risk of PTSD are willing to walk into danger," he says. "There is an obligation to care for those who care for the community."

HOW FAR CAN WE GO?

HUMANS ARE ALWAYS PUSHING THE BOUNDARIES, FROM EXPLORING SPACE TO DOUBLING OUR LIFESPAN IN JUST SIX GENERATIONS.

"This century we're going to see vast modifications in biological organisms… genetic manipulation, stem cell technology, nanotechnology."

PHOTO
Dr Arthur Saniotis

"The 20th century was the age of physics. The 21st century is the age of biology."

That's according to Dr Arthur Saniotis, lecturer in human anatomy and evolution in the University's School of Medicine.

Dr Saniotis is a self-confessed futurist who applies his thinking to key issues facing humankind, and the factors that will shape our evolution as a species. Issues such as: can we continue to push the human lifespan further by decades, even centuries? And what will it take to get humans to safely travel to Mars, and beyond?

"The two issues are uniquely linked in many ways. Biology is a key part of the story but technology also has a huge role to play," Dr Saniotis says.

"As a species, we've been modifying ourselves since the beginning. When we created fire, it was a modification to who we were and what we were capable of. Tool making is a hallmark of our species, as is language, and both of these things have resulted in a range of physical and cognitive adaptations that have made us who we are today," he says.

"This century we're going to see vast modifications in biological organisms, such as through genetic manipulation, stem cell technology, nanotechnology. The scope of medicine and health services is changing from being focused on saving people's lives to altering people."

The current life expectancy for Australians is 85 years for women and 83 for men. How possible is it for humans to keep pushing the limits of our lifespan? Can we ever expect to live to 1000? Dr Saniotis doesn't think a "millennial human" is within our reach, but he says people might conceivably be able to live for hundreds of years.

"Prior to the Industrial Revolution not as many people lived beyond 60 years of age. In 1850, the average life expectancy was 40 years. Today, that life expectancy is doubled and there are now tens of thousands of people in the world who live beyond 100 years. In Japan alone there are about 60,000 centenarians, which is an incredible number," Dr Saniotis says.

"Since the mid 20th century, we've given people in the developed world 20-30 years of extra life. This is quite miraculous, and it's occurred within a relatively short time in human history."

> “Astronauts who see the Earth from their little portal windows feel a sense of psychological connectedness with it.”

Dr Saniotis says a range of health and social issues for older people – such as Parkinson’s and Alzheimer’s disease and dementia, as well as cancer – are currently major hurdles for the quality of older life. But if medical science is able to tackle these issues, what can we expect for the future of the human race?

“The nature of our whole society would have to change,” Dr Saniotis says. “Our notions of ageing and youth, concepts of family, our sexual patterns and relationships, our concepts of work and retirement, social security systems, the food industry, medicine, all of this will change.”

Dr Saniotis poses a further issue: “What if you want to live for centuries but no-one else around you wants to live that long? The rest of your life will see continuous loss; it would be too much for most people. So while physically we might be able to modify and adapt to extend life, it’s possible that for many people it would be psychologically damaging.”

Dr Saniotis says space travel is also a double-edged sword.

“It would take about six months for a manned spaceship to reach Mars, and another six months to return. At the current time, scientists have yet to devise a method to protect astronauts from the amount of cosmic radiation they would be exposed to during long-term space travel.

“Assuming that problem is somehow solved, my main concern is helping to reduce the physical and neurological deprivation that astronauts would experience on such a journey,” he says.

“Over the last 30 years authorities have been monitoring people on space stations, particularly on the Russian space station *Mir*. And you can see so many problems occurring: from changes in blood circulation due to microgravity, muscle and skeletal loss, neurological deficits, and behavioural issues due to stress levels and lack of sleep.”

Dr Saniotis says although astronauts already conduct exercises to maintain physical and mental health, it’s not enough to replace the kind of stimulation they would receive on Earth. And there’s another key factor in all of this: people’s connection to nature.

“It’s known that astronauts who see the Earth from their little portal windows feel a sense of psychological connectedness with it. So even if you can see a small image of Earth, it gives you a sense of stress relief. What will happen when you go into deep space and you no longer have that image?

“The famous naturalist E.O. Wilson posed the theory of ‘biophilia’ – love for nature – that human beings evolved in nature and they are indelibly connected with it. We know that from past research, people in hospitals who see images of nature after an operation have higher rates of healing than those who don’t.

“If you’re cooped up in a spaceship for months on end, and you’re deprived of this connection, you’ll be experiencing stress on multiple levels in addition to other stresses of being in space, and that’s not good for you physically or mentally.”

Dr Saniotis says mindfulness meditation is one technique that should be used for astronauts, prior to, during and after the mission. “Even just a few minutes of meditation will reduce stress hormones, increase calmness and relaxation, and protect your brain.”

In this regard, astronauts and those looking for longer, healthier lives have something in common: “Studies have shown that daily meditation and walking can reduce ageing in older people. This activity gives you a better sense of calm, and enables your immune system to work better.”

Dr Saniotis says there’s “nothing magical about this formula”. And you don’t have to be on a mission to Mars to benefit from it.

A DAY IN THE LIFE: SECURITY SERVICES

WALK IN THE FOOTSTEPS OF ONE OF OUR MANY SECURITY SERVICES TEAM MEMBERS.

The University of Adelaide never sleeps.

Not only has it become a 24-hour hub for students but the University's North Terrace campus occupies a unique location in the city.

As the University has undergone many changes in recent years, so too has Security Services – with new technologies, new buildings, more students and a growing city life and culture. Every phone call and every walk up to the front desk of the Security Office presents a new challenge. One thing that remains constant, however, is Security's dedication to the people on campus.

"It doesn't just have to be students or staff, we have an open campus so we naturally deal with all sorts of people from the broader community," says Security Supervisor Bruce Ball.

From managing lost property and rescuing baby ducks, to monitoring alarms and responding to medical emergencies, no day in Security Services is ever quite the same. "We're everything to everyone. Or if we're not, at least we know who to go to," Mr Ball says.

Here's a sample of a day in the life of our Security team:

5.00am – Raising the Flags

Security maintains and raises the flags on all three campuses. The Australian flag is the first one to go up and the last one to go down at the end of the day.

6.00am – Access

Access to the entire University is controlled by Security Services. Many external doors across campuses can be locked at once, but security officers are also constantly opening buildings and securing them. At North Terrace campus this can mean checking up to 500 doors in a single shift.

7.00am – Shuttle Services

Len Wight has been driving the University's shuttle bus for 24 years, taking students and staff between campuses. Averaging around 135,000 kms a year, Len could have travelled to the moon and back four times!

9.00am – Bike Safety

A number of secure bike racks exist around campus for people who ride to University. Security Services can lend bike locks to students and staff who have forgotten their own. Security Services has a close relationship with South Australian Police and they hold free bike engraving days on campus.

3.00pm – Lost Property

Lost property remains at Security Services for two months before it is donated. Clothes are given to charity while stationary and calculators are donated to the Adelaide University Union to be passed on to disadvantaged students. Unclaimed bikes are given to Containers of Hope, a charity that sends donated items to less fortunate people overseas.

8.00pm – Emergency Phones

Across the University's campuses there are 23 dedicated emergency phones that will put the caller straight through to Security Services. Along with building and lift checks, these phones are tested every weekend.

12.00pm – Emergency Services Planning

Susan Whittington maintains the University's warden network for all campuses, assisting a contracted service provider to ensure 800 wardens are trained to specific requirements. If an emergency situation does occur, Security Officers are prepared to respond to the situation.

5.00pm – Self-Defence Classes

The Security team runs free self-defence classes, which are popular among staff and students.

11.00pm – Safe Steps

The Safe Steps program reminds everyone on campus to look out for their own personal safety and the safety of those around them.

"We're everything to everyone. Or if we're not, at least we know who to go to."

TECH STEPS TOWARDS A NEW LIFE

FROM HELPING CHILDREN WITH SPECIAL NEEDS TO WALK, TO REVAMPING THE BBQ AND THE SURFBOARD, ENGINEERING STUDENTS ARE APPLYING THEIR KNOWLEDGE IN EXCITING WAYS.

Some children with physical disabilities that affect walking need special care and attention to help them reach their full potential with mobility.

A team of Mechanical Engineering students, in partnership with Novita Children's Services, is developing a special "exoskeleton" to help in the rehabilitation of children who have difficulty walking.

The exoskeleton was one of the hundreds of final-year projects on display at the recent Ingenuity expo for the University's Faculty of Engineering, Computer and Mathematical Sciences.

"The exoskeleton is designed to provide clinicians with a repetitive and controlled rehabilitation system to use with their patients. It's flexible enough to support a range of exercises aimed at correcting and strengthening a child's walking pattern," says project member Nathan Young.

"Our project aims to improve on current rehabilitation methods by including motion systems that help with the active control of the pelvis."

In addition to the control system and mechanical design, the project team – involving students Yuming Huang, Zefeng Shao, Jiazhen Wang, Jiaqi Xiao and Yi Ying – will develop a computer-based simulation. This will help them to better understand the system's operating parameters and possible responses of the patient during therapy.

"Anything we can do that will potentially help children to walk will be of great relief to many families," Nathan says.

RECOOKING THE AUSSIE BBQ

It's one thing to talk on your mobile phone while cooking a barbie, but what about using the phone itself to help cook the *perfect* steak?

University of Adelaide student Alex Tolson had this idea while looking for a technical challenge worthy of his final-year Mechanical Engineering project. Now in his fifth year of a double degree (also studying Finance), Alex realised there was no currently available barbecue that gave complete control over the temperature, and hence the cooking process.

The result is the Smart BBQ, which brings together a range of technologies to ensure that, no matter what their cooking ability, the user is able to become proficient in barbecuing.

"The Smart BBQ takes the guesswork out of cooking, enabling the user to cook to a higher standard," says Alex, who has worked on the project this year with colleagues Alexander Pearce and Matthew Freeman.

"Combining temperature sensors on the BBQ with a smartphone interface, the user is able to control all cooking temperatures to within one degree. You even get notifications on your phone when it's time to turn the meat," he says.

One of the biggest technical snags faced by the team was managing the flow of gas. The gas valves they needed for the project were going to cost them $1000 and had to be imported from overseas. So instead, they made their own valves for just $60 each.

"Initially we thought this project was just a good technical challenge, but as we've got closer to the end of the year we've realised the Smart BBQ could really revolutionise the way people barbecue," Alex says.

SURF'S UP

Aerospace Engineering students Isaac Simionato and Nick Travers are applying the same aerodynamics techniques they've learnt in the classroom to designing a better surfboard fin.

"The fin of a surfboard may not sound very space-aged, but essentially it has a wing shape, which is why our work fits in so neatly with this project," says Isaac.

"Professional surfing is a rapidly growing sport and the performance of a surfboard is heavily reliant on its fin design and configuration. However, most surfboard fin designs are largely modelled on dolphin fins. There's been little research and advancement made to current designs."

Aircraft wings, yacht keels and rudders, even golf balls and marine animals have been used as inspiration for designs, taking into consideration the fluid mechanics of each. As well as modelling the performance of their test fins in computer simulations, the team has used wind tunnels to better understand the aerodynamics of both currently available and newly designed fins.

"So far, our new fin designs have shown great potential, providing a superior performance to standard fins in our testing," Isaac says. As surfers themselves, no doubt Isaac and Nick will be keen to test their new fin designs for real – out among the waves.

"Our project aims to improve on current rehabilitation methods."

PHOTOS

Facing page: Seven-year-old Tanna is one of many children who could one day benefit from new University of Adelaide student designs aimed at rehabilitating children with walking problems

Photo courtesy of Novita Children's Services

Left: The Smart BBQ can cook a perfect steak with the help of mobile technology

Right: Aerospace Engineering students Isaac Simionato and Nick Travers with one of their new surfboard fin designs

THE FIRE NEXT TIME

BUSHFIRES ARE A SCOURGE OF AUSTRALIAN SUMMERS BUT THEY'VE ALSO CAUSED THE RISE OF AN AUSSIE ICON: THE GUM TREE.

There are fossils of tree kangaroos on the Nullarbor Plain that are just 700,000 years old – so what, Professor Bob Hill wonders, happened to the trees?

This is far from a question for antiquarian environmentalists – knowing how the Australian landscape responded to climate change in the past will make it easier to understand how it will respond now. And it will help us to work out what we can do to reduce the damage we've done, even restore the landscape to what it was before European settlement.

It's part of a renewed scholarly interest in Australian botany, paleo and present, which was at risk of sliding into a subset of zoology. "Over the years the disciplines combined and as botany was the smaller it went into decline," Professor Hill says. "But this is turning around.

"Now there's a great research interest in Australian botany, in how our vegetation evolved in response to fire, in conservation and in how we can learn about climate change from the fossil records," Professor Hill says.

When not focused on his research, Professor Hill is also a nine-year veteran as the University's Executive Dean of the Faculty of Sciences. An Adelaide graduate, his PhD is on Tertiary plant macrofossils and his DSc explored the interaction of climate change and living Australian vegetation. He spent 19 years at the University of Tasmania, a great place for a botanist interested in ancient Australia. "Tasmania was a fantastic place to start my career; there are few places to match it in the world for fossils. In a way I really fluked it," Professor Hill remembers.

But it took more than luck to build the research record that has made Professor Hill an expert on the interaction of climate and botany in the ancient past and the history of Australian settler society.

He is now a leading member of South Australia's close-knit botanic community, focused on the city blocks that are home to his University offices, the State Museum and the Herbarium in the state's Plant Biodiversity Centre, whose different research skills inform the state's conservation biology effort, which focuses on fire.

Professor Hill is especially interested in what happened in central Australia 40-70 million years back. The fossil records of leaves demonstrate how vegetation responded to climate change and they show that the deserts arrived relatively recently. And the definitive Australian tree isn't even true blue – eucalypts are just blow-ins on a geological timescale. According to Professor Hill, the earliest eucalypt fossils are from Argentina and New Zealand. They died out there, and nobody knows why, but as Australia dried out they made themselves at home.

Really at home… the eucalypts started taking off 25,000 years ago as rainfall dropped and Australia began to burn.

"Eucalypts are the ultimate fire plants – fire survivors and promoters. They do better in high-fire areas," Professor Hill says. And since then they have multiplied and diversified and spread across the continent. There are now 800 species of eucalypts, from tiny Alpine plants to the biggest flowering plants on the planet. And they have replaced older Australian plants, which could not compete on a landscape that burns fiercely, and often.

And the changes to vegetation caused by eucalypts over thousands of years are now being compounded by the damage done by European settlement.

No one knows exactly what grew on the Adelaide Hills before the eucalypts, maybe banksias and casuarinas which cope with fires if they are not too frequent, but there was certainly more diversity.

"This makes a really good case for more research on native vegetation so we know what to put back," Professor Hill says.

But can we, indeed should we, even try?

Professor Hill has no doubt. For a start, restoring the optimum vegetation mix in the Adelaide Hills is in South Australia's best interests. More original vegetation that can deal with more, but less intense fires, will reduce the devastation of eucalypt-fuelled infernos.

"At the moment, we are responding to once-in-a-generation fires, which now occur more frequently, and it is only going to get worse," he says.

And it can be done: "Plants are more resilient than people give them credit for. We can change things back with careful planning but we have to work out our priorities.

"If we think vegetation is worth having, it is not beyond us to put it back in place. But it takes willpower and patience, and the problem with humanity is that we lack long-term planning."

Which is why Professor Hill is optimistic about the future for the next generation of botanists. "There is a lot of restoration that needs to be done, lots of work ahead so we do the least damage to the environment. And hopefully repair some that has already occurred."

PHOTO
Professor Bob Hill

"Eucalypts are the ultimate fire plants – fire survivors and promoters."

BACK TO THE FUTURE

NEW GENERATIONS OF MUSIC STUDENTS ARE REINVENTING THE ART OF SOUND BY HARKING BACK TO THE PAST.

It's 1962 and the University of Adelaide has appointed its first visiting composer in electronic music at the Elder Conservatorium of Music.

In order to perform his music to an audience, composer Henk Badings from The Netherlands uses only magnetic tape recordings (technology that was invented in Germany prior to World War II) and a self-constructed "patch panel", which enables him to create and modulate electronic sounds.

To study this new form of music – a radical departure for one of Australia's oldest and most distinguished music schools – students and staff must build their own versions of what we now describe as "synthesizers" and basic "computers" from scratch; these items do not currently exist on store shelves.

Combining the expertise of an electronics technician with the guiding light of art, Dr Badings and those who follow – such as the celebrated composer Tristram Cary – are placing the University of Adelaide at the forefront of electronic music in Australia.

Half a century later, and the department store shelves contain numerous keyboards, synthesizers and computers of all kinds – including mobile phones and tablets that have four million times the memory of the Apple II, the first computer ever owned by the University's electronic music program.

But in a nod to those pioneering times of the 1960s and '70s, today's students undertaking the University's Sonic Arts program, as it's now known, are again building their own equipment from scratch, as well as writing their own software.

The Head of Sonic Arts, Stephen Whittington, explains: "The hands-on approach that used to be taken here many years ago is still an important part of the course now. That's in keeping with the spirit of the early days but really it's to get the students to appreciate what's involved.

"We've got 'circuit-bending and hardware hacking', for example, which is very popular with students; they love it. By getting to know the inside workings of devices, and how they can be manipulated, the students are discovering creative aspects to the work that they never expected."

That's not to say the Sonic Arts program doesn't keep up with technology, quite the contrary. New software, hardware and a range of digital technologies are constantly being assimilated into the program so that students and staff alike remain up-to-date.

But that can't replace the students' individual creativity – such as the student who built her own "laser harp", which uses beams of light instead of conventional strings.

"Our approach changes the student from being a passive user to an active participant," says Lecturer and Electronic Music Unit Director Christian Haines. "Many students find they enjoy the self-creation process so much, such as writing their own software, that they don't even want to use the pre-purchased software; and that's a great discovery to make. They're engaged and shaping the area in which they work."

Although part of the Elder Conservatorium of Music, the term "Sonic Arts" is designed to cover more than just music. "We call it Sonic Arts now because 'electronic music' was too narrow," Mr Whittington says. "Broadly, Sonic Arts is anything to do with making sound and music primarily using digital means, but not exclusively."

"We've broadened our scope too, into making visual art, game sound, film sound and interactive media," says Sonic Arts lecturer Dr Luke Harrald. "Given the rise of mobile devices, that's one of the big directions; there's a lot of content needed for mobile platforms."

Sonic Arts has been steadily increasing in undergraduate student numbers over recent years, a promising sign of the current interest. At postgraduate level there are students studying areas such as computer game sound, how to use games themselves as an instrument, the use of artificial intelligence in musical performance, and mixing live ambient sounds with music in real time.

But while many students initially develop their interests in this field by tinkering with sound and composition in their own bedrooms, the Sonic Arts program also has its own orchestra, bringing live performance and group collaboration quite literally into the mix. Earlier this year, the Electronic Noise Orchestra (ENO) saw 65 students operating laptops and mixing desks, performing works by Brian Eno on stage in a free concert at the Scott Theatre. It's believed to be the biggest student electronic orchestra performance of its kind in the world.

"It was unprecedented – nothing had ever been done on that scale before," Mr Whittington says. "And while the musical outcome is less important than learning from the collaborative side of it, I'm pleased to say it held up as a performance in its own right."

Dr Henk Badings would have been proud.

PHOTO

Students Thomas Capogreco and Iran Sanadzadeh with the Head of Sonic Arts, Stephen Whittington

"Our approach changes the student from being a passive user to an active participant."

JOHNSON BUILDING GARDEN

Continuum (1974)

Stainless steel work by sculptor Herbert (Bert) Flugelman, who is well known to Adelaideans for *The Spheres* ("the Rundle Mall's Balls"), and *Tetrahedra* on the Adelaide Festival Centre forecourt. *Continuum*, which reflects the artist's interest in fundamental geometric forms, was a gift to the University of Adelaide on its centenary by Flinders University.

NORTH TERRACE

Sir Walter Watson Hughes statue (1906)

Hughes' donation of £20,000 resulted in the establishment of the University of Adelaide in 1874. This bronze statue on a granite pedestal was presented to the University by the Hughes family. The larger-than-life work commands a place of prominence outside the Mitchell Building.

GOODMAN CRESCENT

Sir Thomas Elder statue (1903)

Gifted to the University by public subscription upon Elder's death, this bronze sculpture outside Elder Hall stands in honour of the university's most generous benefactor. Elder's gifts totaled around £100,000 – a staggering amount in the 1800s – helping to create academic positions in science, medicine and mathematics and establishing the Elder Conservatorium of Music.

Reconciliation Touchstone (2007)

Unveiled during Reconciliation Week, this reconstituted red granite work features imprints of handshakes. The imprints were a result of a Handshake Ceremony on North Terrace campus – around 120 people came together and a dental plaster was placed inside their clasped hands. The resulting forms are embossed with the traces of individual palms bonded together as a symbol of the University's commitment to reconciliation.

ART AT OUR HEART

AROUND EVERY CORNER AT THE NORTH TERRACE CAMPUS, STUDENTS, STAFF AND VISITORS TO THE UNIVERSITY OF ADELAIDE CAN FIND WORKS OF ART ON PUBLIC DISPLAY.

Many have been donated to the University, helping to enhance the campus environment and its culture.

Here are some examples of what visitors can expect to see, among them works created by famous artists.

Members of the public are welcome on campus to explore public art.

Tours of these works and others are offered by University Collections.

For enquiries email:
unicollections@adelaide.edu.au
or phone **(08) 8313 3086**.

READER SURVEY
WIN 1 of 5 $100 2016 Adelaide Fringe vouchers
Click here!

LOWER NAPIER, NEAR ENGINEERING SOUTH

Dual (1978-79)

This steel work by the nationally recognised South Australian sculptor Greg Johns is based on the eastern philosophical concepts of creating duality by breaking a circle. Its form is influenced by the work of Henry Moore.

NAPIER BUILDING FORECOURT

Dorado (1964)

Bryan Kneale is a renowned sculptor in the United Kingdom, celebrated for his inventive, modernist explorations of abstract forms. This reflects the international, adventurous outlook of its donor, Kym Bonython, AC DFC AFC, who gifted the steel sculpture to the University.

Medley Theatre Glass Mosaic (circa 1960–1963)

Originally designed for the Adelaide Teacher's College Medley Dance Theatre, this work by the notable South Australian artist Geoffrey Wilson – best known for his landscape painting – represents education as a cultural and moral force in society. The work, comprising glass mosaic tiles made in Italy, was relocated to the Napier undercroft in 2004 where it complements the modernist architecture of the Napier building.

WALTER YOUNG GARDEN

Reclining Connected Forms (1969)

Considered internationally a leading sculptor of his generation, Henry Moore drew on his interest in armour, protection and the human form as inspiration for this work, suggestive of a mother shielding her child. This bronze sculpture was purchased for the University through the Benham Bequest.

FREE COMMUNITY EVENT

Carols on Campus

at the University of Adelaide

A celebration of Christmas

Thursday 17 December 2015 at 7pm
Bonython Hall, North Terrace campus

We invite you to bring a book or a toy for the gifting tree, in support of The Smith Family.

www.adelaide.edu.au/carols

adelaide.edu.au

seek LIGHT