

# ANUreporter

The Australian National University

Spring 2013

## Buried treasure



# ANU

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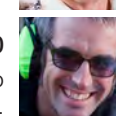
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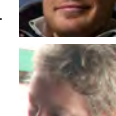
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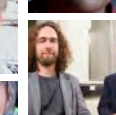
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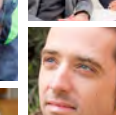
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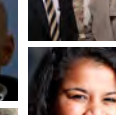
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# Vice-Chancellor's introduction



**A**fter the announcement of major government cuts to university funding earlier this year, ANU and our sector face difficult times ahead.

Difficult times force us to make a choice. They can mean the beginning of a decline: if we choose to do nothing, we begin a decline that would see our university become a shadow of its former self, abandoning the ambition of our founders.

Alternatively, difficult times can be the catalyst for change, renewal and growth. Renewal that will ensure this great institution remains one that we can all be proud of.

With input from our community, we have shaped a budget solutions package that will get us through these difficult times and ensure we have the ability to invest in the research and education that has, in less than 70 years, seen ANU grow from an idea to one of the finest universities in the world.

In this edition of *ANU Reporter* we celebrate our excellence in education and research in articles such as 'Untraceable' (p. 22) and 'The Power of Nature' (p. 32), and the strong community spirit and rich history that characterise the University in 'Chasing Dreams' (p. 33) and 'Growth, Destruction, Rebirth' (p. 28).

By the time you finish reading, I'm sure you'll agree with me that the ANU community has the resourcefulness and resilience to turn our budget challenges into opportunities.

**Professor Ian Young AO**  
**Vice-Chancellor and President**



## WEAVING BRIAN SCHMIDT'S UNIVERSE

*Nobel Laureate Professor Brian Schmidt and Head of Textiles Valerie Kirk with the newly unveiled Schmidt Tapestry.*

The Schmidt Tapestry, which celebrates Professor Schmidt's work, was unveiled in June.

More than one metre wide and two metres long, the tapestry took nine months to weave and is based on a Hubble Telescope image that Professor Schmidt selected as the photograph that best sums up his work.

But the tapestry isn't just a view of the stars. The digital technology that played an important part in Professor Schmidt's research is also woven into the image, with pixels of varying sizes overlaying the supernovae, and in the lower section there is a small sliver of the Earth with equations on it.

Professor Schmidt says he never expected to inspire art with his research.

"One of the things I love about ANU is how we are able to mix science and art and music – all of the things that ANU does well, and this is an expression of that," he says.

The tapestry hangs in University House next to tapestries celebrating Nobel Prize winners Rolf Zinkernagel and Peter Doherty, John Eccles, and Howard Florey, as well as one acknowledging the work of Frank Fenner.

## Indigenous health on agenda

A new scheme that rewards high school students who undertake Indigenous studies will start next year.

All secondary school students who successfully complete the course will receive five bonus ATAR points when they apply to study at ANU.

Last month the University also launched the Peter Sharp Scholarship for medical students studying in the Indigenous health stream.

Danielle Dries (pictured) was the inaugural recipient of the \$50,000 scholarship, which is funded by the ACT Government.



## Triple launch at Crawford School

The Crawford School of Public Policy has been busy lately. In May, the Federal Government announced a \$3 million endowment to set up a Tax Studies Institute in the School.

June saw the launch of the School's new Food Policy Institute, which will look at the challenges posed by the growing world population.

And last month at the ANU China Update conference, Minister for Trade Richard Marles announced a \$305,000 program to bring Chinese and Australian researchers together to confront the challenges of climate change policy.

## ARC grants

Funding of more than \$10 million out of an Australia-wide total of \$47 million has been granted to four Australian Laureate Fellowship Scheme projects at ANU – more than any other Australian university.



The successful recipients include Professor Nicholas Evans for his project on linguistic diversity; Professor Hugh O'Neill (pictured), who is studying the properties of naturally occurring minerals; Professor Kim Sterelny, who will investigate the origins of human cooperation and inequality; and Professor Xu-Jia Wang for his project on nonlinear partial differential equations.

ANU researchers will receive a further \$5 million for ARC Linkage Projects, including improving young driver training and protecting Australia's unique orchids from extinction.



Graham Tuckwell with scholarship applicants. PHOTO BY STUART HAY.

## Tuckwell Scholars welcomed

Twenty-five of Australia's brightest young students have been selected for the Graham & Louise Tuckwell Foundation scholarships.

The Tuckwell Scholarship Program was established by ANU alumnus Graham Tuckwell and his wife Louise in February.

The scholars were chosen from a shortlist of 72 students who spent a weekend at the University undertaking interviews and getting to know the campus and Mr Tuckwell.

"We were after a highly talented group of students from all around Australia – from the city, from the country, from private schools, from Catholic schools, from government schools. That's what we've got," said Mr Tuckwell.

The scholars will receive \$20,000 a year for the length of their undergraduate degree and accommodation on campus so they can pursue community service and extracurricular activities. They will also have the advice and support of the Tuckwell Fellows: human rights law expert Professor Simon Rice, biochemist Associate Professor Susan Howitt and historian of Southeast Asia Dr Mary Kilcline Cody.

Vice-Chancellor Professor Ian Young said the students would bring a great deal to ANU.

"We are delighted to welcome such an outstanding group of talented and passionate young people to our community," he said. ■

Video: [http://bit.ly/rep\\_Tscholars](http://bit.ly/rep_Tscholars)

## Founding father remembered

A statue of ANU founding father the late Professor Frank Fenner was unveiled at University House in June.

Master of University House, Professor Lawrence Cram, said that the statue goes part of the way to honouring the Fenner's commitment to the University community.

"One of Frank's favourite places on campus was Fellow's Garden, so it seems only fitting that his statue will be placed there, looking over at Black Mountain."

The copper bust was created by Peter Corlett OAM, a leading Australian figurative sculptor, and funded by 43 donors.



Peter Corlett with the bust of Frank Fenner. PHOTO BY STUART HAY.

"I had a suite of photographs that showed him smiling," Corlett said. "There was this whimsical naughty boy side, and I thought, that's what I want to catch, because that seemed to me to personify the man's spirit." ■



Chris Grange speaking at a budget forum. PHOTO BY STUART HAY.

## Budget package announced

The University has developed a plan to solve the challenges presented by the Federal Government's recent cuts to university funding.

The cuts mean ANU faces a reduction in income of \$23 million in 2014 and \$28 million in 2015. In response, Executive Director, Administration & Planning, Chris Grange, held 17 forums to hear solution suggestions from staff and students across campus.

The final package, drawn from these suggestions, includes a voluntary early retirement scheme, a major overhaul of administration, increased parking fees, a student recruitment drive and an energy savings plan.

In a meeting of more than 1,200 staff and students in Llewellyn Hall last month, Vice-Chancellor Professor Ian Young said the University was choosing to approach the challenge as a catalyst for change, renewal and growth.

"The package is a comprehensive one that firstly looks to grow income for the University, and then seeks to make savings in a way that will enhance our academic excellence," he said.

"This package has been a community effort. More than 1,000 staff and students took part

in the budget forums held over the first two weeks of June. Four times as many visited the website and over 300 submissions were received.

"When you face a challenge of the magnitude that confronts ANU, you have a choice. As a community we have chosen change, renewal and growth. It is clear from the forums and the submissions how much our staff and students are committed to the future of this university."

Professor Young also announced an immediate pay increase of two per cent for all ANU staff, and a further two per cent increase to be paid in 2014.

"Investing in the people that make this institution great is essential to investing in our future, and I believe this is a timely and appropriate measure to recognise the ongoing contribution our staff make to this institution.

"We are committed to ensuring that ANU returns to a firm financial footing. Each and every member of the ANU community – staff, students and alumni – is rightly proud of the excellence in research and education for which we are renowned. This package will enable us to invest in that excellence." ■

For more information visit <http://budgetsolutions.anu.edu.au>

## Queen's honours

Three ANU academics were included on the Queen's Birthday Honours List in June.

Associate Professor Timothy Kain (pictured) from the School of Music was made a member of the Order of Australia in recognition of more than 30 years raising the profile of classical guitar in Australia and nurturing the next generation of musicians.



Professor Graham Farquhar from the Research School of Biology was made an Officer of the Order of Australia for his contribution to the field of biophysics and his role in creating a strain of water-efficient wheat.

Heritage specialist Dr Michael Pearson from the Research School of Humanities and the Arts was also appointed an Officer of the Order of Australia, for his work on cultural heritage conservation and management, and as an educator and researcher.

Sixteen ANU alumni were also honoured on the list.

## New Head of Art

Denise Ferris took up the position of Head of the ANU School of Art in May.



Since she arrived at ANU in 1987, she has been a Senior Lecturer in Photography, Post Graduate Coursework and Honours Convenor and Associate Dean (Education) of the ANU College of Arts and Social Sciences. She is also an elected member of the University's Academic Board.

## Painting the campus green

An app to help students be energy- and water-wise has gained ANU first prize at the 2013 ACT Sustainable Cities Awards.

ANU Green Key is a smartphone app designed for residents of halls and colleges to collect data on lighting, electricity, heating and water use in their rooms.

The University also won an award in the Sustainable Buildings category for the new Lena Karmel Lodge.

In other sustainability news, the Department of Applied Mathematics will receive at least \$5 million to research Carbon Capture and Storage as part of the Australian Government's Clean Energy Future package.

# word watch

AMANDA LAUGESSEN puts pollicie talk under the microscope.

In the tumultuous lead-up to another federal election, it is perhaps an opportune time to look at some of the contributions of politicians, especially the recent Labor Government, to Australian English, or *pollie speak* (also *pollie talk*, first coined in the 1980s to refer to the style of speech of politicians, usually long-winded and filled with jargon). Will there be words or idioms that we will remember and associate with the prime ministerships of Kevin Rudd and Julia Gillard?

Rudd's time as prime minister has contributed to or popularised a number of terms in our Australian political lexicon. His use of Australian colloquialisms was memorable, particularly when in 2009 he used the phrase *fair shake of the sauce bottle* in a television interview. He was taken to task by the Opposition for using 'dated' colloquialisms and being 'inauthentic'; others criticised him for getting the idiom wrong – he should have said *fair suck of the sauce bottle*, they argued. However, the variant *fair shake* is found in rural Queensland.

Also in 2009, Rudd faced *utegate*. This was a

scandal involving the donation of a *ute* (utility vehicle) to Rudd's 2007 election campaign.

Adding '-gate' is a reference to Watergate, and is commonly used to denote a corrupt or scandalous activity, especially when there is an assumed attempt to cover up such activity.

Gillard's prime ministership was marked by debates over the level of sexism in Australian politics. In October 2012, she famously attacked a culture of misogyny in Australia, in what is now known as 'the misogyny speech'. Earlier this year she talked of *men in blue ties*, referring to conservative males in positions of power. The Gillard government's Gonski education reforms have given rise to the phrase *to (not) give a Gonski*, meaning 'to (not) care about education'.

The Rudd/Gillard period has also seen a revival of the Australian term *faceless men*, a term referring to those who wield power behind the scenes. First used in 1963 by the Liberal Party of ALP powerbrokers, it was used in reference to the



deposing of Rudd as prime minister. The term has proved to have considerable durability in Australian English; whether any of the terms we heard during the last few years of politics will have the same durability remains to be seen. ■

The Australian Dictionary Centre is a joint venture between Oxford University Press and ANU.



Denise Hales with the portrait of Anton. PHOTO BY DAVID PATERSON.

# life sentences

BRIAN WIMBORNE explores the life of a rabbi who devoted his life to countering prejudice.

Anyone who heard Herman Max Sanger speak could not but be impressed with his eloquence and erudition. Sir Robert Menzies considered him to be Australia's greatest orator. Yet English was not his native tongue.

Sanger was born in Berlin in 1909, the only son of Rabbi Jacob Sanger and his wife Hilda. Ordained a rabbi 1933, he was to spend the next three years at a synagogue in Berlin ministering to the city's persecuted Jews and attacking the Nazis from his pulpit. Interrogated and hounded by the Gestapo, he eventually acted upon the advice of an anonymous caller and fled the country.

Once in London, the World Union for Progressive Judaism suggested that he assume leadership of Melbourne's non-orthodox

community, which had been struggling for survival since its foundation in 1930. Taking up the challenge, Sanger arrived in Australia in August 1936 and was soon conducting services and raising money for a synagogue.

With a wide vision, Sanger resolved to build a relationship between Christian and Jew in Australia. He forged links with the Anglican and Catholic archbishops of Melbourne, and the Methodist leader, Reverend Irving Benson, invited him to preach from Melbourne's Wesley Church. This was the first time a rabbi had preached in an Australian church. In return, Christian groups (Catholic and Protestant) were invited to attend sabbath services at the Temple Beth Israel. Prime Minister Menzies was to say of Sanger, 'no man could have done more to cause men to shrug off the absurdities of prejudice'.

In 1942 Sanger founded the Association of Jewish Refugees and expressed his opposition to refugees from the Nazis being designated 'enemy aliens'. His encouragement of their integration into the wider Australian community helped to ensure their acceptance and they were eventually classified as 'friendly aliens'. During and after World War II he campaigned for Australia to take more Jewish refugees.

In 1962 Sanger was appointed to the Order of the British Empire. He died in 1980 and was buried at Springvale cemetery. The Herman Sanger Hall at the Temple Beth Israel commemorates his lasting contribution to the community. ■

The Australian Dictionary of Biography is edited by staff at the National Centre of Biography at ANU.

# Pride of place

The Research School of Earth Sciences received a very special present on its 40th birthday. By TEGAN DOLSTRA.

"This is very much how I remember him – the man who loved his dogs, was a chain smoker, and wore crumpled tweed sports jackets that never matched his ties," says Denise Hales, looking up at the portrait of her late husband.

"If you look very carefully, there is actually a safety pin holding his glasses together – it was there for years because he never had time to fix them."

Denise presented the portrait of Professor Anton Hales, foundation director of the Research School of Earth Sciences (RSES), to the School on its 40th anniversary in July.

Painted on an old wooden door by the couple's granddaughter Megan two years after Anton's death, it is a blend of memory and a photo taken by Denise in the eighties.

Originally from South Africa, Anton moved from the US to Australia in 1973 to take up the position of foundation director of RSES at the age of 62. Denise wasn't to join Anton in Australia until six months later, but she shared a sense of his excitement well before she arrived.

"If you look very carefully, there is actually a safety pin holding his glasses together."

"Back then there was no email, no mobile phones; so he sent me letters. In one he described RSES as 'an incredible place – they come in at 9, go home at 5, play bridge at lunchtime, and still produce the most incredible science'," she recalls.

"He loved it here. Everyone was so incredibly generous in welcoming us. We had a terrific time and made lots of wonderful friends."

Anton and Denise lived with their two children in the house that is now the Heritage Early Childhood Centre, where they often hosted dinner parties.

"I wasn't allowed to have a key to the School, for security reasons, so when Anton was in his

office, with no mobile phone, I used to have to throw stones at his window to let him know our dinner guests had arrived."

Current RSES Director, Professor Ian Jackson, was a second-year PhD student when Anton joined the School.

"Within a few weeks as foundation director, Anton seemed to know what every PhD student in the School was doing," he says. "That level of commitment and interest was a hallmark of Anton's directorship and his selflessness in mentoring young scientists."

Professor Jackson says he was honoured to accept the portrait on behalf of the School.

"When Denise first approached me, I was overwhelmed and honoured by her offer," he says. "The portrait is fantastic. We'll probably hang it in the Director's suite, so Anton can look over the shoulder of all our future directors."

It looks like Anton – with the company of his ashtray and his favourite dog – will continue to take an interest in RSES for a long while to come. ■



Dr Graham Walker and the Scicycle. PHOTO BY BELINDA PRATTEN.

# Pedal power

Graham Walker has created an eye and balloon-popping one-man show to take science to some unusual audiences.

**CASEY HAMILTON** was in the crowd.

**W**hat has three wheels, loud explosions and is followed by a crowd?

The Scicycle is the brainchild of Dr Graham Walker from the Australian National Centre for the Public Awareness of Science, who designed the three-wheeled cargo trike to peddle science to the masses.

"I created the Scicycle to take science into places it might not otherwise be seen," he says. "I can ride into a venue, quickly set up and start doing little activities or shows."

"The Scicycle shows are designed to be a buffet of science. People come and go and in the five minutes they stop they might see some liquid nitrogen experiments or a little explosion."

These bites of science generally address concepts in physics and

“The Scicycle shows are designed to be a buffet of science.”

chemistry, but Walker is keen to make some modifications to the bike to include more everyday science in the shows.

"I want to promote science with a deeper relevance than blowing stuff up with liquid nitrogen – although that is fun. I'm looking at installing a generator on the bike to demonstrate renewable energy and there is already a solar panel to charge the PA system."

"Balancing these kinds of things with the more exciting experiments is important, especially for people who don't choose to engage with science. You have to make it fun."

Walker had the idea for the Scicycle when applying for a recent round of Inspiring Australia grants which encouraged applicants to think outside the box.

"You needed to be proactive. Rather than asking people to come to me, I decided to take science to them, whether that's in Garema Place, in a library or at an arts festival – it's about new venues and new audiences. I've even been asked to take the trike to the Denny Ute Muster in Deniliquin!"

After kitting the bike out with a smorgasbord of hands-on science, Walker took it to the streets with the help of the National Science Week

committee, the ACT Government, and his colleagues at ANU – who are also able to book the Scicycle to help with their science engagement activities. The performances have been a huge success.

"When you see someone who clearly doesn't give two hoots about science and you find a way to get them interested, I know it's worked. After shows I've had great conversations with seniors, questions from a bunch of skaters who looked like they probably should have been in school, business men and even drunks."

"If you set up in the middle of Garema Place with no one watching and then by the end of a 30-minute show you've got 150 people crowded around you, that's success." ■

Video: See the Scicycle in action [http://bit.ly/rep\\_Scicycle](http://bit.ly/rep_Scicycle)



Emeritus Professor Rodney Baxter. PHOTO BY BELINDA PRATTEN.

# A plus

Emeritus Professor Rodney Baxter has been honoured by the world's oldest science academy, writes **TEGAN DOLSTRA**.

**P**rofessor Rodney Baxter almost mistook the letter informing him he had been awarded one of the world's most prestigious science prizes for junk mail.

"The news came in the form of a letter from the Royal Society and when I saw it on my desk I just put it in my pocket thinking 'oh, it's just another circular'," he says. "So I was carrying it around for a couple of hours before I actually read it."

The letter contained the news that Baxter was one of three academics selected for the Royal Society's Royal Medals. Also known as the Queen's Medals, they were founded by King George IV in 1825, and Michael Faraday and Francis Crick rank among the recipients.

Baxter was chosen for his "remarkable" contribution to the field of statistical mechanics.

"Statistical mechanics is about the way atoms behave when they're together," the mathematical physicist explains. "Water is water is water, but it's also steam and ice. The only difference is if it's cold

“I was carrying the news around for a couple of hours before I actually read it.”

it likes to huddle together in the form of a solid, and when you boil water it expands.

"So I've spent my career trying to come up with models that explain such phase transitions. I'm trying to provide a pathway between the theory and the experimental evidence."

"I came up with the 'Hard Hexagon Model' in 1984 to explain how helium is absorbed onto graphite, which was later compared with experimental data and found to be quite accurate."

Baxter says he ended up in statistical mechanics by chance, when an intriguing question caught his attention.

"I was beavering away in particle field theory for my PhD," he says. "But I happened to read a paper by Andrew Lenard in which he'd solved a one-dimensional model in statistical mechanics of a Coulomb gas of electrons and protons – in the paper he made an intriguing remark that he was having trouble with electrons in a neutralizing charge background. That really sucked me in, so I sat down and solved it. It took a couple of months."

Baxter, who retired in 2003 after almost 35 years at ANU, says he is looking forward to travelling with his wife to London – his birth place – for the Royal Society Awards presentation in November. It will not be his first time at the Royal Society headquarters – he was admitted as a Fellow there in 1982.

"It does ring nice bells," he says. "I'm writing to my old director of studies at Cambridge to say I'd like to come and see him while I'm over there."

Baxter has no plans to stop "doing his sums" anytime soon, but he is planning to be more careful with his mail in the future. ■

# Buried treasure

**CASEY HAMILTON** packed her hammer and joined a group of ANU geologists as they set out to unearth the missing body of a giant fossil fish on the NSW South Coast.



Dr Gavin Young with *Edenopteron* in the background. PHOTO BY BELINDA PRATTEN.

If you saw me trekking through coastal bushland carrying a sledge hammer and a crowbar, you might think I'm up to no good, but I am actually off to see an old friend. A really old friend.

I'm joining a research team from the ANU Research School of Earth Sciences as they search for the fossilised body of *Edenopteron keithcrooki*, a 360 million-year-old giant predatory fish. The team uncovered the skull of the new species and is returning to the site in the hope of uncovering the rest of their fossil friend.

Wearing borrowed hiking boots and layers of polar fleece and enthusiasm, I bundle myself into the car in the NSW town of Eden. Bob Dunstone, a plant scientist who moved from

working with living plants to fossilised ones in his retirement, is in the driver's seat; former ANU Geology Department staff member Dr Keith Crook (for whom the *Edenopteron* fossil was named) and his wife Dr Anne Felton, an ANU geology graduate, are along for the ride too.

Throughout the sixties and seventies, Crook supervised ANU geology student fieldwork, mapping much of the coastal geology from the Victorian border right up to Ulladulla. In 1978 they came across something unexpected. "We were finding objects in the shale that clearly were not modern material – they were animal fossils," says Crook.

They had discovered a hotbed of fossils from the Devonian Period. Spanning from about 420

to 360 million years ago, this 'Age of Fishes' was when lobe-finned fish like *Edenopteron* first appeared, and armoured placoderm fish crowded the waters. But the most exciting thing about the Devonian Period is that it saw marine life first start to explore land.

"The rocks here on the south coast span a time when marine animals like fish were beginning to use their fins to crawl out of the water and move around on land. It was a time when plant life on land diversified and atmospheric oxygen increased. From those points of view, this is a scientifically significant and challenging place to study," says Crook.

As we pull up in a clearing at the end of a fire trail, we meet the second carload of the research team. Dr Gavin Young – a student

“

This group is closely related to the ancestors of the first land animals whose fleshy fins evolved into legs.

”

of Crook's in the sixties and leader of the *Edenopteron* team – is here, along with his son Ben, Professor Tim Senden from the Research School of Physics & Engineering, and Bega Valley Shire Councillor Liz Seckold.

"We originally visited this site in 1979 using one of Keith's student's maps but then lost it – there wasn't GPS back then," Gavin says as we begin the trek to the site. "Luckily we had photos of us working at the site, so we were able to relocate it from landmarks.

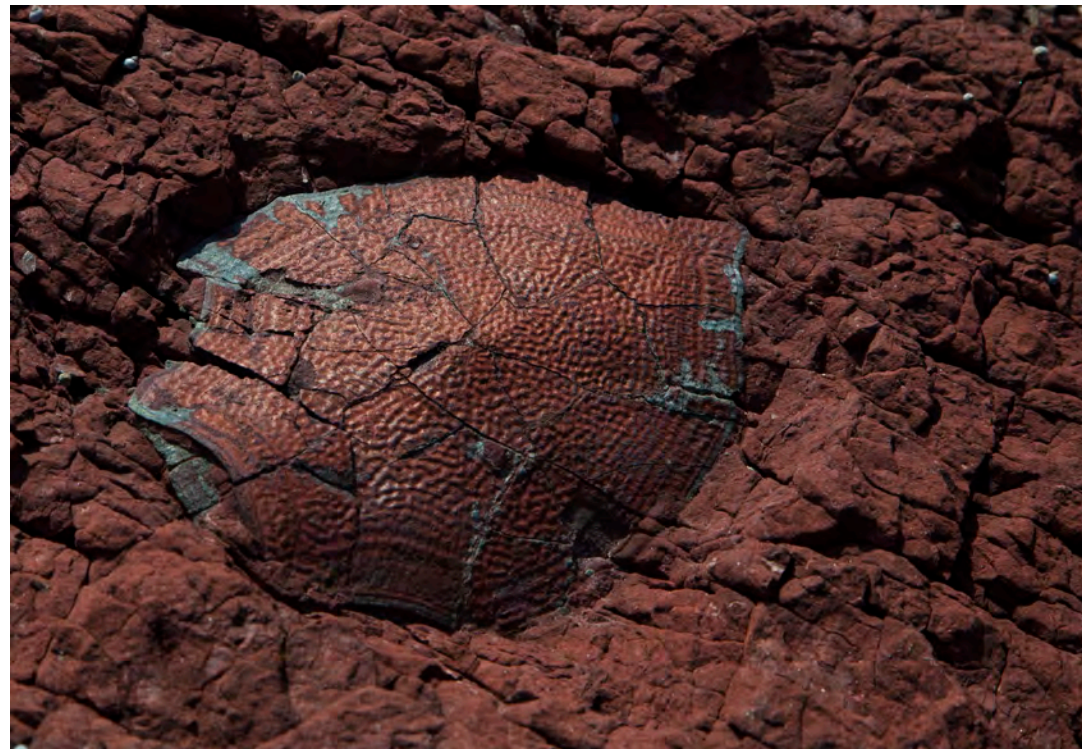
"The fossil bones at this site are quite spectacular, but years ago we decided to keep the locality secret and leave the fossils in place. We couldn't dig them out for study because they would break into tiny pieces, so we traced the fossil layer into the tea tree scrub and discovered a new excavation site."

As we reach the site, I can see why they want to keep it secret. The martian-red rocks that once formed an ancient riverbed have been thrust out of the ocean, exposing hundreds

of fossilised fish. Some are little more than grey strips of crushed bone running in lines through the red rock, but others are in exceptional condition.

"There was a lot of geological movement in this area so it's a miracle they haven't been destroyed," explains Felton, pointing across the bay at the distinct coloured layers in the cliff face which warp closer to the shore, showing the immense forces at play. We follow the sound of a power drill up the hill, signalling that the other half of the team has started the dig.

Digging fossils is not like you see in the movies, with fine layers of dirt painstakingly removed with a paintbrush. These fossils are buried within a thick layer of rock, and power tools are the only way to reach them.



Dr Gavin Young in the field (left) and a complete bone of an extinct armoured fish embedded in red mudstone (right). PHOTOS BY CASEY HAMILTON.

The team is drilling holes in which to pour expanding cement in order to crack the slab along its weakest points, a new technique they are testing after the method they used to excavate the skull of *Edenopteron* in 2006 didn't cut it. Or rather it did – it cut right through it!

Unaware of the remnants of the scaly giant beneath their feet, the research team was cutting through the rock with a circular saw to extract a placoderm specimen with the tail still intact. When the block was lifted out, Ben made the surprising discovery.

"We pulled out this big bit of rock and saw a large tooth. Placoderms don't have teeth, so we knew we were onto something," he says.

Back at the lab, the team realised the circular saw had cut right through the jaws, making the task of piecing the bones together more difficult than usual.

"It was huge," exclaims Gavin when I ask him about the skull. "The bottom jaw was about 50 centimetres long. Initially we thought it had a flat skull, because things of this size that have been found overseas have crocodile-shaped skulls. However *Edenopteron* was a high and narrow fish. It was probably out in the main river channel as 'top predator' gobbling up placoderms for lunch."

Compared to similar Devonian fish fossils in the Northern Hemisphere, *Edenopteron* had a few unusual features, including extra bones in its palate and strange ornamentation on the scales.

"The Eden site is only the fourth place in the world where Devonian fish show these unusual features," says Gavin. "They were first identified in fish from another fossil site in central NSW, then at the Jemalong Range

“ These were perhaps the first forests to have evolved on the planet. ”

near Forbes, and in similar-aged rocks in Australian Antarctic Territory.”

Back in Devonian times these areas of Australia and Antarctica were joined together as part of the supercontinent Gondwana.

"It was always assumed that the Devonian fish found in Australia were immigrants from the Northern Hemisphere. Now we have identified a group of lobe-finned fish that actually evolved here and were closely related to the ancestors of the first land animals whose fleshy fins evolved into legs."

Today the team has lifted a large section of rock, revealing a patchwork of placoderm fossils beneath, but no trace of the two- or three-metre-long body of *Edenopteron*. It will be a few days before the next expanding cement slab cracks, so we pack up and trek back to the cars.

The team wants to show me another fossil site on the way back to town. The track is rough, with collapsed drains and branches covering the road and Gavin is trying to find the site by memory.

"We could pull out a map, but that's cheating," he jokes.

We're soon pulled over, crowded around a map on the bonnet of the Hilux.

After several minutes of discussion, we drive a little further, stopping beside an innocuous rocky outcrop.

"The Devonian plant beds in this area have hardly been studied, but this is an exceptionally important fossil site," says Gavin. "There is evidence here of some of the oldest known land plants and even some creepy crawlies that lived among the leaf litter – these were perhaps the first forests to have evolved on the planet."

Dunstone hands me a hammer and encourages me to have a go. Feeling out of place, I pick up a likely looking rock and gently tap it with the hammer. It reveals nothing. I pick up another and it crumbles in my hands. I keep picking up rocks for a few minutes, beginning to wonder what all this fossil fuss is about.

The next rock I pick up looks just like the rest. I give it a half-hearted tap. I turn to Felton: "I think I have something".

She inspects the rust-coloured impressions in my rock.

"You've found an impression of some reed-like plant stems," she says. "This site is full of plant fossils; it used to be a still lake. The vegetation nearby would fall into the water and settle, leaving impressions like this."

It turns out my own discovery was a dime a dozen, but that doesn't bother me: I now understand the team's passion. The thrill of the find. The wonder of how old something is. Piecing together the clues of how we came to be standing on this land as it is now.

"You always think, 'maybe tomorrow, maybe over that ridge, we will find something'," Dunstone had said to me earlier in the day and now it rings true. I turn back to the outcrop with my hammer. Maybe the next rock I pick up will be the next big find. ■



John Gosling. PHOTO BY BELINDA PRATTEN.

# Forty winks

People are heading online to discover the secret to a good night's sleep, writes **EMILY DUNCAN**.

In our 24/7 cycle, ultra-caffeinated times, a bit of shut-eye can be hard to come by.

But the toll of sleepless nights could be more than just tired eyes and a bad mood.

"A person with insomnia is nine times more likely to experience depression than a member of the wider population, and 17 or 18 times more likely to experience an anxiety disorder," says PhD student John Gosling from the ANU Centre for Mental Health Research (CMHR).

"Insomnia has also been shown to have a large burden of disease and causes about as much disruption to a person's life as generalised anxiety disorder."

Gosling is part of a team of researchers implementing a web-based program to tackle insomnia.

The GoodNight Study utilises a program developed by researchers at the University of Virginia. Small-scale trials have been promising with 60 to 70 per cent of participants with severe and moderate insomnia reporting a full recovery after completing the program.

Now Gosling and his team will build on this research by tracking 1,600 insomniacs as they use the program, and following completion, for at least 18 months. They hope to establish a link between treatment and a decrease in symptoms related to depression.

"We think it's a really good way to target people who are at risk of developing depression," says Gosling.

"Obviously it's better to identify and treat something before it becomes a major problem."

“ A person with insomnia is much more likely to experience depression or anxiety. ”

The program uses cognitive behavioural therapy to encourage healthy bedtime routines.

Participants keep a daily sleep diary and perform activities and exercises related to sleep hygiene, the sleeping environment, and challenging thoughts and behaviours that contribute to sleepless nights, such as drinking or exercising before bedtime.

Early trials found participants

fell asleep 40 per cent faster, typically in under 20 minutes, and experienced 55 per cent less time awake during the night.

Internet health interventions have become increasingly popular, with treatments popping up to address everything from potty training to dementia.

Gosling believes the internet has huge untapped potential for mental health treatment.

"I don't think it's a matter of replacing face-to-face therapy," he says. "It's about filling an unmet need."

"There are a lot of people who simply don't seek help, and are more willing to engage with something online. Something like this is perfect for them." ■

The CMHR is recruiting participants for the GoodNight Study. Find out more at [goodnight.anu.edu.au](http://goodnight.anu.edu.au).



# Rumble in the jungle

A deadly battle between nature and capitalism is being waged deep within the forests of Cambodia, writes **JAMES GIGGACHER**.



Members of the Kompong Thom community map out their natural resources with Dr Sarah Milne (top right). PHOTO BY PHEAKDEY SORN.

In the lush, green forests of Cambodia, two worlds are colliding.

On one side are capitalists, tycoons and powerful multinational corporations, backed by the all-too-willing Cambodian state. Driven by the promise of wealth, they are responsible for massive land grabs, illegal logging and projects like dams and rubber plantations, now sprouting up over what was once wild and inaccessible rainforest.

Facing off are Cambodia's indigenous peoples and their subsistence economies, long removed from the modern world. Now, their traditional worldviews, knowledge and livelihoods are not only being challenged, they are radically under threat.

It is on this forest frontier that Dr Sarah Milne, a post-doctoral researcher and conservation specialist from the ANU College of Asia and the Pacific, can often be found. She regularly makes the trek through Cambodia's thick jungles.

"I have always been driven by a love for nature, and a desire to find ways for people to co-exist with and connect to nature, especially in a way that gives rise to social justice," says Milne. "This led me to do volunteer work in the Cardamom Mountains in Cambodia with remote communities over 10 years ago now, and I haven't stopped since."

What Milne witnessed inspired her to action.

"People were incredibly poor due

to Cambodia's 30-year civil war. They were deriving their livelihoods almost entirely from the forest and subsistence agriculture, using unique traditional knowledge, and they were beginning to face incredible threats to their land and way of life," she says.

"At times, when I'm doing fieldwork in remote villages, I feel like I've stepped back two centuries into an ancient Asia – a world governed by the whims of spirits and the natural world. But then I turn around and see new roads, excavators, chainsaws, company workers and military policemen. On the sidelines of this are local villagers, who also have great aspirations about modernity and 'development'.

"It's a place of fusion, as well as violence and dispossession."

Modern day Cambodia has been labelled a "country for sale". According to the latest data, more than half of Cambodia's arable land – 2.6 million hectares – has been leased to concession holders by Cambodian authorities.

Milne says this has had an enormous cost for ordinary Cambodians, around 80 per cent of whom rely on rural livelihoods. Often it leads to the displacement of farmers, in most cases without warning. Any resistance is usually met with violence and coercion.

"In many areas local people now face loss of land and alienation, with a bleak future of becoming labourers on rubber plantations or in factories. This has affected tens of thousands of villagers," says Milne.

“Local people now face a bleak future of labour in rubber plantations or factories.”

But some people are banding together to fight back. Villagers in the Cardamom Mountains are beginning to work with monks to ordain trees publicly – an act of defiance which has drawn international attention.

"In particular, they are hoping to draw attention to the impending construction of a Chinese-backed

hydropower dam that will flood their ancestral lands and see them relocated," says Milne.

Milne hopes donors, NGOs and 'ordinary people' will respond, by applying pressure on the Cambodian Government to re-think its actions.

"That is the ideal scenario, but domestic political action is becoming increasingly hard for communities and advocacy groups in Cambodia: they frequently face government suppression and threats."

And in some cases, the threats are not idle. The dirty war being waged in Cambodia's forests has claimed its fair share of victims, none less than Cambodia's most high-profile environmentalist, and Milne's collaborator and friend, Chut Wutty.

In April 2012 Wutty, who Milne describes as a soldier for nature and humanity, was shot dead while escorting two journalists from *The Cambodia Daily* through a forest conservation area in Koh Kong province to expose illegal logging.

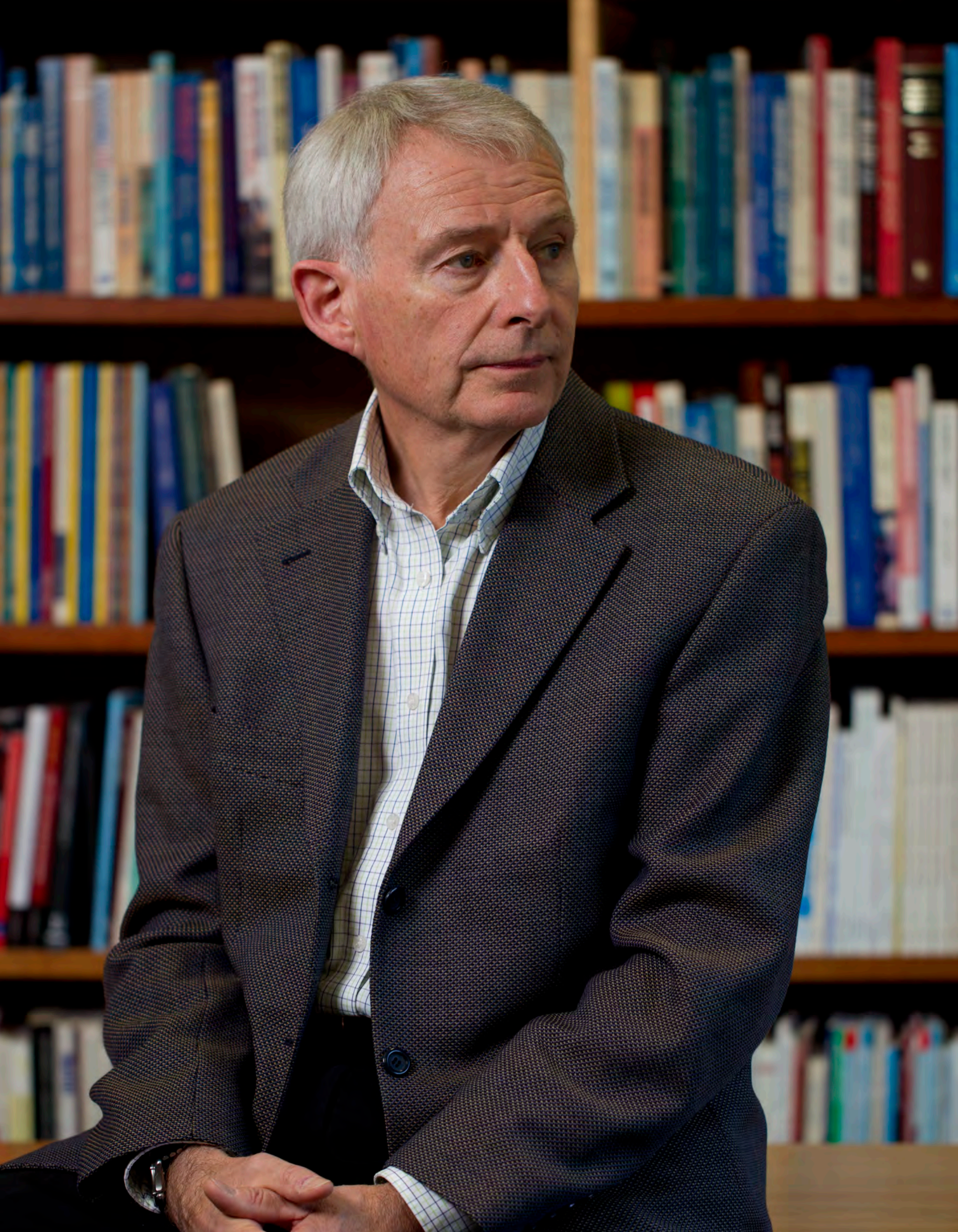
"The murder of Chut Wutty is a tragedy. He offered hope to so many people: villagers, environmentalists, young Cambodians, those who are striving to be heard, and those who are daring to stand up against the powerful forces that are dominating Cambodia. He also inspired those facing similar struggles elsewhere in the forested, and often forgotten, regions of the world," says Milne.

"Hope can only be maintained if people continue to support each other and believe that change is

possible. But the future is uncertain and unpredictable, especially because there is a lot of fear in Cambodia – fear of conflict, of violence, and of speaking out.

"In the future I hope that a way of non-conflict and social transformation can be found, but there may be a long road ahead. There has been no proper investigation into the murder of Chut Wutty and the government has closed his case, which sends a strong message to other activists."

And even though hope may be fragile, Milne will keep on fighting. She is back in Cambodia, working at the frontier, bearing witness to what is happening there, and trying to make sure that these two colliding worlds can live together for the sake of everyone's future. ■



# Politics by numbers

Professor Ian McAllister has been researching voter behaviour for more than 40 years. **ANN JONES** discovers that the polling numbers don't always add up.

**T**he voter stands, hunched at a cardboard booth, pressing pen to paper, marking out his version of democracy.

The booth is a bit wobbly and it means that he can't press too hard and despite his awkward posture these final pen marks are a manifestation of the grace of democracy, the end point of the thought process of one citizen in the lead up to a federal election.

Australia has one of the highest satisfaction levels with democracy in the world. Australians believe that their marks on paper mean the same as the next person's, which is surprising to anyone who uses the tone of the media as their political barometer.

ANU political scientist, Distinguished Professor Ian McAllister, has noticed the gap between public discourse and public feeling. He leads the longest running statistical study of voter behaviour in Australia.

"Journalists phone me up and they say 'everything is going to hell and it's all falling apart' and I say, 'well, actually: no', which isn't what they want to hear," he says.

"Australians' satisfaction with democracy is among the highest in the world, surpassed only by Denmark.

"Trust in politics across a whole range of countries has declined, but our trust in politics has remained quite high, relatively, and our sense of efficacy remains quite high – that's our sense that we would be treated as well as anybody else."

Since the Australian Election Study started in 1987, McAllister has been running the mail-back survey which asks participants hundreds of questions.

The resulting conglomeration of numbers represents a comprehensive picture of how

“

Polling is about 30 per cent science and 70 per cent judgement.

”

Australia operates in the months leading up to a federal election.

Of course, data alone does not have a voice. Political scientists act as interpreters and with such long-term data they can understand voter movements to a very sophisticated degree.

Trends, says McAllister, can be cyclical and that doesn't show up in one-off election polls.

"When a new party comes into government people trust them and like them, then after three or four years they realise that the party's not as good as they thought, and their trust goes down.

"Then, there are secular trends, which are to do with generational change and changes in social structure. Really, you can only pick things like that up if you are looking at long time periods."

It is the long-term trends that really interest McAllister, in contrast to the desires of campaign managers and politicians.

"Political parties do come and ask me things periodically, but what they want to know is what is going to happen in the next two to three months and what I say, based on the last ten years or whatever, is of no interest to them whatsoever."

The data collected by McAllister and his colleagues clearly show that the influence of the swinging vote is not as great as you'd think.

In fact, people who genuinely oscillate between voting for one party or the other are very few. Ironically, McAllister himself is one of them.

In fact, he confesses that he is not party political. Even though McAllister has dedicated his whole professional life to the study of political behaviour, he does not profess a love for it.

"I started my PhD on politics in Northern Ireland, not because I was engaged with either side, but because I wanted to know why people used political violence to try and achieve goals. Why did some people choose between the constitutional means of getting political goals and physical force?"

"And then I got interested in political parties as the process by which democracy works, and political parties are the building blocks of democracy."

For McAllister, it is a science, and he baulks at the idea that a political poll could come anywhere near the same type of in-depth longitudinal understanding that a political scientist can achieve.

"The types of polling that political parties do are about 30 per cent science and 70 per cent judgement.

"Some people are good at the judgement, but it is not science; it's not what I do."

After studying voting and political behaviour over decades, his own behaviour as a voter has remained remarkably stable and McAllister still hasn't made a decision on who he is voting for this year.

"I talk about politics a lot, but I never place myself in the middle of it. I'm sort of detached in terms of numbers and so on."

Soon, on a Saturday morning, perhaps at a primary school gymnasium, walking past the sausage sizzle and towards the ledgers and cardboard booths, McAllister will mark his vote.

But he won't be caught up in the romanticism of democracy. ■

# Safe house

One of Australia's nearest neighbours is facing a nation-wide crisis of violence against women. **SOPHIA CALLANDER** reports.

**F**ifty per cent of Papua New Guinean women have been raped in their own homes. Sixty-eight per cent have been subjected to physical violence of some kind. Few receive proper medical care and even fewer receive the counselling, support and intervention they need to obtain protection, let alone justice.

Working to protect these women is Dr Kamalini Lokuge, an epidemiologist in the ANU National Centre for Epidemiology and Population Health.

Together with Professor Stephen Howes, Director of the Development Policy Centre at the ANU Crawford School of Public Policy, Lokuge recently returned from Papua New Guinea, where she proposed a family and sexual violence Case Management Centre (CMC) for the city of Lae.

"The day of the proposal meeting, there was a case of a young woman who had been abducted at the age of 17," says Lokuge. "She had been held captive in a room for two years and had been regularly beaten and raped. She had escaped and come to Lae's Family Support Centre (FSC) and after receiving medical care was transferred to a safe house; but there was little security there and very quickly the perpetrator became aware that she was being held there and he came with a gun.

"For all of us at that meeting, the preoccupation quickly became about what was going to happen to her that night – the FSC staff were at risk, the man running the safe house was at risk and the police didn't know what to do."

While the young woman was able to settle safely back into her home village, many others

have not been so fortunate. This is what initially led Lokuge to conduct an evaluation of the FSC to see what could be done to help.

"From that evaluation I found that the 12,000 clients the FSC has treated – mostly women and children – had received good quality medical care and counselling," she says. "But the thing I couldn't let go of was that the majority of women that presented had been injured, raped or assaulted by their partners or family."

Having worked in war-torn and poverty stricken parts of the world since the age of 26, Lokuge knows what it takes to make a real difference to people's lives.

"Unless you engage all the way through the process with the people and communities living the problems and the health workers that help



Dr Kamalini Lokuge. PHOTO BY BELINDA PRATTEN.

“The majority of women had been injured, raped or assaulted by their partners or family.”

them deal with those problems, often what you do will not make a difference," she says. "It may seem like it will work, it may change things at a policy level, but in terms of what mothers and children will get, nothing will change.

"The people working in Papua New Guinea are doing more than their best, at their own personal cost. But despite their heroic efforts, the outcomes for survivors of family and sexual violence are all too often tragic because most

services are under-resourced. That's what we're trying to address with the CMC – helping the community build on what they have already achieved."

Lokuge hopes the Lae centre will open later this year. She and her team will continue to monitor the program and hope it will eventually be adopted as a national model.

"People delivering programs know why they're successful or why they fail, but we'll keep

repeating the same mistakes if we don't take that knowledge and make sure it's available to the next set of doctors, nurses and health workers trying to deliver that program in a similar setting," says Lokuge.

While service delivery in the community is essential for reducing the impacts of violence against women, Lokuge stresses the need for policy improvement and advocacy to end it.

"If you can communicate your research in a form that policymakers can use, then you are the best doctor you can be to patients because you are not only giving them care, you are making things change for the future." ■

To get involved in the project visit [http://bit.ly/rep\\_PNGCMC](http://bit.ly/rep_PNGCMC)

Video: Dr Lokuge talks about her research [http://bit.ly/rep\\_kamalini](http://bit.ly/rep_kamalini)

# Untraceable

ANU researchers have created a crack-proof encryption system that's got the nod from NASA. **TEGAN DOLSTRA** reports.



Dr Thomas Symul and Dr Vikram Sharma. PHOTO BY DAVID PATERSON.

Your bank account details and medical records might be safe from prying eyes now, but who might be able to hack your secrets in 5, 20 or 50 years' time?

In the digital age, encryption is crucial for keeping private information private. From major military and government records to email correspondence, encryption – disguising messages with a code – protects information from eavesdroppers who may have less-than-honourable intentions.

Current encryption systems have flaws – as ASIO and Sony can no doubt tell you. But QuintessenceLabs – a cyber security company developed by ANU researchers – has invented a crack-proof encryption system that has been attracting attention from some of the world's largest organisations.

Secret codes have come a long way in the past 50 years, says QuintessenceLabs co-founder and ANU College of Physical and Mathematical Sciences researcher Dr Thomas Symul.

“We can apply it to virtually every domain that uses electronic information.”

“If two people share a perfectly random code, they can communicate in total privacy. But how do you transmit that secret code in the first place?” he says.

“Spies used to write down a random number key in a notepad, which they carried in a briefcase to a secret location. They'd use the key to decode a message, then rip out the page and burn it.”

QuintessenceLabs' breakthrough technology is essentially similar, but a little more complex.

The first step involves generating a truly random number sequence. This is more difficult than it sounds: it's been proven theoretically that it's impossible to purposefully create a string of random numbers.

“You always need to start from somewhere – a time of day, your birthday, the date,” explains Symul. “And if someone can work out what that initial sequence was, your string of random numbers suddenly isn't random at all.”

But this theoretical impossibility proved no obstacle for Symul, who developed a truly random number generator a couple of years ago. The trick was to look at the problem on a quantum scale.

“What we do is measure quantum processes that occur inside vacuum. Most people think vacuum has nothing in it, but it actually contains a little bit of energy. Pairs of particles and anti-particles are popping in and out of existence all the time, resulting in a randomly fluctuating field,” he says.

The next step is to transmit those random measurements from one place to another, using a laser and an optic fibre. The unique properties of the system mean anyone trying to tap into the signal will leave behind incriminating 'fingerprints'.

“Quantum mechanics tells us that you cannot measure perfectly both the amplitude and the phase of a laser beam,” says Symul. “You can make a perfect amplitude measurement, but it adds a lot of noise to the phase measurement and vice versa. So if somebody tries to listen in on the transmission they'll leave a mark.”

These tell-tale signs of interference enable the receiver to select only numbers that definitely haven't been intercepted. They can then use them as a key to code and decode later transmissions.

Just like Cold War spies burning their secret keys after use, the QuintessenceLabs keys are unrecoverable.

“When you measure a quantum object, you

destroy it in the process. So it's impossible for somebody else to make the same measurements and therefore have the same secret key as you,” explains Symul. “That means you can be confident that your data will be safe forever.”

Earlier this year, QuintessenceLabs co-founder and CEO, and ANU alumnus, Dr Vikram Sharma, took the cutting-edge technology to New York for the IBM SmartCamp competition. The company outshone 3,000 competitors from around the world to finish in the global top three.

“It took a little while for the result to sink in,” says Sharma. “But when it did, I was really proud of the fantastic team we have at QuintessenceLabs and the fact that Australian innovation was on the world stage.”

The judges were impressed by the technology's innovative laser usage – which gives it cost, size and performance advantages over conventional single-photon approaches.

“There are only a few groups in the world working with 'bright lasers' – most others use single-photon generators and detectors,” says Sharma. “By using bright lasers, we can use off-the-shelf components and integrate straight into existing infrastructure.”

These advantages have attracted interest from near and far.

“We can apply it to virtually every domain that uses electronic information. We've had interest from government agencies and some of the largest defence contractors in the world, such as Lockheed Martin and Boeing,” says Sharma.

“I'm also very pleased to say that we received an invitation from NASA to open an office at its Ames Research Park in Silicon Valley.”

As the makers of a truly unsolvable coding system, it's no surprise QuintessenceLabs is attracting attention – and the more they attract, the safer your data will be from prying eyes. ■

# Mystery island

Five hundred years ago, the rock islands off Palau were thriving with human life. So why are they now abandoned?

JENNIFER TANNER reports.



Dr Christian Reepmeyer. PHOTO BY STUART HAY.



Uchel-rois rock island. PHOTO BY CHRISTIAN REEPMAYER.

Large stone platforms are scattered around, providing shelter and housing. Men are fishing, hoping to catch their family's next meal. Women are doing the washing in the nearby well, while the children are having an afternoon splash.

This was the scene only 500 years ago on the islands off mainland Palau. Today, the only indications that there was ever any human activity are the massive stone platforms. Made from coral rubble, they are the only certain sign that permanent settlement existed here.

Dr Christian Reepmeyer, a post-doctoral researcher in the ANU School of Culture, History & Language, is investigating how these islands came to be completely abandoned. Along with his colleagues Associate Professor Geoffrey Clark, Ms Jolie Liston and Ms Ella Ussher, Reepmeyer has delved into the history of

these islands to try and find some answers.

"The rock islands are beautiful places," says Reepmeyer, who has visited several times.

"They are uplifted, very sharp, limestone islands — imagine a coral reef that is sitting on top of the ocean. There are about 300 islands in total, spanning an area of around 40 or 50 kilometres."

The team think colonisation started happening a few millennia ago.

"There was a medieval warm period around 1,000 to 1,500 years ago, when the climate was optimal for human occupation and there was a lot of rainwater," says Reepmeyer.

"So we think this is when people started moving from the mainland to the islands and settling permanently."

So why did these people abandon what appears to have been

“ People all of a sudden found themselves competing for freshwater. ”

a perfectly suitable environment?

"Our argument has always been that it has something to do with water," says Reepmeyer.

"The climate records tell us that there was a period where the climate got drier, resulting in less precipitation coming in and the rainy periods becoming less frequent and more unreliable."

"These islands are very porous, which means that water seeps through the limestone.

"So people were getting their water supply through a freshwater layer that 'swam' on top of the salt water. But this source was fed by rainwater, and when the rain stopped, their once-constant water supply turned brackish and undrinkable."

This change in climate caused distress for the rock island natives in more ways than one, says Reepmeyer.

"The main reason for the abandonment was climate change, but the social impacts that come with that were also a factor."

"Yes, the water resources were getting sparse, but this also caused an increase in conflict as well. People all of a sudden found themselves competing not just for the freshwater, but for the marine resources as well."

Interestingly, it was a shipwreck from the 1700s that led

Reepmeyer and his colleagues to sketch out the timeframe of the abandonment.

"There was a European packet ship on its way to China in 1783 that wrecked off the outer reef of the rock islands," explains Reepmeyer.

"The crew ended up camping on one of the islands, where they built a new ship so they could continue their journey, but we know that when they were there, there was no one living on the islands. So the abandonment must have been before this European contact."

The good news is that the inhabitants of the rock islands did not meet their deaths by this change in climate; instead, realising their water supply was diminishing, they chose to move to Koror on the Palau mainland.

"While this lack of water forced the people to leave and was a source of conflict, at the same time

tradition says that the integration of the communities once they moved to the mainland gave a big boost to the Chief of Koror," says Reepmeyer.

The island group may still look like a sun-kissed paradise, but its idyllic appearance is deceptive, as Reepmeyer has discovered for himself.

"For me, as an archaeologist, it's fascinating," he says. "You visit and see the beauty of the place, but once you spend a night out there you actually see the problems first hand and how difficult it would be to live there."

The rock islands may be uninhabitable now, but Reepmeyer's research has shown just how quickly a rock can become a nirvana. Perhaps a future change in climate will see these islands inhabited once more. ■

# Water tables

Australia is making the first splashes in water accounting, a burgeoning field that helps individuals and countries alike manage their water. By **TEGAN DOLSTRA**.

Chances are, the first thing you did when you woke up this morning was make yourself a cup of coffee. You might then have put some porridge on to cook and gone off to take a shower.

All three of these activities have a common, crucial component, the importance of which is often underappreciated.

Aside from how hot it was, how many of you spared a thought for the water you used – where it was sourced, how much you used and how much it cost?

Professor Jayne Godfrey, Dean of the ANU College of Business and Economics, thinks about these questions all the time. She is one of the world's foremost experts in water accounting – an “embryonic” discipline that's all about providing decision makers with thorough, accurate information about water.

“Every person on the planet has an interest in water,” says Godfrey. “Water accounting is about providing data that can help people make incredibly important decisions about their water usage.”

Godfrey has recently returned from South America, where she gave a talk on water accounting at the inaugural Latin America Water Week in Chile.

“Mine was the only paper on water accounting because

Australia is leading the world as the only country with a water accounting standard,” she says. “I was there to share our expertise with the international community and show people what can be done.”

Godfrey met with academics, public policymakers, engineers, hydrologists and major water authorities to give them an insight into how water accounting can help them manage this precious resource.

“Latin America has pretty much every water issue that we have in Australia. It has the driest deserts in the world, but also some of the wettest areas in the world. It has the absolute extremes.

“If you think about Chile, for example, it's such a long country that it passes through several degrees – it's got mountains with rain shadows, dry plains, desert and rainforest. How do you manage excess water and flooding in some places at the same time as areas that don't receive any rain at all for years at a time?”

Water accounting is not just about volumes, prices and geography; it's also about water quality, an important parameter when it comes to health and the environment.

“Imagine water is being contaminated by a mine in one country and when it flows through to another country it puts human health or agriculture at risk.

“ I think we've seen how important water accounting could be in the Murray Darling Basin. ”

That's going to cause tension.

“Water accounting allows countries to ask, ‘are we receiving pure water but exporting contaminated water; if so, what do we need to do about it?’”

So water accounting is also about keeping countries and companies accountable for their blue gold. But what incentives are there for countries to report accurately?

“That's where auditing would come in,” explains Godfrey. “Water exports should marry up to another country's imports and vice versa, just like dollars.

“I think we've seen how important water accounting could be in the Murray Darling Basin. We saw a lot of issues around water and who held it, how much had actually been delivered from one state to another. It's really important to have a standardised approach across Australia so we can avoid these discrepancies.”

The current auditing system in Australia is voluntary but an

auditing standard is due out later this year.

“There is no international mandate for auditing yet,” says Godfrey. “The rest of the world is going to wait and see how it pans out because Australia is recognised as leading the way, not just in terms of accounting but also management.”

Unfortunately, Godfrey missed out on seeing any dams or other water infrastructure during the conference, but did witness the natural wonder that is the mighty Amazon river.

“The Amazon is amazing,” she says. “I was there just at the tail end of the wet season and saw the river drop by two metres in four days. And that was just a tributary – it was phenomenal.”

Godfrey's trip down the Amazon reinforced her passion for water accounting and the difference it could make to people's lives.

“It really struck me how crucial the Amazon river system is to everyone's lives. We saw people bathing, fishing and mining – both legally and illegally – in the water. It's also the only form of transport through the jungle, for food, people, everything.”

So tonight when you're doing the dishes or making a cup of tea, try a bit of your own water accounting – you might be surprised by the numbers. ■



# Growth, destruction, rebirth

The historic Mount Stromlo Observatory Director's Residence was destroyed in the 2003 bushfires. Ten years on, it's getting a new lease of life. By **GEORGIA NIELSEN** and **STACEY POST**.



Vice-Chancellor Professor Ian Young AO and Member for Canberra Gai Brodtmann outside the Residence during the funding announcement in May. *PHOTO BY EMILY DUNCAN.*

**P**erched on top of Canberra's Mount Stromlo, keeping watch on the city below, the Director's Residence had long been regarded as one of the finest examples of federation

architecture in Canberra. But when the firestorm of January 2003 ravaged the nation's capital, much of the two-storey brick home was destroyed – seemingly beyond repair.

That is until now. With a grant of almost \$500,000 from the Federal Government, the house will be stabilised to allow members of the public to explore its history.

Originally known as 'Observatory House', the Director's Residence was built in 1929 for Mount Stromlo Observatory's founder and first director, Walter Duffield, and his family.

Its completion in 1928 was long-awaited by the Duffields, who had been residing in the Canberra Hotel (now the Canberra Hyatt) for four years.

The family made the most of the wait by establishing an extensive garden around the Residence, which even included a croquet lawn. Mr Duffield's daughter Joan remembers helping her mother plant the gardens.

"The garden was really quite lovely," she said in an interview for the Mount Stromlo Observatory Precinct Conservation Management Plan in 2004.

"My mother was a great gardener and while the house was being built, she would potter around the garden. We'd all help. Across the road from the Director's house we also made an orchard."

After just 10 months in the Residence, Mr Duffield, a chronic asthmatic, passed away from pneumonia.

Miss Duffield remembers coming home from school in Melbourne just in time to farewell her father.

"It was absolutely freezing. It was teeming with snow and the roads in Canberra were all slush. I have never seen anything like it. The mountain was covered with snow, pure white. My father was much too ill to be moved to the hospital. I arrived and he died that night."

Mr Duffield was buried not far from the Observatory, a quiet location that during the day has spectacular views of the Brindabella Ranges to the west. The search for his replacement

“As the smoke cleared we could see the Woolley's home [the Director's Residence], so we went across, made tea for the men and carried it back to the Observatory.”

stretched on for almost a decade. When the search finally ended in 1939 with the appointment of Sir Richard van der Riet Woolley, progress was further halted by the Second World War.

"He was appointed on the eve of the war. Instead of being able to do observatory work, he had to turn all this into an optical munitions establishment," explained Miss Duffield.

While it was the 2003 firestorm that destroyed the Residence, it was not the first to cause damage to the Observatory. Doris Hogg, wife of astronomer Arthur Hogg, wrote in 1977 of the day in 1952

when fire first threatened the mountain.

"It was calm at first but then with a whoosh the workshop caught alight when a spark from the encroaching fire caught on some leaves in the guttering," said Mrs Hogg.

"We were all stamping out odd sparks on the lawns. The workshop was well alight and destroyed at the cost of one hundred thousand pounds or more – valuable, almost irreplaceable delicate machinery with it."

Mrs Hogg remembers the part the Director's Residence played in the aftermath of the fire.

"As the smoke cleared we could see the Woolley's home [the Director's Residence], so we went across, made tea for the men and carried it back to the Observatory."

The Residence witnessed many more cups of tea as it housed subsequent directors and their guests, such as Prime Minister Joseph Scullin and the Prince of Siam.

While it still bears the scars of the 2003 fires, the Your Community Heritage Federal Grant will provide safe public access to the building.

A second government grant of \$25,000 will be used to develop an interactive heritage trail and smartphone app for visitors, to communicate the scientific and cultural heritage of the site.

Research School of Astronomy and Astrophysics Director Professor Matthew Colless says the project ties together Stromlo's rich history with future plans.

"The old Director's Residence has

witnessed the growth, destruction and rebirth of Mount Stromlo Observatory," says Colless.

"Thanks to this generous funding, we can take the final step in the reconstruction of Stromlo."

The restoration project will take about 18 months, including stabilisation of the ruin, weatherproofing and landscaping.

"It will really add to Stromlo's role as a centre for public education and outreach," says Colless.

"We're very glad that the Director's Residence will bear witness to an exciting future as well as an illustrious past."

The Residence awaits its restoration with a great responsibility weighing on its beams. Like a phoenix rising from the ashes, it will emerge with a new purpose: to share its once-private stories with all lovers of history and the stars. ■



The Director's Residence in 1928. *PHOTO COURTESY OF THE NATIONAL ARCHIVES.*

# Poetry and punishment

Caribbean PhD student Melissa Jogie's first encounters with English literature have inspired her to shake up the reading curriculum in Australian schools. By **EMILY DUNCAN**.



Melissa Jogie. PHOTO BY EMILY DUNCAN.

“Corporal punishment was still a big thing in Trinidad and Tobago when I was in primary school. We would get lashes if we couldn't recite, for example, Wordsworth's *Daffodils*,” recalls ANU PhD student Melissa Jogie.

“It was so funny. You'd get lashes because you couldn't recite a poem about a flower you'd never seen. After years in the Caribbean education system I began seeing that our upbringing was very much teaching to the test; teaching to what you needed to know; teaching the British curriculum.”

Despite this potentially traumatising introduction to English Literature, Jogie's love for reading blossomed through school and university, eventually taking her overseas to study a Master of Arts in English Literature and a Graduate Diploma in Education.

Now, armed with postcolonial theory, she has combined her passion for reading and

teaching in a PhD thesis on the way identity is represented in the texts taught to high school students from diverse cultural backgrounds.

This research stems from the disjuncture she observed in her own schooling days as well as her observations of the Australian and British education system.

“In Australia I was so excited about the discipline, but then when I did the teacher training, it didn't quite match up with my expectations,” she says.

“I realised there were huge gaps in teacher training. We were only looking at the texts we were given and the texts we were given in NSW were very old.

“Texts like *Great Expectations* have been on the curriculum since the High School Certificate started in 1967, and while it's a great novel, I wondered, ‘is it really the best novel to discuss issues like cultural identity? Will it engage our contemporary students in these deeper

“You'd get lashes because you couldn't recite a poem about a flower you'd never seen.”

meaningful discussions?”

Jogie's research involves a combination of classroom observations, interviews with teachers and student questionnaires. She is interested in the way texts are selected and taught and how this helps students from both European and non-European backgrounds engage with contemporary issues around belonging and identity.

She is concerned by what she describes as a tendency towards exam-orientated teaching,

particularly in high-achieving schools.

“What happens is students stop learning from Year 10 and they start training to take exams.

“I think our literary fictional world is alive, and it's growing and changing, and I think our education systems should match the changes and incorporate for greater scope and engagement, so that our students aren't learning to the test, they're actually learning to engage.”

Her own experiences reciting poems about English roses and rolling meadows while surrounded by the palm trees and golden sands of the Caribbean was the catalyst for an ongoing interest in literary treatments of ‘exotic’ cultures.

“Growing up on an island in the Caribbean, you didn't really have much to do and it was very difficult to think of the world as a bigger place,” she says.

“My ticket out of the world was reading.

I'd get into a book and I'd be like, ‘I really want to go to that place.’ I was reading Orhan Pamuk, reading about Istanbul and Turkey and Transylvania. Just reading about all these different places got me thinking widely.

“In university I was lucky enough that I went on to continue English and learn so much more about our own Caribbean authors.

“I started understanding a lot more about the struggle of identity and having a voice in society and I realised there's a wealth of information that can be engaged with.

“Cultural texts are often treated as tours of exotic places. I'd like us to stop looking at cultural texts as exotic tours and start engaging more with what it means to belong to different cultures.”

For Jogie this could mean anything from teaching about war-stricken countries from the perspective of local authors to exploring refugee communities and asking questions

about teenage experiences of sexuality.

Between a full-time study load and a part-time job at the ACT Council of Parents and Citizens Association, Jogie still finds time to indulge her love of literature.

Recently she received a presentation award at an international conference in Hong Kong and “like any diligent literature student” she spent all the prize money on books.

“A friend of mine just introduced me to Goodreads [an online reading wish-list site] and I told her it would be the ruin of my PhD,” she jokes.

One day Jogie hopes to set up a not-for-profit group to teach literary skills to children in refugee camps or detention centres.

“I think reading is the golden ticket to education and emancipation,” she says.

“Once you can read and write you have a start in life that other people can only dream of.” ■



# The power of nature

Two and a half billion years of chemical experimentation through evolution may be about to provide us with a remarkable solution to the global energy crisis, writes **SOPHIA CALLANDER**.

**E**arth is facing a problem. As our population rises and our impact on the planet grows, we can no longer rely on oil or coal to power our cars, provide our electricity and generate our heating. The search is on for a clean, renewable fuel.

One of our most promising renewable fuel sources is hydrogen, which is completely sustainable and clean because it produces only water vapour when burned. Unfortunately, current methods of generating hydrogen are inefficient and expensive, and its development has fallen behind cheaper options like solar and wind power.

But Professors Robert Stranger and Ron Pace from the ANU Research School of Chemistry have been researching a natural process that could hold the answer to our energy needs.

"We now live in an electric world but we still need storable fuels to do lots of things because batteries are not good at storing energy," says Pace. That's something that most people don't realise.

"Things like gasoline are great for storing energy, but the problem is that when you burn gasoline you generate a lot of carbon dioxide as well. That's why we're really interested in hydrogen: when you burn it, you don't get carbon dioxide – only water vapour and plenty of energy."

Together with their colleague Simon Petrie, Stranger and Pace have been looking into photosynthesis – the process by which plants convert carbon dioxide and water into oxygen and energy using the power of the sun. It just so happens that a critical step in this reaction involves splitting water to produce hydrogen.

"Nature has developed the most highly efficient engine you could possibly have to split water and produce hydrogen. If we can mimic it, we've got a fantastic mechanism to have a renewable energy source," says Stranger.

The team have discovered not only the molecular structure by which plants split water during photosynthesis but also the mechanism, using computational chemistry.

"Now we know what the molecular structure looks like. Now we know how it produces hydrogen. And through doing so, now we



Associate Professor Ron Pace and Professor Rob Stranger. PHOTO BY CASEY HAMILTON.

“Nature has developed the most highly efficient engine you could possibly have.”

know what important bits of it we need to build a mimic of it. In other words, we know how to create artificial photosynthesis," says Stranger.

"That's the key to this – stealing nature's secret. It's got the perfect machine, so let's copy it!"

For those conjuring up images from *Day of the Triffids*, the reality of this power plant is something quite different.

"The idea is not that you produce a sort of giant mechanical plant. A functioning artificial photosynthesis industrial entity might look in many parts like a wind farm or a voltaic field and uses the cheapest available source of water – seawater – to generate hydrogen," says Pace.

"We can build factories, we can run pipelines and powerlines, which means that we can combine the secrets that we learn from nature with our own strengths, to produce an outcome that is better than either."

Not only does photosynthesis provide the oxygen we breathe and the food we eat, it may also hold the key to sustaining the energy needs of our future. ■

Video: Learn more about artificial photosynthesis [http://bit.ly/rep\\_artphot](http://bit.ly/rep_artphot)



Albert Patajo and Carl Figueiredo. PHOTO BY STACEY POST.

# Chasing dreams

ANU student Ben Duggan has established a foundation that gives Canberra teenagers the chance to realise their full potential. **STACEY POST** reports.

**M**ost kids usually have big dreams for their future career – a nurse, a fireman, a scientist, or a professional football player. For some – through hard work and maybe a bit of luck – that dream actually becomes reality.

But for most of us, that childhood profession lives on only in our memories.

ANU undergraduate student Ben Duggan established the Raising Hope Education Foundation in 2010 as a way of instilling confidence in Canberra teens to make sure they reach their full potential in life after the classroom.

The Foundation's Boom! Mentoring program buddies ANU students with Canberra high-school students once a week to chat about career paths,

“To have an impact on someone's life is really rewarding.”

school and life in general.

"It is important for students to believe that they can be whatever they want to be – to have the confidence to chase their dreams and the self-belief to keep trying when things get tough," says Duggan.

"Mentors help encourage self-belief because without it it's too easy for students to give up, or turn down a great opportunity."

High-school student Carl Figueiredo

enjoys building things and has grand plans to be an engineer after school. He jumped at the chance to be involved in the one-on-one mentoring program.

"I am fairly certain about what I want to do when I get older and what path I want to take, but before talking to my mentor about my choices, I thought it would just be a case of if I didn't get the marks then that was it and I would have to try something else," says Figueiredo.

The program was introduced into ACT schools in January, and more than 40 ANU staff and students have trained to be mentors.

Second-year ANU student Albert Patajo is Figueiredo's mentor. Patajo joined Boom! Mentoring to help others, but also picked up some

personal skills along the way.

"To have an impact on someone's life is really rewarding," he says.

"The experience has helped me better define myself, by gaining great leadership and communication skills, and shown me the real worth of helping others."

Raising Hope is proving that just because you can't bend a football quite like David Beckham, or unpack the theory of gravity like Sir Isaac Newton, doesn't mean you can't have a successful career. And that sometimes a chat once a week with someone might be all it takes to change a life. ■

To find out more about Raising Hope, or to get involved in the Boom! Mentoring program, visit [http://bit.ly/rep\\_boom](http://bit.ly/rep_boom)

# catch up

Been a while since you visited the ANU campus? That doesn't mean you should miss out on the many events taking place at the University.

Watch the latest videos at: [youtube.com/ANUchannel](http://youtube.com/ANUchannel)



## Tuckwell Scholars announced

Watch: [http://bit.ly/rep\\_Tscholars](http://bit.ly/rep_Tscholars)

Meet some of the country's best and brightest students as they look forward to starting their studies at ANU as Tuckwell Scholars.

The Tuckwell Scholarship Program was established by ANU alumnus Graham Tuckwell and his wife Louise in February. Their \$50 million gift to the University was the largest ever donation to an Australian university by an Australian citizen.



## Growing solutions, harvesting answers

Professor Tom Kompas, Director of the ANU

Crawford School of Public Policy

Watch: [http://bit.ly/rep\\_foodpolicy](http://bit.ly/rep_foodpolicy)

How can we ensure there is sufficient food for all? And why does climate change policy sometimes come into conflict with food policy? In this video, Professor Tom Kompas sheds some light on those questions as he discusses the new Food Policy Institute.



## Putting the chicken before the egg

Alex Bruce, ANU College of Law

Watch: [http://bit.ly/rep\\_AlexB](http://bit.ly/rep_AlexB)

Alex Bruce, Associate Professor at the ANU College of Law, Tibetan Buddhist monk and recent PhD graduate, speaks about the emerging field of animal law.

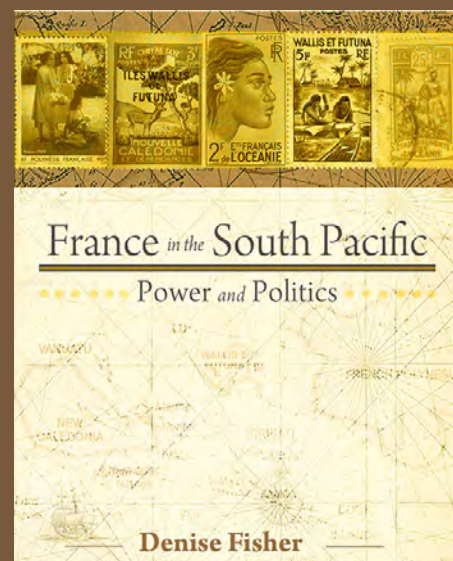
His research delves into how animals are represented, or underrepresented, in law, and how these laws differ from east to west.



Australian National University

## bookshelf

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## France in the South Pacific: Power and Politics

By Denise Fisher

France is a Pacific power, with three territories, a military presence and extensive investments. Once seen by many as a colonial interloper in the South Pacific, by the early 2000s, after it ended nuclear testing in French Polynesia and negotiated transitional Accords responding to independence demands in New Caledonia, France seems to have become generally accepted as a regional partner.

Combining historical background with political and economic analysis, this comprehensive study offers vital insight into the intricate history – and problematic future – of several of Australia's key neighbours in the Pacific.



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[anu.edu.au/merchandise](http://anu.edu.au/merchandise)

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# Roy Jackson: Retrospective 1963-2013

27 September – 3 November

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