

WESTERN SYDNEY
UNIVERSITY



Hawkesbury Institute
for the Environment



Success Showcase

Quarter Two and Three 2015

RESEARCH SUCCESS

ARC LINKAGE SUPPORTS GENETIC SELECTIONS FOR A DRIER AUSTRALIA

In the recent ARC Linkage round, Dr Paul Rymer and Prof David Tissue have successfully gained an ARC Linkage grant to better understand trees' capacity to respond positively to climate change.

In Australia's south-west, an increasingly dry climate is impacting on native forests with rapid and destructive loss of large trees in a short period of time. The damage has been exacerbated by insect and fungal infestations leading to large-scale dieback of numerous tree species across Western Australia.

This research will identify the most drought-resistant genetic traits by stress-testing populations of trees under extreme conditions and then identifying which trees offer the best productivity to cope in real-world conditions.

THE FUTURE OF FRUIT FLY CONTROL IS BIOLOGICAL, NOT CHEMICAL

Destructive fruit flies such as the Queensland fruit fly cause production losses in the millions of dollars each year, affecting many fruits including stonefruit, mangoes, tomatoes and many others. Traditionally, chemical pesticides have been used that enter the growing fruit but recent changes in regulation mean that these pesticides are no longer allowed.

There has been significant focus on the use of large-scale releases of either sterilised or single-sex fruit flies to bring down the populations of fruit flies in the wild. Recently, Assoc Prof Markus Riegler gained funding through the ARC Industrial Transformation Research Program to lead the Western Sydney University node of the Centre for Fruit Fly Biosecurity Innovation through Macquarie University.

Over five years, the Centre will coordinate our efforts to boost the capacity of research into single-sex fruit fly technologies, with support for three new HDR students, a postdoctoral research fellow and a research technician.

RESEARCH DETERMINES TIMING OF FRUIT FLY SEX DETERMINATION

Recent research by Dr Jennifer Morrow and Assoc Prof Markus Riegler determined the point at which a developing fruit fly embryo becomes male or female. This important discovery furthers our understanding of techniques that enhance mass rearing of single-sex fruit flies where large numbers of male-only flies are needed for mass-release programs.

This research program is being extended with new funding under the Australian Research Council Training Centres scheme.





THE FUTURE



**Dr Sebastian
Pfautsch**

RESEARCH SUCCESS

Our trees are sentinels for the health of our ecosystems. We are uncovering the detailed inner workings of our hardy and resilient trees to better understand their ability to cope with stresses and to function in a world under change. Here are three recent publications that show just how resilient and adaptable our native trees are.

TREES AT RISK IF MINING ALTERS GROUNDWATER LEVELS

Western Sydney University research has found open-cut mines that modify groundwater levels can impact ecosystems outside official boundaries, raising questions about their full ecological effects. Open-cut mines often change the dynamics of groundwater tables, but little is known about what happens to nearby trees and ecosystems when groundwater is diverted around mines to prevent the flooding of pits.

“We know Australian trees, such as eucalypts, can extend roots 30 metres or deeper into the ground to find water,” says Dr Sebastian Pfautsch, from the Hawkesbury Institute for the Environment. “What we examined in this study is how these trees respond when nearby mine operations start changing underground water supplies.”

The research demonstrated that there are measurable effects on native trees from lowering groundwater at mine sites, a common practice in deep open-cut mines. These effects can be measured at considerable distances from the mines, indicating far-reaching impacts from mining on groundwater and water tables.

Read more at <http://bit.ly/Mining-Water>

PREDICTING THE FUTURE: EUCFACE EXPERIMENT FINDS HIGHER CO₂ GIVES TREES EFFICIENCY BOOST

Australia’s native forests will use water more efficiently in the future as the amount of carbon dioxide in the planet’s atmosphere increases, according to new findings from the EucFACE experiment.

Professor Belinda Medlyn says the experiment is the first to test, on Australian native vegetation in the field, the effect of elevated CO₂ on the workings of stomata – the pores on leaves which open and close to control a plant’s exchange of gases and water. She says the models they developed predicted plants would operate more efficiently under higher concentrations of CO₂.

“In our experiment at the EucFACE facility we showed the models were accurate. The leaves were much more efficient – gaining 35 percent more carbon per unit of water lost – within the zone of the higher atmospheric carbon dioxide compared to trees just outside.”

Read more at <http://bit.ly/EucFACE-Results>



WHICH ENVIRONMENTAL CONDITIONS HAVE THE MOST IMPACT ON TREE PRODUCTIVITY?

The impacts of rising CO₂ are being widely studied on a variety of tree species, especially those such as eucalypts that make up most of our extensive native forest area. But what impacts on the health of tree species in very fragile ecosystems, such as the Wollemi Pines discovered in 1994 north-west of Sydney?

Research recently published in the journal Functional Plant Biology explored the combined effects of elevated temperature and elevated CO₂ regimes on Wollemi Pines by using Western Sydney’s glasshouse facilities. The experiments indicated that the beneficial effects of elevated CO₂ (improved water use efficiency and carbon fixation) will not usually offset the damaging effects caused by higher temperatures. These findings are consistent with similar research on pines and eucalypts conducted at the Hawkesbury Institute for the Environment.

This research is important in understanding the main factors that impact on tree health and performance under both normal and more extreme conditions, especially in rare tree species such as Wollemi Pines where there are significant gaps in our knowledge of their ecology.

Read more at www.bit.ly/Wollemi



STAFF SUCCESSES

EMERITUS PROFESSOR JANN CONROY AWARDED MEMBER OF THE ORDER OF AUSTRALIA

Our very own Professor Jann Conroy was appointed as a Member of the Order of Australia (AM) for

‘Significant service to environmental science, particularly climate change and plant growth research, as an academic, and as a mentor of young scientists’.

Jann has dedicated so many years of her life to research and higher education in Australia and to the mentorship of young scientists and academics. It was Jann’s initial hard work and dedication over so many years that ultimately lead to research intensity and excellence in plant sciences and the formation of the Hawkesbury Institute for the Environment.



DR BRENDAN CHOAT AWARDED AT THOMSON REUTERS CITATION AND INNOVATION AWARDS 2015

Dr Brendan Choat accepted his Thomson Reuters 2015 Citation and Innovation Award at a ceremony at the University of Melbourne. In total, 11 Australian Research Groups were selected to receive Citation Awards in recognition of their outstanding contribution to research.

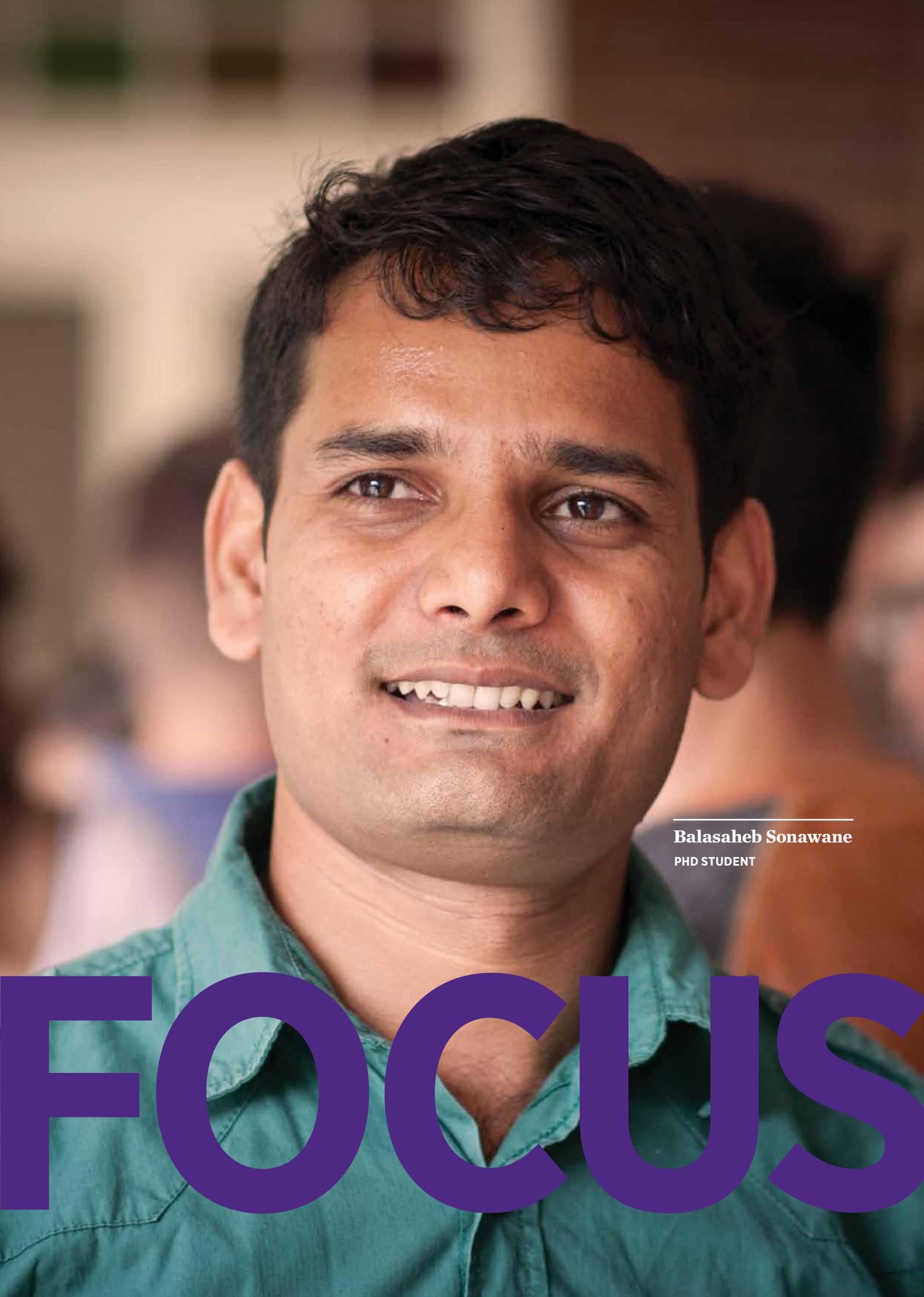
In addition, 8 Australian organisations were recognised for their excellence in innovation. Brendan and his colleague Dr Tim Brodribb (University of Tasmania) received the citation award in Plant & Animal Science for their research in “Drought and tree mortality”.

PHD STUDENT BALA SONAWANE JOINS WASHINGTON STATE UNIVERSITY’S PHOTOSYNTHESIS RESEARCH

PhD student Balasaheb Sonawane has been offered a postdoctoral position to work at Washington State University with Associate Professor Asaph Cousins. His project will focus on enhancing growth of sorghum in water and nitrogen limited environments.

The research will build on Bala’s training in photosynthetic physiology and stable isotopes. Assoc Prof Cousins is a rising star in C4 photosynthesis and the Department at Washington State has a well-known pedigree in Photosynthesis research and is expected to visit the HIE in 2016.

This is a terrific outcome from Bala’s hard work during his PhD and testament to the Hawkesbury Institute’s success in training excellence.



Balasaheb Sonawane
PHD STUDENT

FOCUS



Caroline Fromont

PHD STUDENT

“Caroline was awarded funds to attend the Association of Tropical Biology and Conservation conference in Honolulu in July 2015.”

STUDENT SUCCESSES

“Our talented students have access to an environment of research excellence and the many opportunities that result, enabling them to build essential professional skills, connections and experience.”

ROHAN RILEY AWARDED THE 2015 F G SWAIN PRIZE

Rohan joined HIE as a new PhD student from Canada under the supervision of Dr Jeff Powell.

Rohan was awarded the annual F G Swain Prize, a prestigious scholarship to enhance the research outcomes of doctoral students based on the Hawkesbury Campus, and promote the Hawkesbury Campus as a focus of excellence and innovation in research.

The award has been established in recognition of the significant contribution of Professor Graham Swain to Hawkesbury, first as Principal of Hawkesbury Agricultural College over the period 1972 to 1988, and then as Western Sydney University Deputy Vice-Chancellor and CEO of Western Sydney University Hawkesbury from 1989 to 1993.



CAROLINE FROMONT AWARDED AUSTRALIAN BIOLOGICAL RESOURCES SURVEY (ABRS) TRAVEL AWARD

Caroline is a PhD student whose research examines the role of microbial symbionts in the ecology of psyllids, tiny sap-sucking insects that feed on native figs including the iconic Moreton Bay fig and fig species in Lord Howe Island.

Caroline was awarded funds to attend the Association of Tropical Biology and Conservation conference in Honolulu in July 2015, an experience that provided excellent networking and professional development opportunities for Caroline.



TIM SUTTON WINS BEST POSTER

Tim Sutton was announced as the winner of the Best Poster Prize at the recent Australian Entomological Society Conference and AGM in Cairns.

Tim's poster was titled “One step ahead: a parasitoid disperses farther & forms a wider population than its fig wasp host”, exploring the population ecology of the fig wasps and their pollinating relationship to native figs.

Tim's award builds on his strong reputation for excellence as a student in the sciences, having been previously awarded the E A Southey and the F G Swain Awards in previous years.



KYLIE BRICE WINS THE PADDY PALLIN SCIENCE GRANT AWARD

Kylie has been awarded the annual Paddy Pallin Science Grant Award which she will use to analyse the microbial communities present inside the digestive systems of koalas. This important research is part of efforts to conserve populations of koalas and better understand how their gut microbes influence their ability to digest food from eucalypt leaves.

The results will be used to develop inoculants that can be administered to translocating koalas to provide them with the appropriate range of gut microbes that would enable them to digest Eucalypts in new regions and increase their survival rates.

TRACEY STEINRUCKEN WINS TOP YOUNG SCIENTIST

Topping a stellar run for Tracey is her recent award of Top Young Scientist at the Australasian Mycological Society conference in Canberra.

Tracey's talk was titled “Pathogens, water stress and dieback in an invasive tree”, based on her award-winning research into fungi that infect the weedy Parkinsonia, a woody shrub that infests large areas of pastoral land in northern Australia.

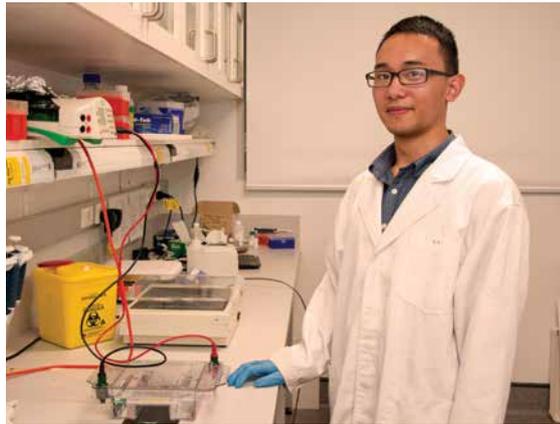
Tracey is currently enjoying life in California as part of her time as Western Sydney University's 2015 Fulbright Student based at the University of California, Berkeley.



STUDENT INTERNS

In 2015, the Hawkesbury Institute for the Environment has hosted 35 keen student interns across a range of projects and its three research themes. Our interns have experienced life in research with full access to real-life scientific projects, giving them invaluable experience as they build experience, skills and connections in science.

Find out what some of our interns think of their time at the Institute.



Christian Aguirre

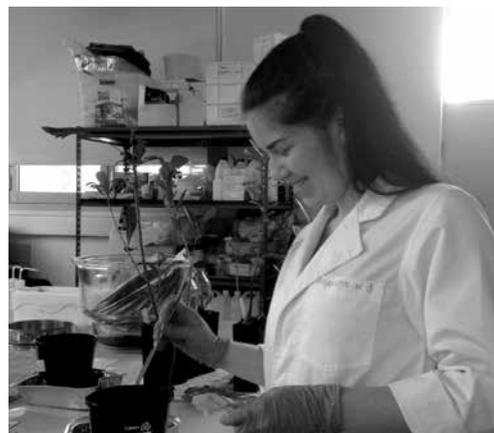
**BACHELOR OF SCIENCE
(BIOLOGICAL SCIENCES)**

“Learning new skills/techniques from researchers who are experts in their fields, gaining experience on working in a real laboratory and out in the field/greenhouse were the most valuable outcomes for me.”

Rhiannon Rowe

**BACHELOR OF SCIENCE
(ENVIRONMENTAL SCIENCE)**

“The most valuable outcomes for me in this program were gaining laboratory experience as well as meeting people who are currently working on projects at the HIE. I learnt a lot from the PhD candidates and laboratory assistants.”



Rhiannon Wright

BACHELOR OF SCIENCE (ADVANCED SCIENCE)

“The most valuable outcome I gained from being part of the HIE internship program is most definitely the practical skill experience. I was given excellent instruction and demonstration in a variety of skills, and the confidence to utilise those skills autonomously.”



Josh Vogelzang

**BACHELOR OF SCIENCE
(ZOOLOGY)**

“To watch and learn from an experienced researcher, understand the fundamentals of designing an experiment and learning how to use chemicals and scientific machines. Participating in the scholarship has been valuable experience for my future career.”

LEARNING

A black and white photograph of three men in suits standing in front of a brick building with large, multi-paned windows. The man on the left has a beard and is smiling. The man in the center is balding and is also smiling. The man on the right is wearing glasses and has a neutral expression. They are all looking towards the camera.

FROM LEFT TO RIGHT

**Professor Ian Anderson (HIE),
Mr Hugo Llorens and
Mr John Faulkner.**

WHY THE CLEAN TECHNOLOGY REVOLUTION HOLDS SO MUCH PROMISE

At a very special event on Monday 31st August, the Whitlam Institute and the Hawkesbury Institute for the Environment were treated to an inspiring presentation by the US Consul-General, Mr Hugo Llorens. Outlining the enormous progress made around the world in adoption of clean technologies such as solar and wind power, Mr Llorens commented on Australia's own level of adoption of solar and other renewables.

Thank you to Mr Llorens and the Whitlam Institute for hosting this unique and inspiring event.

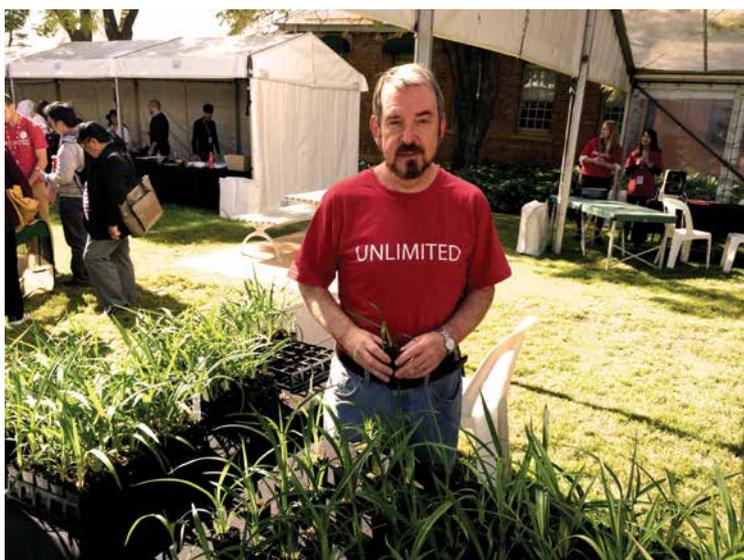
SCIENCE LIFE

National Science Week is held across Australia every August, with more than six hundred events nationwide to promote increasing national and international interest in Australia's science.

The Hawkesbury Institute for the Environment is fortunate to be part of the Western Sydney Science Hub through the Regional Hubs scheme that supports regional engagement activities.

The Institute hosted two groups of primary school students with video-making sessions based inside the forest at EucFACE, followed by the immensely popular reptile sessions with Murray Austin. Our colleagues in agricultural education in the School of Science and Health also hosted an inspiring session on food production and food waste, to enhance students' understanding of the origins of food and the food consumption cycle.

Thanks to our communications intern Megan Hounslow for her support in producing the Science Hub website at <http://bit.ly/WSHub>.



PLANTING A NEW VISION AT WESTERN SYDNEY UNIVERSITY OPEN DAY

Open Day 2015 was always going to be a celebration of the University's new vision and it certainly delivered! By August 30, the Parramatta campus was transformed into a sea of crimson as the new branding was rolled out to the public.

We were proud to be part of the festivities on a perfect late winter day and hosted one of our favourite activities to give away native plants to our visitors. Giving visitors a small gift is part of our vision of 'planting an idea' that will inspire our guests to consider life at Western Sydney University. We hope that every Spring when their native *Dianella* bursts into bloom, that our guests will think of their day at the University and the vibrancy of our University community.

These plants are just one species that forms part of our efforts with Greening Australia to find the best stocks for revegetation of our Cumberland Plain and make Sydney a greener, cooler and more biodiverse place to live.



SELECTING EVEN MIGHTIER RIVER RED GUMS

Australia is famous for its iconic eucalypts, and none more so than the incredible River Red Gum (*Eucalypts camaldulensis*). With an enormous range across Australia, the River Red Gums can live for hundreds or thousands of years and are a key species in our riparian and wetland ecosystems.

These trees have been at the centre of Australian literature, made famous by authors such as Murray Bail whose well-known book *Eucalyptus* describes:

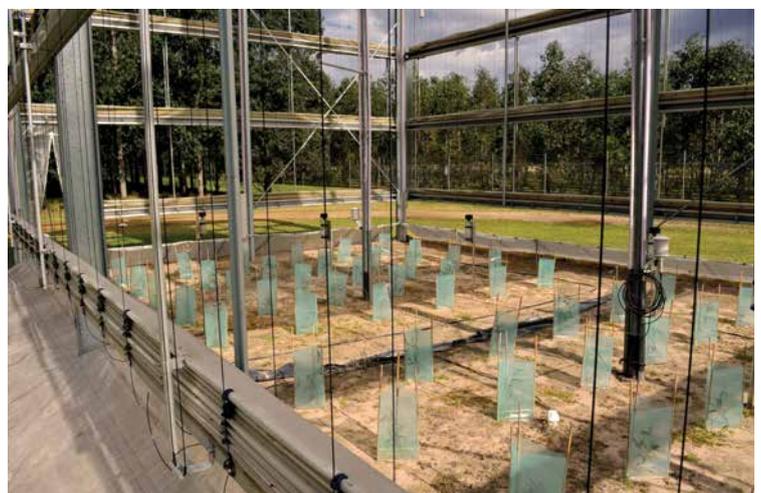
“Over time the River Red Gum (*E. camaldulensis*) has become barnacled with legends. This is only to be expected. By sheer numbers there’s always a bulky Red Gum here or somewhere else in the wide world, muscling into the eye, as it were; and by following the course of rivers in our particular continent they don’t merely imprint their fuzzy shape but actually worm their way greenly into the mind, giving some hope against the collective crow-croaking dryness. And if that’s not enough the massive individual squatness of these trees, ancient, stained and warty, has a grandfatherly aspect; that is, a long life of incidents, seasons, stories.” – Murray Bail – ‘Eucalyptus’ – 1998)

A new planting at Hawkesbury of *Eucalyptus camaldulensis* has been established in recent months, with extensive open and sheltered plantings as part of the Science and Industry Endowment Fund research.

In these plantings, clonally-grown *E. camaldulensis* selections are planted out into the field and into the Large Rainout Shelters to assess their performance under ambient and drought conditions. These regimes follow on from testing under greenhouse conditions of elevated carbon dioxide and elevated temperatures to provide a detailed understanding of the genetic and physiological factors that support resilience under the most extreme of conditions.

“This experiment really makes use of the full range of facilities at the Hawkesbury Institute”, explains Prof David Tissue, lead scientist in the project.

“From regimes of additional heat exposure combined with drought and elevated carbon dioxide in greenhouse phases, through to open field and rainout shelter plantings with imposed drought, the results from this experiment will inform the evaluation of performance of different genotypes from different climate regions in Australia under real-world conditions”.





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