



Professor Rick Shine accepts his Eureka Prize for Promoting the Understanding of Australian Science at the awards dinner on September 6. Left to Right: Professor Trevor Hambley, Dean of Science; Professor Rick Shine; Dr Michael Spence, Vice Chancellor of the University of Sydney. Credit: 247Studios and Australian Museum.

Professor Rick Shine has been named the 2011 Eureka Prize winner for Promoting Understanding of Australian Science Research in recognition of his effective and dedicated communication of herpetological and conservation research over three decades and the outstanding impact it has had on the Australian community.

This award represents a second Eureka win for Prof Shine, who took away the 2006 Eureka Prize for Biodiversity Research in recognition of his pioneering work on ecology, evolution and conservation of Australian reptiles.

Presented annually by the Australian Museum, the Eureka Prizes reward excellence in the fields of scientific research and innovation, science leadership, school science and science journalism and communication.

As one of Australia's foremost researchers in ecology and evolution, Professor Shine is also one of this country's most widely-heard science communicators. Throughout his 35-year career, Professor Shine has devoted enormous effort to public outreach and has helped to break down the barriers between researchers and the wider community.

Through delivering public talks, publishing books and popular science articles, creating websites and maintaining an active

## EUREKA TRIUMPH

Professor Rick Shine strikes gold – again – by winning his second Eureka Prize, this time for three decades of outstanding communication of herpetological research.

public profile with consistent media appearances, Professor Shine has informed the Australian public on a range of issues including understanding our ecological challenges, preservation of endangered reptiles, evolutionary theory and basic biology of frogs and reptiles.

Most recently, Professor Shine has substantially changed the public's opinion on cane toads - Australia's most notorious invasive species, which has lived here for over 70 years. Through actively communicating the research from his group, Team Bufo, Professor Shine is replacing myth with fact and filling in the long-standing knowledge gap, both in the scientific community and in the Australian populace, surrounding cane toads.

Professor Shine says: "I was delighted to win the Eureka, because I passionately believe in the importance of communicating our research results. The level of public understanding of many important scientific issues is abysmal, and if we don't change that situation then we are unlikely to make rational choices about environmental issues.

"As with just about any award like this, the credit really belongs to several people, not just me. In particular, my wife Terri created and runs our cane toad website, [www.canetoadsinoz.com](http://www.canetoadsinoz.com) - our key route for explaining what scientific approaches can tell us about the unloved amphibian."

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## DIARY DATES

### SATURDAY OCTOBER 22

#### ANNUAL BIOLOGY ALUMNI PARTY

#### WARRAH FIELD STATION

75 CRYSTAL ST, PEARL BEACH

11AM - 6PM

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## EDITORIAL

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# HEADSPACE



It was wonderful to host so many alumni, colleagues, students and members of the public at the 2011 Murray Lecture delivered by Dr Jim Haseloff from the University of Cambridge.

We were treated to a fascinating tale of how synthetic biology is exploiting engineering principles to make entirely new organisms. His partner, Professor Andrea Brand, a leading developmental neurobiologist also from Cambridge, delivered a university lecture on her work on stem cells in the brain of *Drosophila*. They both joined our postgraduate students for a weekend at Warrah and discussed, among other things, how they have juggled two research careers within one family.

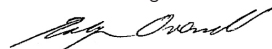
Our current undergraduate students are hungry for advice on the careers that can grow from a Biology major. We are grateful to two of our alumni who returned to campus recently to share their experiences since graduation. Cameron Radford, who recently completed a Masters of Wildlife Health and Population Management, shared his journey from a nature-loving childhood to his current position with Australian Wildlife Conservancy at North Head. Cameron encouraged students to become involved in as many volunteer opportunities as possible during their degree, in order to clarify where their career interests lie. Karina Holden, currently commissioning editor for science and nature documentaries at the ABC, inspired students with her passion and stories of how hard work, flexibility and dedication has taken her from a Biology major to a career in film. If you are an alumnus who would be willing to share your journey with current undergraduate students, please let me know.

I congratulate Prof Rick Shine who was recently awarded the 2011 Eureka Prize for Promoting Understanding of Australian Science Research. This was in recognition of his enormous contribution in working with the media to share his research with the public. A quick glance at the list of our media contributions on the School homepage, [sydney.edu.au/biology](http://sydney.edu.au/biology), shows just how busy he and his group have been.

A number of events are planned for 2012 to celebrate the School's 50th Birthday. As part of these activities there will be an exhibition at the Macleay Museum on 50 years of the School of Biological Sciences. We will develop a gallery of images of past students and staff so please send any such treasures you may be able to contribute to our editor.

We are delighted to have had such a strong response to our upcoming Warrah Field Day and BBQ on October 22. If you would like to join in on this day, please register for the event at [sydney.edu.au/biology/alumni](http://sydney.edu.au/biology/alumni)

With warm regards,

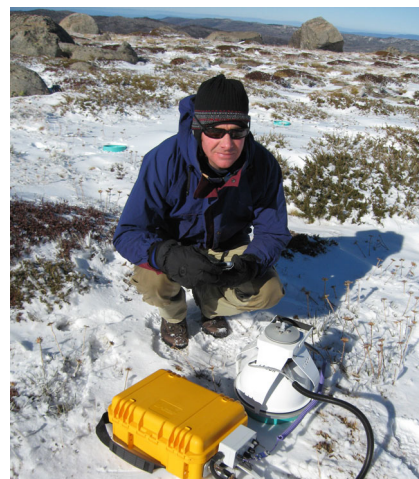


Robyn Overall

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# RESEARCH SPOTLIGHT: CHARLIE WARREN

It is estimated that each year, the respiration of microbes in soil emits ten times more CO<sub>2</sub> than anthropogenic sources. Currently there is no way of accurately predicting rates of soil respiration, but Charlie Warren hopes that his research, elucidating the mysterious ways that plants interact with the soil, can help.



“I’ve always been fascinated by processes,” says Charlie Warren, Associate Professor in the School of Biological Sciences. “As a kid, I used to spend hours pulling apart my toys to figure out how they worked.”

Now as a fully fledged scientist with an impressive CV, which includes over \$2.5M funding in the last five years, a QEII fellowship and prestigious NSW Tall Poppy award, Prof Warren has kept his childhood curiosity for intricate mechanistic processes, but has turned his focus from understanding toys to ecosystems.

Having joined the School in 2006 as a Senior Research Fellow, Prof Warren’s work primarily looks to understand the functioning of plants and ecosystems. And with funding from an Australian Research Council Future Fellowship won in May this year, Prof Warren can set about trying to solve his newest puzzle - unravelling the interactions between plants and the soil that nourishes them, in the hope of understanding their metabolic footprint.

“There has been a lot of work done on how plants change the atmosphere through the compounds they take up and emit from leaves, but that is only half the story. We still know almost nothing about what effect plants have on the soil,” says Prof Warren.

So in what way do plants impact the soil? Prof Warren has put the spotlight on plant roots as key players in this process. “We usually think of roots as organs that help plants draw up compounds from the environment, but they are equally likely to let compounds

leak out of them,” he says.

In fact, plant roots are so leaky that about 10% of all carbon fixed by plants in photosynthesis is lost as organic compounds - amino acids, carbohydrates and organic acids - through the roots into the soil. “This seems to be an enormous cost to the plant, so I want to delve deeper into this mystery to find out exactly what compounds are being exuded from the roots and how they are affecting the soil,” says Prof Warren.

Despite root exudation being well established in the plant literature, surprisingly little is known about the exact substances being leaked out. While previous studies have identified two or three organic acids (usually citrate and oxalate) as being exuded from roots, Prof Warren’s own research tells a dramatically different story. His preliminary tests have shown that a cocktail of as many as 200 different organic compounds is being lost from plants through their roots.

Part of Prof Warren’s project for the next few years will involve trying to pinpoint the exact compounds being lost from the roots through exudation and to determine whether this equates to an overall net loss for the plant. His unique experiment will attempt to characterise the movement of all 200 organic compounds in and out of plants, which is a significant leap from previous work that has focused on only a handful of compounds simultaneously.

Distinguishing between compounds that are leaking out of roots compared

with those that are being taken up requires the use of stable isotopes. But instead of purchasing these at great cost, Prof Warren will use plants as chemical factories to synthesise all the organic compounds he needs.

The idea is that plants that have been fed with labelled carbon (C<sub>13</sub>) and nitrogen (N<sub>15</sub>) - two elements that are present in all plant organic compounds - will grow and incorporate these isotopes into their systems. Labelled organic compounds can then be harvested and finally fed to experimental plants.

This next process involves putting experimental plants into a hydroponic “soup” of the 200 labelled organic compounds and closely monitoring for one hour. Labelled compounds that are found in the plant show what is being taken up and unlabelled chemicals in the soup show what is being exuded.

Prof Warren says that elucidating the complexities of root exudation can ultimately contribute to our understanding of big issues facing science today, such as food security and climate change. “We already know that root exudates play a role in helping plants take up nutrients, such as phosphorus, and in the future we may be able to modify this to achieve better yield of crop plants.

“And importantly, understanding root exudation is critical for us to accurately predict soil respiration, which is a crucial missing piece in helping us form the global carbon budget and giving us an energy blueprint to live by in the future.”

# A HELPING HAND FOR OUR HARBOUR

Did you know that there are over 550 fish species in Sydney Harbour? Dr Figueira hopes that soon, Sydneysiders will be just as familiar with the fish living on their doorstep as they are with Nemo and friends from the Great Barrier Reef.

“Sydney Harbour is one of the most biologically diverse harbours in the world and we can feel enormously proud of this natural heritage,” says Dr Figueira, a fish population biologist. “But it is also Australia’s largest and most urbanised estuary, so we need to be concerned about what human-induced changes will do to it.”

Although currently boasting over 570 species of fish and 3600 invertebrates (including dozens of Australian endemic species), Dr Figueira believes that scientists must be continually monitoring biodiversity and water quality in Sydney Harbour if we are to conserve this icon for the future.

“There has been lots of progress in raising awareness of water pollution and cleaning up the harbour since the 80s; however, pressures on the harbour will only increase as Sydney continues

to grow and sitting on our laurels may cause us to move backwards,” he says.

Together with researchers from the Sydney Institute of Marine Science (SIMS) – a collaboration of scientists from four universities, two state and one commonwealth agencies in Sydney – Dr Figueira is contributing to our understanding of how Sydney Harbour will cope with modern pressures of urbanisation and climate change.

His own research on fish populations suggests that Sydney Harbour’s flora and fauna will likely change in the future due to global warming. In studying how climate change is altering the distribution of fish on Australia’s east coast, Dr Figueira has found that rising sea temperature is causing certain tropical species to be pushed further south. “Due to habitat constraints, we probably won’t be

seeing Nemo in Sydney Harbour. But some of his friends could certainly be showing up in the future,” he says.

Dr Figueira also believes that a major part of conserving Sydney Harbour involves education of Sydneysiders, who are custodians of this city’s natural treasure. “I think that a person growing up in Sydney needs to know about the biology and history of Sydney Harbour,” he says.

To drum up public awareness, Dr Figueira recently walked 11 km along the Sydney Harbour shoreline as part of the SIMS Harbour Hike. Tagging along for the educational experience was new Sydney citizen Max, Dr Figueira’s 2-year old son.

“My son’s first word was ‘-ish’, which made me extremely happy as a fish biologist,” says Dr Figueira. “And I’m hoping that after the walk, he’ll soon be able to say the full word.”



Dr Will Figueira at the Sydney Institute of Marine Science’s Harbour Hike on September 4, to raise awareness of the natural and cultural heritage of Sydney Harbour. Left: Walking 11 km with his 2-year-old son, Max. Right: Showcasing marine research to members of the public at the post-hike exhibition and festival. Credit: SIMS and Will Figueira.



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# THE REAL RAT RACE

BY KATYNNA GILL

Sydneysiders sometimes feel swept up in the rat race, but a real rat race started in bushland around Sydney Harbour on 11 August, when School of Biological Sciences ecologists reintroduced populations of native bush rats, called Boguls.

Boguls (*Rattus fuscipes*) are native to Australia and were once common in Sydney, but were wiped out when Europeans settled the area. Research led by Associate Professor Peter Banks and Dr Grainne Cleary, suggests that Boguls may be able to out-compete black rats (*Rattus rattus*) in the race for territory.

“This re-introduction of Boguls is the first large scale trial to see how well the Boguls can compete against pest black rats. We will give the true blue Bogul back its residence advantage by reducing black rat numbers, but that is all we can do - the rest is up to our little Aussie battler Bogul to fight for its traditional territory,” said Dr Cleary.

The reintroduction project is led by the University of Sydney team and supported by Taronga Zoo, National Parks and Wildlife Service, Mosman Council, Australian Wildlife Conservancy and pest control company Rentokil.

Research by one of Prof Peter Banks's previous PhD students on Bogul populations in bushland in Jervis Bay indicated that when black rat numbers were reduced, Boguls were able to move in from adjacent areas and establish populations. A check of these areas five years later showed that the Boguls had maintained strong populations, while black rat numbers remained very low.

“We're keen to see whether the Bogul is in fact able to out-compete the black rat, as suggested by the work in Jervis Bay and another joint pilot study we conducted with Taronga Zoo in an enclosure of natural bushland at the Zoo in 2010,” explained Prof Banks.

For the August reintroduction, Prof Banks and colleagues released one hundred Boguls, caught from outer Sydney bushland, into sixteen bushland locations from Mosman to Manly. The microchipped Boguls will be radio tracked to chart their movements over the next eighteen months.

NPWS Area Manager for Harbour North, Peter Hay said that the NPWS was very excited about the project's potential and were hoping this could lead to further reintroductions of native animals to the Sydney Harbour National Park.

“To date, most natural heritage restoration programs have focused at the ecosystem scale, through measures such as bush regeneration or wide scale pest control. It is really exciting to support a project that looks to the next level in environmental restoration, the individual species of fauna, by investigating whether we can tip the balance back in favour of our native rats.

“If this works in the context of all of the challenges Sydney Harbour faces it will provide every reason for thinking that we have a new tool for conservation management across the entire system of parks and reserves,” he said.

So how can Sydney residents, especially those in the Mosman and Manly areas, tell the difference between their new Bogul neighbours and the pest black rat?

“The most obvious difference is the length of the tail: pest black rats have tails that are much longer than their bodies, whereas Boguls have tails that are the same length as their bodies or even shorter,” said Dr Cleary.

“Apart from the tail length, most people find it difficult to tell the two apart. Despite the name, black rats aren't actually black! They are a similar grey colour to Boguls, so it's easy to mistake them. We hope local residents will take a close look to identify Boguls and help keep them safe,” explained Dr Cleary.

“By re-introducing the Boguls around Sydney Harbour, which will hopefully reduce the population of black rats, there is fantastic potential to improve the entire ecosystem in the area and also possibly see the return of other native species such as bandicoots and gliders.”

## VISITING ACADEMIC: PETER HEPLER

Professor Peter Hepler, from the University of Massachusetts, was a visitor in Professor Robyn Overall's laboratory for the whole month of August. Visiting Sydney especially to use our state-of-the-art electron microscopy facilities, Prof Hepler worked on a project with Dr Debbie Barton to visualise how highly dynamic actin filaments are arranged at the rapidly growing tips of pollen tubes.

In August this year, Prof Hepler was awarded the *Charles Reid Barnes Life Membership Award* by the American Society of Plant Biologists in recognition of his distinguished career in plant cell biology. Since his PhD at the University of Wisconsin, Prof Hepler has been behind a long and varied list of discoveries about the plant cytoskeleton.

These include discovering cross-bridging between microtubules in the mitotic spindle and the mechanism behind cytoplasmic streaming through actin and myosin working like muscle fibres.



## PLANT CONGRESS

August was peak season for carrot-and-ivy-scholars, who travelled from around the world to meet in Australia's south-east for back-to-back conferences.

In August, the city of Melbourne was bustling with over 2000 plant enthusiasts who were in town for the 2011 International Botanical Congress (IBC). A healthy number of students and staff from the School of Biological Sciences made the journey to Victoria for the conference and Associate Professor Murray Henwood co-ordinated two sessions with the theme - *From Molecules to morphology: an integrative perspective on the evolution and biogeography of Apiales*.

It was a particularly intensive month for carrot-and-ivy-scholars, as 40 Apiales researchers from Australia, Russia, France, America, South Africa and Poland followed up their Melbourne botanical experience with a trip to Sydney to take part in the triennial 7th International Apiales symposium.

The School was well represented by past and present members at the International Symposium, which was organised by Prof Henwood together with a team from the School (Glenda Wardle, Trevor Wilson, Semra Yetke and Kerem Daldal) and the Royal Botanic Gardens and Domain Trust (Barry Conn and Andrew Perkins).

Talks were given by Kerry Gibbons, Nathan Emery, Dr Andrew Perkins and Prof Henwood. The organising team was delighted to accept the acclaim of participants (at dinner after a few glasses of excellent Australian wine) who voted it the 'most convivial symposium ever'. The symposium was capped off by three days of field trips in the Illawarra and the Blue Mountains where delegates were introduced to a mind-boggling array of Australian plants (including a few very special Australian carrots and ivies).

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# ALUMNI PROFILE: TRACY LANGKILDE

Dr Tracy Langkilde (PhD 2005) made a dramatic life change when she left Australia for a postdoctoral position in the US. Seven years later, we find out how she has been keeping busy.



Tracy Langkilde has turned her childhood passion for nature into a successful career as a behavioural ecologist. Her meteoric rise from PhD student in Rick Shine's lab, to postdoctoral fellow at Yale University, to running her own lab as Assistant Professor at the University of Pennsylvania, has also led to a slew of awards - including a NSW Tall Poppy Award and the 2011 George Mercer Award from the Ecological Society of America for her work on invasive fire ants. Now, she reflects on coming of age in academia, how she juggles career and motherhood, why she left Australia for the US and why she may never return.

## **Why did you choose to go to the US for your first postdoctoral position?**

I really wanted to get some research experience in the US for several reasons. 1) it's not as far to travel to international conferences, 2) I wanted the opportunity to be exposed to new researchers and ideas, 3) I hoped that a stint overseas might make me more competitive in the Australian job market. The plan was to return to Australia after two years, but moving was wreaking havoc on my husband's career. So when I got offered a permanent job at a good university, it was too hard to turn down.

## **What is the difference between working in science academia in the US compared to Australia?**

It's less laid-back over here. Most people eat their lunch at their desks, there are far fewer public holidays

and people take less time off. The tenure-track process, whereby new academics get evaluated by scientists within and outside of the university in their 6th year to decide whether they can become permanent, means that there is quite a lot of pressure for young researchers. This can be good as it's very motivating, but I think it's a different situation in Australia where it's much more difficult to get jobs, but easier to keep them.

## **What is it like being the principal investigator in your own laboratory?**

It's a lot of fun, but has taken some getting used to. I was accustomed to doing all my own research so it took a while to learn how to effectively incorporate other researchers into my work. I now have 12 undergraduate students working in my lab, as well as six PhD students and two postdocs. Having a group allows me to do so much more than I ever could do by myself, and the perspectives of other researchers with different backgrounds and strengths has really helped shape my research program.

## **What is it like juggling a career in academia with a baby?**

It's much less scary than I thought it would be. Although I have far fewer hours that I can work, I am actually much more efficient. And it has really put things in perspective for me. Papers and grants are no longer the central focus of my universe, and I am much less obsessive about these things. I feel like I have a much more

balanced life and this has positively affected my research. I've taken Darren to four conferences and into the field with me, and he loves it!

## **What advice do you have for students wanting a career in academia?**

Follow your heart. I felt pressured to change systems and "diversify" when I was looking for a postdoc, but I'm glad I stuck to the study systems and questions that I am passionate about. It's that passion that got us into research in the first place, and also helps us to be successful scientists. Also – network! You never know when a casual conversation at a conference will lead to a job. That's how I got my postdoc.

## **What has been your proudest moment so far?**

Winning the Tall Poppy Award from the Australian Government and the George Mercer Award from the Ecological Society of America were both unexpected and amazing. The nature of the scientific process means that we often receive more criticism than praise, and these Awards represent a wonderful mark of support by my peers for my research.

## **Do you think you will ever come back to Australia?**

I love it where I am now – I have a really exciting research system, a fantastic group of very talented young researchers in my lab, and a wonderfully supportive department. But who knows what the future holds...

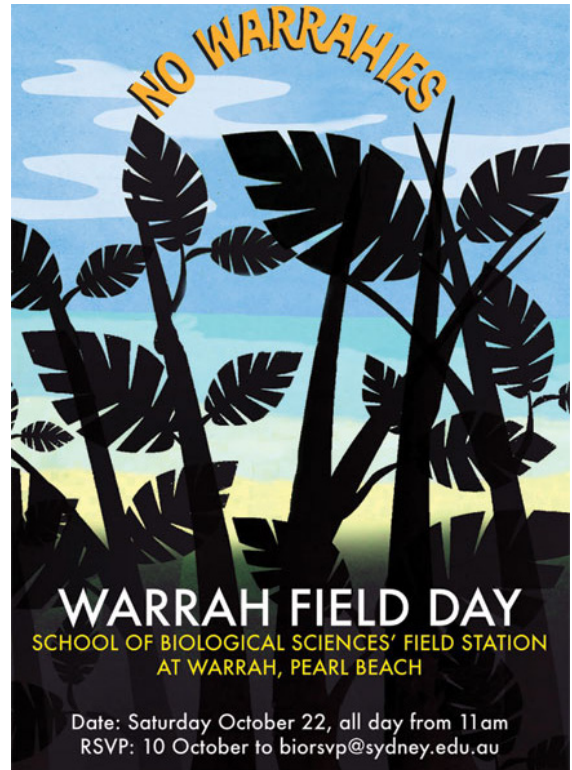
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# ALUMNI BBQ AT WARRAH

The School of Biological Sciences invites all alumni to a Warrah BBQ.

Take your friends and family on a trip down memory lane at the Warrah field day and BBQ. Enjoy a family-friendly day revisiting the School's much-loved field station and rekindling ties with former class-mates. There will be bush walks and trips to the rock platform, led by the School's resident experts, as well as biology activities set up in the field station's laboratories. A BBQ lunch will be catered and transport assistance provided. See the School of Biological Sciences' alumni webpage for more details: [sydney.edu.au/biology/alumni](http://sydney.edu.au/biology/alumni)

Saturday 22 October, 2011, all day, from 11am - 6pm  
Warrah, 75 Crystal Ave, Pearl Beach NSW  
RSVP: 10 October to [biorsvp@sydney.edu.au](mailto:biorsvp@sydney.edu.au)



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## ALUMNI CAREERS EVENT

On September 8, alumni Karina Holden and Cameron Radford returned to the University to show our students how they turned their passion for biology into successful careers doing what they love.

Following the School's wildly successful careers event in April, alumni Karina Holden (BSc 1993) - commissioning editor for science and nature documentaries at the ABC - and Cameron Radford (MSc 2011) - wildlife ecologist at the Australian Wildlife Conservancy - had students flocking to their semester two seminar on how to pursue careers in media and conservation.



*Biology alumni presented a second inspirational careers event this year - Biology careers: from media to management - to University students on September 8. Left to Right: Cameron Radford and Karina Holden*

FACULTY OF  
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