



*Student holding a captured cane toad on the tropical wildlife biology and management field trip. Credit: Steven McEwan.*

## STUDENTS GIVE TROPICAL WILDLIFE BIOLOGY THE THUMBS UP

One of the School's most popular third year courses, Tropical Wildlife Biology and Management, has received a 'thumbs up' from students.

This year, 63 students attended the course, and judging by student feedback, the five-day field trip to the Northern Territory was a great success.

Student representative Libby Dwyer, who received feedback from 42 students, said "every single student who gave their response, verbal or written, said not only did they thoroughly enjoy the unit, but they would also highly recommend this unit to all future students. There was an overwhelming amount of positive feedback for the unit as a whole, and students are still talking about the trip as the highlight of their year so far."

The course, which is co-taught by Dr Jonathan Webb and Dr Mathew Crowther, is held at Mary River Park, Northern Territory, during the monsoon season in February, when reptiles, amphibians, and other wildlife are active and abundant in the tropics. During the field trip, students learn essential wildlife biology skills, including how to design and carry out fauna surveys, how to identify animals, and how to design and execute a field experiment.

Dr Webb, the course organiser, believes that students enjoy the field trip because they learn real world techniques in a fun, relaxed atmosphere. "Part of the reason why our course is so successful is because all of our staff members are highly motivated and enthusiastic, and their passion and

enthusiasm for biology rubs off on the students. During the course, we take students spotlighting at night to search for snakes, frogs and mammals, which is an activity that most students will not have experienced before."

Libby Dwyer agreed with Dr Webb, and said "All students were pleased with the responsiveness and dedication of the course coordinators, both 'on-trip' (Darwin) and 'back-at-uni' (Sydney). All feedback from students indicated that Dr Webb was particularly supportive; welcoming of face-to-face contact for any questions or assistance they needed with reports and 'back-at-uni' assessments." Several students praised Dr Webb's dedication to teaching. Comments included "Out of all the lecturers I've had, Dr Webb has been the most easy going and responsive to communication, both in person and via email" and "Dr Webb has been very helpful both at Darwin and at uni, particularly in the weeks before the major assessment (toad report) was due"

Tropical Wildlife Biology and Management will run in February 2011, before Semester begins, and is sure to continue attracting students.



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# HEADSPACE

Welcome to the first edition of the new look *Biology News*. Our redesigned newsletter is part of the University of Sydney's fresh new look, which was launched in January this year. You will see this new look reflected in our modern university logo as well as our website and other printed publications.

This edition of *Biology News* gives me the opportunity to introduce two new academic staff members who recently joined the School of Biological Sciences. Dr Mary Byrne, a developmental biologist, returns to Australia after more than a decade working in internationally renowned laboratories overseas. Dr Simon Ho, a specialist in bioinformatics and an alumnus of our School, returns after a PhD in Oxford. Both Dr Byrne and Dr Ho will undoubtedly contribute immensely to the School's teaching and research profile.

It is also a great pleasure to acknowledge the many achievements and prizes awarded to our academic staff and students. We congratulate Dr Marianne Frommer FAA, who was honoured with election as a Fellow of the Australian Academy of Science, Dr Dieter Hochuli who won a Vice Chancellor's award for his high quality supervision of students, and Professor Rick Shine who was given a Lifetime Achievement Award by Australian Herpetologists. We are also immensely proud of our students, some of whom were honoured at our annual award ceremony in late May.

As our School continues to attract new research staff, I am delighted to announce that refurbishments in Heydon-

Laurence are near to completion. This will create a top grade laboratory space for molecular biology as well as a spacious integrated laboratory and office space for the Desert Ecology Research Group.

On that note, I would like to invite all alumni to join us in celebrating the 20-year anniversary of research in the Simpson Desert by Professor Chris Dickman and the Desert Ecology Research Group. Festivities include a public talk, presented by Professor Dickman on August 12, and an exhibition showcasing the extraordinary study that will be installed in the SciTech library from August until December.

Please also save the date **Friday October 29** for our annual Biology Alumni Cocktail Reception. We look forward to this event as an opportunity for our staff, students and alumni to catch up and share stories. We look forward to seeing you there.

Warm regards,

**Professor Robyn Overall**  
Head School of Biological Sciences

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# EDITORIAL



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# SPOTLIGHT: DR MIN CHEN

Dr Min Chen is changing what we know about photosynthesis. Her groundbreaking research on the novel photosynthetic pigment chlorophyll d has overturned the conventional understanding that chlorophyll a is essential to oxygenic photosynthesis.

As a Queen Elizabeth II Fellow of the Australian Research Council who has published more than 30 papers in the last five years and received more than \$1.8M of research funding, Dr Chen is a rising star in academia. *Biology News* spoke with Dr Chen to hear about the breakthrough last year that sent ripples through the research world

## How would you describe your research interests?

I am fascinated by the colour of photopigments and the role they play in photosynthetic reactions. I am also interested in the origin and evolution of oxygenic photosynthesis (which produces oxygen as a by-product). How life on Earth survived the revolutionary changes when cyanobacteria first released oxygen into the atmosphere is largely a mystery. Understanding this is one of my long-term research goals.

## I understand you have been working with the novel pigment chlorophyll d. Why is this pigment special?

Until recently, all oxygenic photosynthetic organisms had been found to contain chlorophyll a (Chl a) as their major photopigment. The light absorption properties of Chl a mean that only light wavelengths in the visible range, 400 nm to 700 nm,

can be absorbed. All solar radiation outside that range is not absorbed and is therefore not able to be used, limiting the efficiency of photosynthesis.

However in 1996, a novel cyanobacterium - *Acaryochloris marina* - was discovered. This photosynthetic bacterium was amazing because it was found to contain mainly a new pigment, Chl d. So far, this is the only organism in which this version of chlorophyll has been found. And to this day, Chl d is the only chlorophyll known to replace Chl a in oxygenic photosynthesis.

## How is Chl d different from Chl a?

Chl d has a similar chemical structure to Chl a, except for one small difference - the substitution of a formyl group for a vinyl group at the C3 position. This difference is enough to allow Chl d to effectively absorb radiation beyond the visible region and out to 750 nm, where other chlorophylls cannot absorb. This provides access to an additional region of the solar spectrum.

## What was your recent major discovery?

Until now, the mechanism of biosynthesis of Chl d was completely unknown. Our breakthrough came in August 2009. We discovered a gene that is fully responsible for synthesis of Chl d in *A. marina*. Our work revealed that this gene produces an enzyme that converts Chl a into Chl d. It is a new type of enzyme and its gene is only found in the genome of *A. marina*, not in any other chlorophyll a-containing cyanobacteria.



Photo credit: Malcolm Ricketts

## What are the significant impacts of your discovery of the new enzyme involved in synthesis of Chl d?

Potentially, one could add this Chl d gene to other oxygenic photosynthetic organisms, such as crops or algae. This would increase the organism's ability to absorb and utilize an additional region of the solar spectrum, between 690–750 nm. This could lead to significant improvements in agricultural photosynthetic efficiency or bioenergy storage. It may also be useful for remote sensing and detection of plants that contain this unique pigment. This discovery has not only potential applications in biotechnology, but also has implications for the broad knowledge of function of enzymes and their modification.

## STUDENT PROJECTS



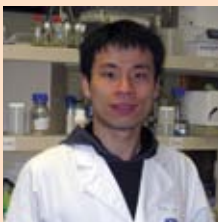
Zane Duxbury's honours project "photoregulation in *Acaryochloris*" will focus on the molecular function of bacterio-

phytochrome and its evolutionary relationship with chlorophyll d. The project is in collaboration with Dr Penny Smith, who has a very strong track-record in plant molecular biology.



Hao Pan's project "photosynthetic system in *Chromera*, a newly discovered alga", is in collaboration with Dr Dee Cater

(School of Molecular Bioscience) and Dr Jan Slapeta (Faculty of Veterinary Science).



Simon Liu's project "proteomic analysis of *Acaryochloris* under very stressed conditions"

focuses on the metabolic transition from aerobic to anaerobic conditions, and aims to understand the evolutionary relationship between aerobic and anaerobic metabolic pathways.

# WHO'S NEW?

## DR MARY BYRNE



On returning to Australia after 14 years in the UK and USA, developmental biologist Dr Mary Byrne takes up the position of senior lecturer in eukaryotic molecular biology and genetics in the School of Biological Sciences.

Dr Byrne, whose research is in identifying genes that control a plant's development from stem cells into complex differentiated tissues, has recently returned from the John Innes Centre in the UK. There, in the Department of Crop Genetics, she directed a program focused on the genes that regulated the development and growth of the model plant species *Arabidopsis* and commercially important grasses and food crops.

Now based in the Macleay building at the University of Sydney, Dr Byrne joins a blossoming research contingent involved in plant molecular genetics within the School of Biological Sciences, which includes recently appointed staff members Professor Peter Waterhouse and Dr Penny Smith. "I'm so looking forward to collaborating with my new colleagues who work in similar fields," says Dr Byrne. "I'm also keen to start some cross-collaborations with people in other areas, like Simon Ho who is an expert in bioinformatics."

Whilst Dr Byrne is new to the School, she has close connections with members of the Molecular Genetics Laboratory, having conducted her PhD under the supervision of Professor Ron Skurray at Monash University. "Obviously with Ron as my supervisor,

my PhD research did not involve plants!" said Dr Byrne. "I worked on antibiotic resistance transposons in the bacteria *Staphylococcus aureus*. During my PhD I became interested in the way some bacterial cells, like *Bacillus*, differentiate and develop. But to explore this in more complexity, I had to make the move into multicellular organisms."

Dr Byrne chose to work on plants, which took her to the CSIRO Division of Plant Industry for her first postdoctoral fellowship, followed by eight years in the internationally renowned Cold Spring Harbor Laboratory in Long Island, USA. Here with Professor Rob Martienssen, Dr Byrne began her research on the molecular genetical control of plant development, using *Arabidopsis*.

Today, Dr Byrne's research focuses on genes that control plant shoot meristems (stem cells that give rise to new plant tissue), the molecular basis of leaf patterning and the role of ribosomes in plant development, which she says has led to some recent exciting findings. "Results from experiments in which we mutated ribosomal proteins have indicated that we might be greatly underestimating the role played by ribosomal proteins in eukaryotic development."

In addition to research, Dr Byrne will take on a teaching role in the School with eight lectures and practical classes in the second semester Developmental Genetics course this year. Dr Byrne says she is keen to work with senior students and to experiment with various teaching methods in her course. "My course will be small, so I really want to encourage interactive discussion and problem solving. Undergraduate teaching will also be a great way of attracting students into my new lab."

## DR SIMON HO



*Credit: Simon Ho*

Dr Simon Ho has joined the School of Biological Sciences as senior lecturer in Bioinformatics.

Dr Ho, who completed his undergraduate degree with the School, returns to his *alma mater* with an impressive research record gained from positions at the University of Oxford and the Australian National University.

After seven years away from Sydney, completing a PhD and two postdoctoral fellowships in molecular evolution, Dr Ho says he is excited to return to the School to contribute to research, and also to set up collaborations with other research groups within the Faculty of Science. "I'm so happy to be back in the School of Biological Sciences, which has a lot of active research in the fields of evolution and molecular biology. I'm really keen for the opportunity to collaborate with a new group of researchers who have new data sets for me to analyse and work with."

Dr Ho's research primarily concerns molecular evolution and phylogenetics. Using a combination of molecular biology, statistics, and computer science, Dr Ho analyses sequences of DNA to estimate evolutionary rates and timescales.

While most of his research falls under the broad category of bioinformatics, Dr Ho says it also encompasses the more traditional fields of zoology and palaeontology. "I've always been really interested in animals and the

evolutionary paths taken by them. What I love about my research is it enables me to work on a variety of animals, from whales, to pigs to woolly mammoths."

Having conducted his PhD research with the Ancient Biomolecules Centre at the University of Oxford, Dr Ho has significant experience with ancient DNA, and has used bioinformatics to determine the molecular evolution of woolly mammoths, cave lions and aurochs – the wild ancestor of our modern cow. "I am really interested in using my research to answer paleontological questions. I like the

challenge of using ancient DNA, and the opportunity it brings in working with some of the biggest animals of the past million years."

Dr Ho's research, in phylogenetic methods and their application, can be applied to a broad range of biological questions - from conservation genetics and estimating how populations will respond to climate change, to bio-medicine and determining the main factors causing the rise of virus populations. "What I do is fairly fundamental to many fields of biology, as many researchers who analyse DNA sequences will have a phylogenetic

component to their studies," says Dr Ho, "so there is often an opportunity to collaborate with people working in that area."

As a senior lecturer, Dr Ho is also looking forward to working with the School's students. "I am giving some guest lectures and a practical in bioinformatics this year, and eventually hope to run my own course in evolution. One of the benefits of working in a high quality institution is the access to high quality students, who make for really rewarding teaching."

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## USING INSECTS TO HELP HUMANS

What can insects teach humans about fighting agricultural pests and infectious diseases? Dr Kenneth Wilson from Lancaster University in the UK will work to uncover the answer during a visiting fellowship at the University of Sydney.

Dr Wilson was awarded a University of Sydney International Visiting Fellowship and a U.K. Royal Society Travel for Collaboration Grant to work with Professor Steve Simpson and colleagues in the School of Biological Sciences. Combining his own expertise on the evolutionary interactions between parasites and their hosts, with Professor Simpson's work on animal nutrition, Dr Wilson hopes to understand how diet affects human immunity and our ability to fight infectious diseases.

"There is a lot of interest at the moment in how dietary supplements can make you fitter and healthier, and there have been a lot of anecdotal reports in the press and literature about how



important dietary supplements might be to human immunity," says Dr Wilson. "I want to take a good look at the scientific literature to work out what research has been done in this area and what exactly we know about the effect of nutrition on human immunity and resistance to parasites."

Dr Wilson plans to conduct a meta-analysis – a review of all the literature relating to the field of nutrition and immunity – to ascertain whether there is any evidence for the effect of dietary supplements in aiding human immunity, and if so, whether those effects are genuine. "If I find a paucity of good studies, then I want to look at how we might design a robust experiment to answer our question," says Dr Wilson.

Dr Wilson will call on the vast amount of literature on insect nutrition, in particular the pioneering work by Professors Simpson and Raubenheimer in creating the Geometric Framework models for nutrition, to create a new experimental approach in tackling the question of nutrition and immunity in humans.

"This will significantly improve our knowledge of how diet affects someone's ability to fight infectious

diseases, and will tell us, for example, how improving people's diet in developing countries will consequently help them fight infectious diseases such as malaria."

Alongside their nutritional collaboration, Professor Simpson and Dr Wilson will work on a project with Dr Greg Sword and Dr Fleur Ponton involving biological control of the Australian plague locust. Professor Simpson and Dr Sword hope to draw on Dr Wilson's experience working on a highly effective viral control for the African armyworm – an important agricultural pest in Tanzania.

"There are many parallels between the African armyworm and the Australian plague locust – they have similar life histories, they are both migratory pests and they both cause outbreaks," says Dr Wilson. "I'd like to take the knowledge that we have gained from over 10 years studying armyworms in Tanzania and translate this to a better understanding of the natural pathogens of plague locusts and a better use of the biological control agent Green Guard (a grasshopper-specific fungus). And of course do some good science at the same time."

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## PRIZES

### Bridget Murphy is a Fresh Science 2010 winner

BY KATYNNA GILL

Bridget Murphy, a PhD student in the School of Biological Sciences, and Dr Peter Domachuk, a postdoctoral fellow in the School of Physics, are Fresh Science 2010 winners. Fresh Science is a national competition that identifies new and interesting research being done by early-career scientists around the country and gives winners the chance to tell their stories to the media and other audiences.

Bridget and Peter are two of only sixteen scientists chosen from over 130 nominations across Australia this year to present their science to media, school students, the general public, scientists, government and industry at the Fresh Science event held from 7 until 10 June 2010 in Melbourne.

Both University of Sydney researchers were selected from the many nominations for their intriguing research and ability to explain it to non-scientists.

"I'm very excited about being chosen as a Fresh Scientist, but also pretty nervous!" said Bridget before embarking on her science communication adventure.

"Presenting my research in an engaging and interesting way for each of those different audiences will be a challenge, but one I'm looking forward to. As a scientist, you are used to expressing your research in certain ways for scientific journals and conferences, but you have to take a step back and think about how you can explain what your research is about to people who don't necessarily have a science background," said Bridget.

Bridget need not have been nervous – she won a bottle of wine for the best explanation of her research without using any scientific jargon, given in the time it took for a sparkler to burn out, at Fresh Science at the Pub. This free event, held in a Melbourne pub, engages the Fresh Scientists directly with the public and is very popular.

#### **What can Australian lizards tell us about the evolution of cancer and live birth?**

Bridget's research explores the evolution of cancer and live birth, through a cancer protein found in a live-bearing Australian lizard. Biologists hypothesise that there may be an evolutionary connection between live-birth and cancer susceptibility in animals, and Bridget has found a new link between the two by discovering a potent cancer protein in nature which, has previously only been found in laboratory grown cells.

"My discovery of the cancer protein – vascular endothelial growth factor VEGF111 – in the uterus of an Australian lizard provides a new link between the evolution of live birth and cancer in animals," explained Bridget.



*Bridget won a bottle of wine for giving the best description of her research in the time it took for a sparkler to burn. Photo courtesy of Fresh Science.*

"Ultimately, my aim is to find out how VEGF111 works in lizards. If I can figure out how to disable VEGF111 in the lizard, this could form the basis of a new treatment for some cancers," said Bridget.

"Unlocking the secrets of VEGF111 could also be used to promote wound healing or regenerate blood vessels in patients with cardiovascular disease."

# DR MARIANNE FROMMER ELECTED FELLOW OF THE AUSTRALIAN ACADEMY OF SCIENCE

Dr Marianne Frommer has been honoured by election as a Fellow of the Australian Academy of Science. Dr Frommer is distinguished for her work in molecular genetics, in particular for her invention of bisulphite genomic sequencing.

"I am rather gobsmacked to be chosen as a Fellow, but thrilled on behalf of women in science. Although I've been very fortunate, female scientists often struggle to build and maintain a research profile when faced with family responsibilities. It's great that both women elected this year to the Academy of Science have come from the University of Sydney. Of course, science is a social activity, and I would like to acknowledge my superb co-workers and collaborators," said Dr Frommer.

Dr Frommer is one of three staff from the Faculty of Science to be elected as Fellows of the Australian Academy this year, including Professor Jeffrey Reimers, from the School of Chemistry, and Professor Elaine Sadler, from the School of Physics.

Chosen from scientists working in Australian universities, CSIRO and medical research institutions, Dr Frommer,

Professor Reimers and Professor Sadler were amongst seventeen scientists elected as 2010 Fellows.

Election to the Australian Academy of Science recognises a career that has significantly advanced and continues to advance the world's scientific knowledge.

Scientific contributions of the new Fellows cover a wide range of specialities that include disease control using an insect parasite, conservation planning, high energy astrophysics, digital signals engineering and wireless communication, mitochondrial physiology, and the physics of diamond.

The new Fellows of the Academy were invited to attend Science at the Shine Dome, an event run in Canberra by the Australian Academy of Science from 5 to 7 May 2010. They were officially welcomed to the Academy at the New Fellows Dinner on 4 May, and formally admitted to the Academy at a ceremony on 6 May. They also had the opportunity to introduce themselves and present a talk on their research to members of the Academy and the general public at the New Fellows Seminar on 5 May.

The School of Biological Sciences celebrated Dr Frommer's win at an event in the Macleay Foyer on May 12.



Photo credit: Malcolm Ricketts

## MORE PRIZES



Biology students who were presented with prizes at the 2010 School of Biological Sciences prize ceremony, held on May 27. Credit: Malcolm Ricketts

In April, Professor Rick Shine was presented with a *Lifetime Achievement* award at the Australian Frog and Reptile Show for decades of internationally acclaimed research in reptile evolution and ecology. Professor Shine is the first to be awarded this Lifetime Achievement award.

Dr Dieter Hochuli was awarded a 2010 *Vice-Chancellor's Award for Excellence in Research Higher Degree Supervision* in April. Dr Hochuli was distinguished for his track record of on-time thesis completions, innovative production of a lab guide and positive approach to students' professional development.

In May, Ms Ana Bugnot, a PhD candidate, was awarded a 2010 Doctoral Fellowship to undertake research at the Sydney Institute of Marine Science.

Ms Melissa Slarp, Masters of Science candidate, was awarded one of three 2010 Sydney Grammar School Teaching Education Scholarships in April.

Congratulations to the 22 students who were awarded prizes and scholarships in the 2010 School of Biological Sciences prizes ceremony, held on May 27.

# 20 YEARS OF SIMPSON DESERT RESEARCH

## EXHIBITION

CELEBRATING 20 YEARS OF SIMPSON DESERT RESEARCH

(In conjunction with the Iconic Landscapes Study)

Let ecologists take you on a trip into the heart of Australia's red desert with an exhibition that celebrates 20 years of continual ecological study in the Simpson Desert. Images and journals from the biologists and volunteers who have worked on the study will be displayed alongside real specimens of the unique plants and animals found in the Simpson Desert.

The exhibition will also showcase the Iconic Landscapes Study - an interdisciplinary Arts and Sciences project looking at how scientific research is communicated to, and received by, local communities.

**WHEN** 12 August to 3 December 2010

### OPEN TIMES

During library opening hours:  
Monday to Thurs: 8 am -10 pm  
Friday: 8 am -8 pm  
Saturday: 9 am -5pm  
Sunday: 1 pm -5 pm

Visit the Library website for variations to opening hours

**WHERE** The SciTech Library  
Level 1, Jane Foss Russell  
Building, G02, 160 City Road  
Darlington NSW 2006

**ENTRY:** Free

LECTURE PRESENTED BY PROFESSOR CHRIS DICKMAN

## SOME LIKE IT HOT:

LIFE IN THE CENTRAL DESERTS OF AUSTRALIA



*Photo credit: Aaron Greenville*

Australia's central deserts support rich assemblages of animals and plants: add water, and the seemingly barren landscapes transform and pulsate with colour and activity. In this lecture, Professor Dickman will take us through the extraordinary 'boom' and 'bust' cycles that characterize inland Australia and examine how life persists during good times and bad. You will see the amazing adaptations that frogs and desert mice use to cope with the extreme conditions, how floods, wildfires and invasive species affect the native small mammals, and how so many species seem to appear and disappear at different times and places over the desert landscape. With the spectre of climate change looming, life in Australia's central deserts may provide a glimpse of what the continent's coastal fringes can expect in future.

### LECTURE

5.45 pm-6.45 pm, EASTERN AVENUE AUDITORIUM, THE UNIVERSITY OF SYDNEY

**RSVP** by Monday 9 August to Carla Avolio:  
T 9351 4543 E [carla.avolio@sydney.edu.au](mailto:carla.avolio@sydney.edu.au)

## OTHER DATES

**15 SEPTEMBER** Law of the Locust, lecture presented by Professor Steve Simpson. Eastern Avenue Auditorium, 5:45 pm - 6:45 pm

**20 OCTOBER** Lizards in an evolutionary tree, presented by 2010 Murray Lecturer Professor Jonothan Losos. Eastern Avenue Auditorium, 5:45 pm - 6:45 pm

## SAVE THE DATE

### BIOLOGY ALUMNI COCKTAIL RECEPTION

The School of Biological Sciences will be holding its annual cocktail reception for alumni on the evening of Friday 29 October 2010. Join us to meet and network with alumni, and to revisit former staff members from the School. We will soon release details about exact time and venue on the Camperdown campus at the University of Sydney. So visit the 'news and events' page on our Biology Alumni website for updates: [sydney.edu.au/science/biology/alumni/news-and-events](http://sydney.edu.au/science/biology/alumni/news-and-events)

BIOLOGICAL  
SCIENCES

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