Australian National University

Research School of Biology Newsletter

Issue 85 | 30 April 2017

ANU COLLEGE OF MEDICINE, BIOLOGY AND ENVIRONMENT

NEWS

Congratulations

Craig Moritz (E&E) has been elected a Foreign Honorary Member of the American Academy of Arts and Sciences.

Melanie Trinick (BTLC) has been elected to represent professional staff on the RSB School Executive Committee.

HDR mentoring programme

After a successful pilot program in 2016, the RSB HDR mentoring programme is now up and running. The program this year is organised by **Megan McDonald** (Solomon group, PS) and student partner **Christiana McDonald-Spicer** (Moritz group, E&E). This year we have 50 participants, 25 HDRs and 25 Post-docs, who we have paired up for mentoring in 2017. Our hope as post-docs is to provide better support and guidance for PhD students throughout their studies here at RSB. We'd like to thank **Karen Scholte** (BTLC) for her support of the program as well as the HDR conveners **Spencer Whitney** (PS), **Adrienne Nicotra** (E&E) and **Alex Maier** (BSB). - Megan McDonald.

Amazon forest research workshop

A lightweight 3D Robotics Iris multirotor drone is used to capture canopy structure and spectral reflectance rainforest canopy during the April 2017 workshop in the Amazon, led by Patrick Meir.

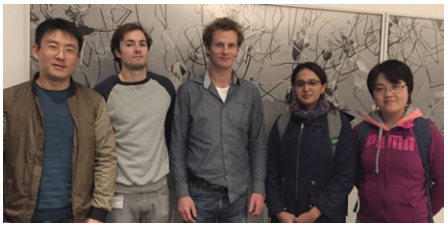
In April, **Patrick Meir** (PS) led a 10-day research council-funded workshop at the Caxiuanã National Forest Reserve in the eastern Amazon. It was convened in collaboration with the Museu Paraense Emílio Goeldi, an Amazon forest research organisation founded in 1866, and the Federal University of Pará, Belém, Brazil. The workshop focused on building expertise to understand the intersection of physiological stress, tree death and ecosystem decline (or resilience) under experimental drought. **Oliver Binks** (Meir group, PS), a post-doctoral fellow, uses this long-term field-scale experiment for part of his research. The meeting was attended by 22 scientists from Australia (ANU and James Cook University), Brazil, Spain, USA and UK; it explored new methods, and enabled new training outcomes. - **Patrick Meir.**

Dave Rowell talked about spiders on the Commonwealth Avenue bridge, on the ABC Curious Canberra podcast and web story. Image: ABC News, Sonya Gee. (See: In the media)

Big Questions in Biology: Old Drugs, New Drugs, and Drug Resistance

Speakers Stefan Bröer, Denisse Leyton and Rich Callaghan relax after the second Big Questions in Biology forum. Image Mel Norris.

Diabetes, cancer, antibiotic resistance and the need for fundamental research were the focus of the second RSB public forum in the Big Questions in Biology series. Speakers **Stefan Bröer** (BSB), **Rich Callaghan** (BSB) and **Denisse Leyton** (BSB) spoke about their work to an audience of around 130 people in the Australian Centre on China in the World auditorium, followed by a question and answer session moderated by Rod Lamberts of the ANU Centre for the Public Awareness of Science (CPAS).



Bröer group members Weidong Jing, Greg Gauthier-Coles and Stephen Fairweather, managed set up and clean up of the refreshments, helped by Kiran Javed and Qi Cheng, also Bröer group. Image Mel Norris.

Biology Society trip up Black Mountain

Ross Deans and Pip Beale, guides on the Biology Society Black Mountain trip. Image Cam McArthur.

Iliana Medina (Langmore group, E&E), **Ross Deans** (Farquhar group, PS), **Pip Beale** (Foley group, E&E), and **Lauren Ashman** (Rowell group, E&E) were guides on a recent ANU Biology Society evening trip up Black Mountain. According to organiser and biology student Cam McArthur, the group of around 35 saw lots of wildlife, including tawny frogmouths, sugar gliders, possums, bats, orb web and wolf spiders.

Group leader profile: Jochen Zeil (E&E).

Research Focus

We are interested in the information processing challenges animals face under natural, evolution-relevant conditions. At the moment we concentrate on insect navigation: what cues do animals use to remember places and to navigate between them? How do they acquire navigational competence? What is the sensory ecology of navigation and how do navigational strategies depend on habitat structure? We have developed the concepts and tools to quantify navigational information, to map it in different habitats and to track the movements of walking and flying animals with high precision. **Trevor Murray** builds 3D models of navigation environments and renders panoramic views from the perspective of navigating ants and wasps which we can display in **Zoltán Kócsi**'s antarium, a 20000 UV/Green/Blue LED virtual reality arena. The antarium will allow us to dynamically project and modify an ant's environment as she walks through it on a trackball. **Moosarreza Zahedi** currently studies the relationship between fractal dimension and navigational information content of natural scenes. Even the tiniest ants are able to navigate and **Fiorella Ramirez-Esquivel** investigates how miniaturization affects the sensory arrays of ants, their antennae and their eyes, which are crucial for communication and navigation and **Willi Ribi** has perfected microCT preparations of insect brains that allow us to trace navigation-relevant neurons.

What do you enjoy most about teaching?

I have taught courses in England, Germany, Brazil, Argentina, Kuwait and Australia and have enjoyed teaching when my area of interest and expertise was embedded in a coherent biology curriculum. This was never the case here at the ANU.

What do you see as challenges for your field of research?

The fact that even the tiniest insect is more flexible, robust, autonomous, energy efficient, computationally smart and a more competent actor in complex natural environments than anything we can presently build. And then there is the challenge of convincing neuroscientists to study brains outdoors and behavioural ecologists that it is worthwhile understanding how the neural networks work through which all selective pressures on behaviour have to find their way.

What do you like most about research?

The friendships in a global science community of kindred spirits, the huge aesthetic and intellectual enjoyment of watching an animal doing its stuff and the rare moments when I feel that I have understood something.

This newsletter is archived at biology.anu.edu.au/news-events/newsletter.
Layout: Mel Norris
Editing: Stefan Bröer & Mel Norris

Bioinformatics Training

RSB Computational Biology and Bioinformatics Unit (CBBU) together with the ANU Bioinformatics Consultancy (ABC), and ANU Statistical Consulting Unit (SCU) organized a series of bioinformatics workshops during Semester 1 teaching break. Over the 2 weeks students and researchers from the ANU College of Medicine, Biology & Environment had the opportunity to gain practical skills in using Linux shell, the Raijin supercomputer at the National Computational Infrastructure (NCI), processing data in R and designing statistically sound experiments and analysing the data.

Approx. 80 participants attended the workshops; commonly attending more than one. Among the participants there were 20 Honours students, 30 PhD students and 13 postdocs.

CBBU, ABC and SCU are planning the next series of workshops during the Semester 2 teaching break. - **Marcin Adamski**, CBBU.

Kenneth Webster (Cooper Group, E&E) has been invited to speak at the 3rd Hemipteran-Plant Interactions Symposium in Madrid, Spain to be held 4 to 8 June 2017.

IN THE MEDIA

Dave Rowell (E&E, BTLC) addressed the question 'Why are there so many spiders on the Kings Avenue and Commonwealth Avenue bridges in Canberra?', on the ABC Curious Canberra podcast and web story recently (see main image).

Tim Brown's (Borevitz group, PS & E&E) work in ecosystem surveillance was featured in an article on the Terrestrial Ecosystem Research Network (TERN) website. Tim is part of the Australian Plant Phenomics Facility (APPF) - ANU node, and was involved in the development of the Sentinal Phenocam, which sits 30m above the Daintree Rainforest (see image), and feeds time-lapse images of vegetation to researchers, to monitor the timing of vegetation development, including flowering, fruiting and leaf lifecycle. Tim's work was also discussed on the APPF blog.

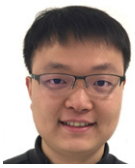
The Sentinal Phenocam is installed on TERN's flux monitoring infrastructure in the Daintree Rainforest in Queensland.

Adrienne Nicotra (E&E) and 2016 Vice-Chancellor's College Artist Fellow **Cathy Franzi** were filmed by the ABC Gardening Australia TV show this month, talking about their collaboration and the artwork Cathy produced as a result. We don't have a screening date as yet, but the segment will be shown later in the year.

NEW APPOINTMENTS

Erin Vaughn has joined the Adamska group (BSB) as a postdoctoral fellow. She will be working on identification of transcriptional targets of the Wnt signalling pathway in the calcareous sponge *Sycon capricorn*. Erin comes from the University of Arizona, where she studied conservation genetics of the endangered Sonoran pronghorn.

The Rathjen group (PS) welcomes two PhD students, **Alexander Sloan** (left) and **Yiheng Hu** (below left). Alexander is working on the role of malectin receptor kinases in plant susceptibility to pathogens. Yiheng is working on field detection and identification of fungal pathogens and associated microorganisms using third generation DNA sequencing.



Eve Cooper is starting a PhD with **Loeske Kruuk** and **Andrew Cockburn** (E&E), on 'Ageing and senescence in superb fairy-wrens'.

Welcome to PhD student **Rowarne Leith** who has joined **Bob Furbank**'s group (PS) in the ARC Centre of Excellence for Translational Photosynthesis after receiving her honours degree from UWA. Rowarne will work on modifying the properties and amount of the enzyme PEP carboxylase in C4 plants to examine the role of this enzyme in

controlling photosynthesis.

Welcome to **Pravin Khambalkar** who joins

the Jones group (PS) as a PhD student funded by a Netaji Subhas International Fellowship from the Indian Council of Agricultural Research. He will work on the identification and characterisation of the Avr7 effector gene from the Fusarium wilt pathogen of tomato.

Aaron Smith joins the Pogson group (PS)

as a PhD student. He will be working on identifying molecular mechanisms that underpin plant stress recovery, in addition to characterising stress recovery in wheat and evaluating if improvements in this area could lead to increased grain yield.

Lauren Ashman has commenced her PhD in the Rowell group (E&E), cosupervised

with Adam Slipinski from CSIRO Entomology. Lauren did her Honours in the Moritz group (E&E), on phenotypic diversity in geckos. Her PhD will exmine the phylogenetics and systematics of cerambycid beetles.

The Leyton group (BSB) welcomes **Xiaojun (Holly) Yuan** as a PhD student.

Holly joined the group as a mid-year Masters student in 2015 and worked as a Research Assistant for 6 months after the completion of her Masters degree. She will continue to work on how disease-causing molecules called 'autotransporters' are assembled in bacteria.

Yi-Chang Sung has begun his PhD in

the Solomon group (PS). He will be working on understanding the mechanisms of PRI proteins in mediating plant disease resistance.

FAREWELL

Martijn van de Pol and **Lyanne Brouwer** (both E&E) have left RSB and returned to the Netherlands, where Martijn has a position at the Netherlands Institute of Ecology.

Timothy Ryan, former honours student with **Susanne von Caemmerer** and **Rob Sharwood** (PS), passed away recently. The ARC Centre for Translational Photosynthesis has set up a web page in his memory.

PHDS SUBMITTED

Virginia Abernathy (Langmore group, E&E) 'Investigating the first stages of coevolution between the pacific koel and its newest host, the red wattlebird'.
Hong Kiat (Don) Lim (O'Neill group, BSB) 'Spleen as a site for hematopoiesis'.

PAPERS ACCEPTED

Abernathy VA, Langmore NE, 'Factors effecting the rates of coevolution between obligate avian brood parasites and their hosts', in M Soler (ed), *Avian Brood Parasitism: Behaviour, Ecology, Evolution and Coevolution*, Springer.

Biquand E, Okubo N, Aihara Y, Rolland V, Hayward DC, *et al,* Acceptable symbiont cell size differs among cnidarian species and may limit symbiont diversity, *ISME Journal*.

Christoffersen B, Meir P, McDowell N, Bridging the gap between plant hydraulics and beta diversity in tropical forests, *New Phytologist.*

Cranston PS, A new genus and species of Australian Tanypodinae (Diptera: Chironomidae) tolerant to mine waste, *ZooTaxa.*

Crous KY, Wallin G, Atkin OK, Uddling J, Ekenstam, A, Acclimation of light and dark respiration to experimental and seasonal warming by changes in leaf nitrogen in *Eucalyptus globulus*. *Tree Physiology.*

Flohr BM, Hunt JR, Kirkegaard JA, Evans JR, Water and temperature stress define the optimal flowering period for wheat in south-eastern Australia, *Field Crops Research*.

Iglesias-Carrasco M, Head ML, Jennions MD, Cabido C, Secondary compounds from exotic tree plantations change female mating preferences in the palmate newt (*Lissotriton helveticus*), *Journal of Evolutionary Biology.*

Kaehler BD, Full reconstruction of non-stationary strand-symmetric models on rooted phylogenies, *Journal of Theoretical Biology.*

Kaehler BD, Yap VB, Huttley GA, Standard codon substitution models overestimate purifying selection for nonstationary data, *Genome Biology and Evolution.*

Krosch MN, Cranston PS, Bryant LM, Strutt F, McCluen SR, Towards a dated molecular phylogeny of the Tanypodinae (Chironomidae, Diptera), *Invertebrate Systematics*.

Lovelock CE, Feller IC, Hickey S, Reef R, Ball MC, Mangrove die-back during fluctuating sea levels, *Scientific Reports*.

Lovelock CE, Reef R, Ball MC, Isotopic signatures of stem water reveal differences in water sources accessed by mangrove tree species, *Hydrobiologia.*

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Medlyn B, de Kauwe M, Lin Y-S,..., Meir P, *et al*, How do leaf and ecosystem measures of water-use efficiency compare? *New Phytologist.*

Mills PJ, Gullan PJ, Cook LG, Nomenclatural changes in the Australasian gall-inducing genus *Apiomorpha* Rübsaamen (Hemiptera: Coccomorpha: Eriococcidae), *Zootaxa*.

Nguyen HT, Meir P, Sack L, Evans JR, Oliveira RS, Ball MC, Leaf water storage increases with salinity and aridity in the mangrove *Avicennia marina*: integration of leaf structure, osmotic adjustment, and access to multiple water sources, *Plant, Cell and Environment.*

Powell TL, Wheeler JK,..., Meir P, *et al*, Differences in xylem and leaf hydraulic traits explain differences in drought tolerance among mature Amazon rainforest trees, *Global Change Biology.*

South PF, Walker BJ, Cavanagh AP, Rolland V, Badger M, Ort DR, Bile acid sodium symporter BASS6 can transport glycolate and is involved in photorespiratory metabolism in *Arabidopsis thaliana, The Plant Cell.*

Tay WT, Walsh TK,.., Jermiin LS, Wong TKF, *et al*, Mitochondrial DNA and trade data support multiple origins of *Helicoverpa armigera* (Lepidoptera, Noctuidae) in Brazil, *Scientific Reports*.

Voigt O, Adamska M, Adamski M, *et al*, Spicule formation in calcareous sponges: Coordinated expression of biomineralization genes and spicule-type specific genes, *Scientific Reports*.