Australian National University

Research School of Biology Newsletter

Issue 105 | February 2019

ANU COLLEGE OF SCIENCE

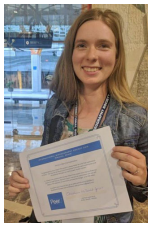
NEWS

AAS panel into Murray-Darling fish kills. **Craig Moritz** (E&E) chaired a multidisciplinary panel of experts, convened by the Australian Academy of Science, who investigated fish kills in the Murray-Darling River system in NSW. The report recommended that urgent steps should be taken within six months to improve the quality of water throughout the Darling River. A press release from the AAS highlights the main points, with an ABCNews article here. Click here to read the report. (see main image).

Four Highly Cited researchers at RSB. Congratulations to **Graham Farquhar** (PS), **Patrick Meir** (PS), **Craig Moritz** (E&E) and **Barry Pogson** (PS) who have been recognised as Highly Cited Researchers in the Clarivate Highly Cited Researcher List issued in December 2018.

Congratulations.
Michael Jennions (E&E) has been appointed to the council of the European Society for Evolutionary Biology (ESEB).

Christiana McDonald-Spicer (Moritz group, E&E) won the prize for best oral presentation by an early career researcher at the International Biogeography Society conference in Malaga, Spain, in January 2019.



The Director's prize in Honours for 2018 has been awarded to **Suyan Yee** (Pogson group, PS), **Caitlin Cherryh** (Lanfear group, E&E), and **Ali Catling** (Nicotra group, E&E).

Congratulations to **Fernanda Alves**, Langmore group (E&E) PhD student, who won a Holsworth Wildlife Research Endowment worth $5125 from the Ecological Society of Australia.

Python programming course.
The 2nd Advanced Scientific Programming In Python - Asia Pacific course was held at RSB on the 20th to 27th of January. The course trained more than 30 scientists from ANU, CSIRO, the government, and afar in advanced scientific programming techniques and best practices that are standard in industry, but specifically tailored for programming scientists. The course was highly interactive and very well received. As a result we initiated a local scientific python meet-up (hacky-hour) to be held in the Gumnut Room 12 pm every last Thursday of the month. The course was generously sponsored by the Biological Data Science Institute and CSIRO. The local organizers (**Benjamin Schwessinger**, ANU, and **Kerensa McElroy**, CSIRO) are grateful for the excellent support by RSB IT and staff. - **Benjamin Schwessinger** (PS).

The Hon Bill Shorten, MP, Leader of the Federal Opposition (left), receives the report investigating the causes of mass fish kills in the Menindee region of NSW, from Craig Moritz, leader of the investigating panel (See: News Item).

Participants in the Advanced Scientific Programming in Python Asia Pacific summer school (ASPP Asia Pacific), held at RSB in January. Image Sharyn Wragg.

2019 Stable Isotopes in the Biosphere conference.
China is home to more than 1,000 stable isotope mass spectrometers, so when Youping Zhou, former RSB PhD student now running his own lab at Shaanxi University of Science and Technology (SUST) in Xi'an invited **Charles Hocart** and **Hilary Stuart-Williams** (Farquhar group, PS) to collaborate on a conference, they jumped at the chance. They gathered a group of more than 150 academics from China, Australia, the U.S.A., Switzerland, France, Germany and others to create a world-class meeting from 20th-24th January 2019. Accommodation was provided in a new 4-star hotel while the meetings took place in the great hall of the SUST library. Candidates feasted on a large variety of Chinese food when not locked in discussion or attending lectures. As a final pleasure the conference rounded up with visits to the spellbinding ancient walls of Xi'an and the Terracotta Warriors.

Hilary Stuart-Williams, visiting the terracotta warriors in Xi'an.

A one-day short-course on stable isotopes made a good conclusion to the proceedings. Overall the conference was a huge success and the candidates left feeling that they had achieved a lot. SUST was incredibly generous with its funding and the new collaborations formed showed that the money had been very well spent! The entire conference reflected well on ANU and SUST. We all look forward to a

Group leader profile: Caitlin Byrt (PS)

To create a future you can look forward to we need to upgrade our crop plant resources. Upgrading crops to improve productivity and adapt to environmental stresses, such as extreme climatic conditions, is key to our future food security and quality of life.

My research involves modifying the function of plant membrane and solute transport mechanisms, and using these mechanisms to improve plant resistance to environmental stress and to enhance crop yields.

Our team is currently focused on studying plant water channels that function like pores in cell membranes that can be opened and closed to control the flow of solutes throughout the plant. When plants experience salt or water stress, and when plant cells expand during growth, they must rapidly adjust water and solute transport across their membranes, and water channel proteins play critical roles in this adjustment. We discovered that some plant water channels can transport salt and nutrient ions and we are using this information to figure out how salt and drought tolerant plants control this mechanism to help them maintain growth in challenging environmental conditions.

One of the most fun activities in scientific research and teaching is getting together with team mates and brainstorming then testing new ideas for how to engineer plants to improve productivity.

The purpose designed plants of the future will present us with the opportunity to improve human health and nutrition; retrieve carbon from the atmosphere and turn it into food and renewable raw materials for energy and biochemical production; and enable us to produce specialised raw materials for manufacturing industries.

Within the plant kingdom we have access to species that have evolved traits enabling them to adapt to extreme environments and species that naturally produce very valuable raw materials.

Every day we come a step closer to having all the necessary tools and understanding of plant biology that is needed to enable us to mix and match together optimised plant quality and productivity traits towards supporting a sustainable and prosperous future. It is an exciting time for innovative plant science investigators!

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

return visit. - **Hilary Stuart-Williams** (PS).

Remaining Growth Capsules delivered.

The remaining GRDC-funded modular growth cabinets were delivered to the RSB compound this month, completing the GRDC Grain Phenomics Climate Facility.

Aly Weirman, (Borevitz group, PS) Business Manager for the APPF, examines the entry to the new Growth Capsule, delivered to the RSB compound this month. Image Mel Norris.

Checking out Kambri teaching spaces.

Members of RSB explored the new teaching spaces on Kambri opening day. Seen here in the student commons area of the new Marie Reay Teaching Building, are (back row, from left: Tammy Gomersall,Yiming Li, Andras Keszei (all BTLC) and Naresh Verma (BSB). Front: Melanie Trinick, Fiona Roxburgh (BTLC) and Aude Fahrer (BSB). Image Mel Norris.

IN THE MEDIA

Ben Long (Price Group, PS) was interviewed by Fran Kelly on ABC RN Breakfast discussing the group's recent publication in Nature which describes the liquid droplet formation of Rubisco complexes prior to their inclusion into nascent carboxysomes during their biogenesis. Their results, which form part of **Nghiem Nguyen**'s PhD project (Price group, PS, CoETP), have implications for the construction of carboxysomes in crop plant chloroplasts as part of a CO_2-concentrating mechanism to improve photosynthesis. Ben Iso appeared on other ABC programs and WIN television, and was interviewed for an episode of the FutureTech Health podcast.

Stefan Bröer (BSB) was interviewed for an article in the Canberra Times and Sydney Morning Herald about the process of starvation.

RSB PhD student **Damien Esquerre**'s discovery that some South American lizards seemed to have broken Dollo's law of irreversibility was covered in the Canberra Times and the ABC. Damien found that egg-laying lizards appear to have gone from eggs to birthing live young and back again. He also found that the South American Andes mountains are 'sky islands', and hotbeds for diversity,

You can watch the ABC news report here.

WELCOME

The remaining three new faculty members appointed last year have taken up their positions at RSB. They are, from left: **Caitlin Byrt** (PS), **Dan Noble** (E&E), and **Joseph Brock** (BSB).

Welcome to the inaugural Director of the Centre for Entrepreneurial Agri-Technology (CEAT) - **Mary Kelly** - who commenced her position on Feb 11th. Prior to CEAT, Mary was Deputy Vice-Chancellor and Vice-President (Research, Development and Industry) at Charles Sturt University (since 2015). Before CSU her roles included Branch Manager, Strategy and Programs during her 4+ years at the Australian Research Council, Director Research Services at University of Canberra, and Senior Scientific Program Officer during her 3+ years at Science Foundation Ireland. Mary brings to the new CEAT role an in-depth understanding of the complexities of collaborative research, innovation and R&D; and the need to bring together research, government, industry and commercial stakeholders towards a shared outcome to realise the true value of a sector or industry. Mary completed her PhD in Microbiology as a Fulbright Scholar at the University of Georgia and her BSc (Hons) in Biochemistry at University College Dublin. - **Owen Atkin** (PS).

Louise Pemble has joined CEAT as the marketing and communication officer. Louise has a background in communication and journalism, a Master of Strategic Communication and a love of innovation, especially in agriculture and climate adaptation. She previously worked at the Department of Agriculture and Water Resources as External Communications Manager working across drought support, carp control and land care projects.

Danielle Way will be visiting RSB for a 6 month sabbatical from January 2019,

working closely with the Atkin and Whitney groups (PS). She is visiting from the Department of Biology, Western University, Canada.

The Jennions group (E&E) welcomes new PhD student **Meng-Han Chung**.

Meng-Han is from Taiwan, and would like to work on how physiological responses change fish behaviour and affect their reproductive success under environmental stress. He hopes to immerse himself wholly in the evolution world, and the happy J research group.

Welcome to new PhD student, **Farhad Hossain**, who completed a BSc in Agriculture and an MSc in Plant Pathology at Bangabandhu Sheikh Mujibur Rahman Agricultural University in Gazipur, Bangladesh. Farhad will be working in the Jones group (PS) on the isolation and functional characterisation of a flax rust gene able to inhibit resistance responses in flax to specific flax rust effectors.

Jenni Hayward has started her PhD in the van Dooren group (BSB), examining the function and structure of novel electron transport chain proteins from Toxoplasma. Jenni did her undergraduate studies at Monash University. For her Honours, she examined chemokine-inhibitory evasin proteins from ticks with Martin Stone in the Biochemistry department. For the past two years, Jenni has worked as a research assistant with Si Ming Man at the John Curtin School. Welcome Jenni!

Erin Hill has started her PhD in the Solomon group (PS). She will be investigating the role of extracellular vesicles secreted by plant pathogens during disease.

Angus Rae is joining the Mathesius group (PS) as a PhD student. Angus was here as a summer student a year ago and then completed his Honours degree at the University of Newcastle with David Collings. We are very happy to see him return to the ANU to take up his PhD project on the regulation of root hair infection by rhizobia.

The Mikheyev group (E&E) welcomes PhD student **Oliver Stuart**, who will be working on the conservation genetics of the Lord Howe Island stick insect. He is planning to develop population genetic research that informs its captive management, as well as a better picture of its population and evolutionary history. "It's a unique research opportunity and I'm really looking forward to getting stuck in," he said

Welcome to **Stephanie Henkel**. Stephie is a second year PhD student enrolled in the Berlin-Canberra International Research Training Program (IRTG 2290). She will spend the next 12 months studying ferredoxin in the the malaria parasite in Kevin Saliba's Lab (BSB).

Inke Falkner has been appointed as Program Coordinator at Kioloa Coastal Campus. Before starting at Kioloa, Inke was the Community Outreach Coordinator at the Sydney Institute of Marine Science. At Kioloa, she will coordinate and continue to develop the research, teaching and outreach activities at the Campus. Please get in touch with Inke to discuss your next visit to the Campus.

Welcome to our new cohort of Honours and Masters students. The Masters students are: **Nonthakorn Apirajkamol** (Moritz group, E&E), **Carolina Dolan** (Kruuk group, E&E), **Caitlin Flux** (Callaghan group, BSB), **Rosalie Harris** (Fulton group, E&E), **Hongje Li** (Brock group, BSB), **Xianghan Li** (Rodrigo group, CBBU), **Luan Liu** (Leyton group, BSB), **Ivan Vinogradov** (Jennions group, E&E), **Tianshu Yang** (Rodrigo group, CBBU), **Haochuan Zhu** (Rathjen group, PS), **Yiran Zou** (Rodrigo group, CBBU).
The honours students are: **Kwan Lung Elroy Au** (Mikeyev group, E&E), **Isaac Bell** (Cardillo group, E&E), **Jayden Black** (Maier group, BSB), **Ming Hong Martin Huang** (Maier group, BSB), **Jonathan King** (Saliba group BSB), **Ruoxi Lin** (Mathesius group, PS), **Julia Lindblom** (Lehane group, BSB), **Xiangning Liu** (Saliba group, BSB), **Carl McCombe** (Williams group, PS), **Kiera O'Halloran** (Mikheyev group, E&E), **Kwong Sum Shea** (Maier group, BSB), **Hanjun Sun** (Whitney group, PS), **Pinhui Wang** (Mathesius group, PS), **Oliver Webeck** (Cardillo group, E&E), **Daniel Yu** (Williams group, PS), **Ayiri Zelinsky** (Solomon group, PS). **Spencer Whitney** (PS) is convener for this group.

FAREWELL

Esther Rajendran (post-doc in the van Dooren and Kirk labs, BSB) has accepted a position to work as a patent examiner for IP Australia. During her time at RSB, Esther made major contributions to understanding how apicomplexan parasites acquire amino acids, and characterising novel proteins in the electron transport chain of these parasites. She also made valuable contributions to undergraduate and post-graduate teaching, and student supervision. Esther leaves us with a very strong publication record, and we wish her all the best for the future. She will be sorely missed! - **Giel van Dooren** (BSB).

Clarissa Alves Negrini, Atkin group Lab Manager (PS) will be leaving for an ongoing position at the Department of Agriculture and Fisheries.

Bethany Stone, International Wheat Yield Partnership Technician and Pogson group (PS) honours student in 2018 left RSB in January to work in the Department of Agriculture and Fisheries.

Keach Murakami has been in Fred Chow's group (PS) for the past nine months. Having written up his work on the reversibility of photosynthetic capacity of mature pea leaves in response to re-exposure to high light after temporary shading, he returns to Japan to take up a position at the National Agricultural & Food Research Organisation, Hokkaido.

PHDS SUBMITTED

Phillipa Beale (Foley group E&E) 'Ambient temperature as a determinant of plant secondary metabolite tolerance and nutrient intake in marsupial folivores'.
Florence Danila (Von Caemmerer group, PS) 'The role of leaf plasmodesmata in C4 photosynthesis'.
Kevin Murray (Borevitz group, PS) 'New computational methods and plant models for evolutionary genomics'.
Kathryn Parker (van Dooren and Kirk groups, BSB) ' Defining the Apicomplexan Amino Acid Transporter (ApiAT) Family'.

PHD AWARDED

Amit Singh (Nicotra group, E&E) 'On growth and form of leaves in 3 dimensions: Applications of machine vision and advanced optics'.

PAPERS ACCEPTED

Aspinwall MJ, Pfautsch S, Tjoelker MG, Vårhammar A, Possellm M, Drake JE, Rymer PD, Creek D, Atkin OK, Reich PB, Tissue DT, Dennison S, Van Sluyter SC, Eucalyptus species with broad and narrow geographic distributions show contrasting responses to an experimental heatwave, *Global Change Biology*.

Bromham L, Six impossible things before breakfast: assumptions, models and belief in molecular dating, *Trends in Ecology & Evolution*.

Chuard PJC, Vrtilek M, Head ML, Jennions MD, Evidence that non-significant results are sometimes preferred: reverse P-hacking or selective reporting?, *PLoS Biology.*

Dziak JJ, Coffman DL, Lanza ST, Li R, Jermiin LS, Sensitivity and specificity of information criteria, *Briefings in Bioinformatics.*

Eriksson D, Kershen D, Nepomuceno A, Pogson BJ, Prieto H, Purnhagen K, Smyth S, Wesseler J, Whelan A, A comparison of the EU regulatory approach to directed mutagenesis with that of other jurisdictions, consequences for international trade and potential steps forward, *New Phytologist.*

Fox RJ, Gearing E, Jennions MD, Head ML, Variation in the condition-dependence of sexual traits in mosquitofish (*Gambusia holbrooki*), *Behavioural Ecology.*

Fox RJ, Head ML, Jennions MD, Disentangling the costs of male harassment and the benefits of polyandry for females, *Behavioural Ecology*.

Guilherme Pereira C, Hayes P, O'Sullivan O, Weerasinghe LW, Clode P, Atkin OK, Lambers H, Trait convergence in photosynthetic nutrient-use efficiency and nutrient resorption along a 2-million year dune chronosequence in a global biodiversity hotspot, *Journal of Ecology.*

Hsiao Y, Pollock DA, Contribution to the knowledge of the genus *Omineus* Lewis, 1895 in Taiwan, with description of two new species (Coleoptera, Mycteridae, Eurypinae). *Zootaxa.*

Iglesias-Carrasco M, Fox RJ, Vincent A, Head ML, Jennions MD, No evidence that male sexual experience increases mating success in a coercive mating system, *Animal Behaviour.*

Iglesias-Carrasco M, Jennions MD, Ho SYW, Duchêne D, Sexual selection, body mass, and molecular evolution interact to predict diversification in birds, *Proceedings of the Royal Society of London, Series B.*

Katris N, Ke H, McFadden G, van Dooren G, Waller R, Calcium negatively regulates secretion from dense granules in *Toxoplasma gondii*, *Cell Microbiology*.

Lehane A, Dennis A, … Li D, Rajendran E …Winterberg M, Rahimi F ... Kirk K, van Dooren G, Characterization of the ATP4 ion pump in *Toxoplasma gondii*, *Journal of Biological Chemistry.*

Lichtenauer W, van de Pol M, Cockburn A, Brouwer L, Indirect fitness benefits through extra-pair mating are large for an inbred minority, but cannot explain widespread infidelity among red-winged fairy wrens, *Evolution*.

Liu F, McDonald M, Schwessinger B, et al., Variation and inheritance of the Xanthomonas raxX-rasSTAB gene cluster required for activation of XA21-mediated immunity, *Molecular Plant Pathology*.

McDonald-Spicer C, Knerr NJ, Encinas-Viso F, Schmidt-Lebuhn AN, Big data for a large clade: Bioregionalization and ancestral range estimation in the daisy family (Asteraceae), *Journal of Biogeography.*

Maier AG, Matuschewski K, Zhang M, Rug M, *Plasmodium falciparum,* Trends in Parasitology.

Meakins F, Hua X, Algy C, Bromham L, Birth of a contact language did not favour simplification, *Language*.

Osmond B, Chow WS, Pogson BJ, Robinson SA, Probing functional and optical cross-sections of PSII in leaves during state transitions using fast repetition rate light induced fluorescence transients, *Functional Plant Biology.*

Parajuli P, Deimel L, Verma N, Genome analysis of *Shigella flexneri* serotype 3b strain SFL1520 reveals significant horizontal gene acquisitions including a multidrug resistance cassette, *Genome Biology and Evolution.*

Parker K, Fairweather S, Rajendran E, … Bröer S, Kirk K, van Dooren G, The tyrosine transporter of *Toxoplasma gondii* is a member of the newly defined apicomplexan amino acid transporter (ApiAT) family, *PLoS Pathogens*.

Sarabipour S, Debat HJ, Emmott E, Burgess SJ, Schwessinger B, Hensel Z, On the value of preprints: An early career researcher perspective, *PLOS Biology.*

Schenk S, Bannister SC, Sedlazeck FJ ... Bui QM, *et al,* Combined transcriptome and proteome profiling reveals specific molecular brain signatures for sex, maturatio and circalunar clock phase, *eLife.*

Schwessinger B, Roy S, Ganguly D, Levelling up: Reproducibility for everyone, *eLife*.

Spry C, Coyne AG, 'The application of fragment-based approaches to the discovery of drugs for neglected tropical diseases', in Javaprakash V. Castagonolo D & Ozkay Y (eds), *Medicinal chemistry of neglected tropical diseases – Advances in the design and synthesis of antimicrobial agents*, CRC Press/ Taylor & Francis Group.

Stoddard A, Rolland V, I see the light! Fluorescent proteins suitable for cell wall/apoplast targeting in *Nicotiana benthamiana* leaves, *Plant Direct*.

Vega-Trejo R, Fox RJ, Iglesias-Carrasco M, Head ML, Jennions MD, The effects of male age, sperm age and mating history on ejaculate senescence, *Functional Ecology*.

Wang H, Yan X, Aigner H, Bracher A, Nguyen ND, Hee WY, Long BM, Price GD, Hartl FU, Hayer-Hartl M, Rubisco condensate formation by CcmM in ß-carboxysome biogenesis, *Nature*.

White CR, Marshall DJ *et al*. incl Arnold PA, The origin and maintenance of metabolic allometry in animals, *Nature Ecology & Evolution.*

Zhao C, Wang Y, Chan KX, Tee EE, Phua SY, *et al* ... Soltis DE, Pogson BJ, Chen Z-H, Evolution of chloroplast retrograde signaling facilitates green plant adaptation to land, *Proceedings of the National Academy of Sciences.*

NOTICES

The Tjabal Indigenous Higher Education Centre is looking for biology tutors for indigenous students. Please email tjabal.centre@anu.edu.au if you are interested.

The First Aid/Parents Room/Privacy Rooms are available to be used for infant feeding and related issues whenever required.