

# Life Earth & Environment:

## Annual Report

School of Environmental and Rural Science  
2014



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*Our purpose is to undertake high quality research that improves our understanding of ecosystems, earth systems and species diversity, as the means to advance ecosystem resilience, and inform management practices to ensure ongoing sustainable landscape use and restoration.*

## INTRODUCTION

**Our Vision: Science for understanding, conservation and restoration of our natural world.**

### Our Theme

The Life, Earth and Environment (LEE) research theme was established in 2014 as a highly active community of academics engaged in discipline-based and interdisciplinary research that spans natural, rural and constructed landscapes. The LEE theme sits within the research portfolio of the School of Environmental and Rural Science at the University of New England and bring together the research disciplines of Botany, Earth Sciences, Environmental Management, Earth Sciences, Engineering and Zoology.

Our research theme is underpinned by internationally recognised researchers with strong track records of industry collaboration and competitively funded research projects. These support our large cohort of postgraduate students.

Our theme undertakes broadly based Life, Earth and Environmental sciences focused across five Excellence in Research for Australia (ERA) areas undertaken in higher education institutions across the country, and in an international context.

- Ecology
- Environmental Science & Management
- Evolutionary Biology
- Geology and Earth Sciences and Zoology

Each area supports a portfolio of research activity that builds on an understanding of fundamental processes to make strategic information available for sustainable management.

### Our Students

Within the LEE theme we provide excellent facilities and support for postgraduate training aligned with work of our research groups. In 2014, **we supported 19 students undertaking Honours, 11 Research Masters and 68 PhD candidates** across all of the LEE research areas.



## Theme Leader's Review

Prof Caroline Gross



The key to a sustainable future is to understand the natural world that we live in by measuring the impact of change on species and their ecosystems — whether this is in contemporary landscapes or the paleo world. The aim of our theme, Life, Earth and Environment (LEE) at the University of New England, is to conduct excellent research in the natural sciences. The staff and students that work under the LEE theme excel at this type of work and this 2014 report outlines the breadth of our endeavours. Highlights include the publication of more than 120 peer reviewed research papers, most in high ranking journals, grants totalling nearly \$3 million and the growth of our team with 4 new academic staff in 2014.

We are privileged to live and work on the Northern Tablelands of NSW which is in close proximity to a diverse range of habitats but it also provides a fantastic springboard for our work that we conduct overseas and in other regions in Australia. There are 29 staff, 12 postdocs, > 20 research assistants and technicians and 79 higher degree students. With recognition from the ARC and other major funding bodies, especially land and water management agencies, the team is productive and provides relevant research for the issues that are relevant to a sustainable future. In this report we showcase our 2014 endeavours and opportunities for future collaborations.

## Academic Staff

Professor Fritz Geiser

Dr Stuart Cairns

Professor Caroline Gross

Dr Alan Baxter

Professor Jeremy Bruhl

Dr Luke Milan

Professor Nick Reid

Dr Phil Bell

Dr Tommy Leung

A/Professor Darren Ryder

Dr Saeed Mahini

A/Professor Nigel Andrew

Dr Romina Rader

A/Professor Karl Vernes

Dr Hamish Campbell

A/Professor John Paterson

Dr Rose Andrew

A/Professor Lalit Kumar

Dr Adrienne Burns

A/Prof Stephen Wroe

Dr Emma Sherratt

Dr Luca Fiorenza

Dr Paul McDonald

Dr Kirsti Abbott

Dr Julian Prior

Dr Nancy Vickery

Mr Rex Glencross-Grant

Dr Chris Wacker

Dr Janelle Wilkes

UNE CI	Title	Funding Scheme	Amount awarded
Prof Fritz Geiser	Coping with forest fires: is mammalian torpor a crucial survival strategy?	Australian Research Council Discovery Grant & Discovery Outstanding Researcher Award (DORA.)	\$785,000
Prof Fritz Geiser	Post-fire mammal survey in the Warrumbungle National Park 2014	National Parks and Wildlife Service	\$18,000
Prof Jeremy Bruhl	Synchrotron analysis of fossils calibrates molecular phylogeny of mapaniid sedges	UNE - Seed Grants 2014	\$18,510
Prof Jeremy Bruhl	Systematics, evolution, ecology and taxonomy of the <i>Banksia spinulosa</i> complex	Australian Biological Resources Study - National Taxonomy Research Grants Program	\$63,000
Prof Jeremy Bruhl	Systematics of <i>Tasmania</i> informs Biogeography of Winteraceae	Australian Biological Resources Study - National Taxonomy Research Grants Program	\$1,030
Prof Nick Reid	Cultural Burning: exploring Indigenous knowledge of country to support fire management	Nature Conservation Council of NSW Firesticks Project	\$30,000
Prof Nick Reid	Grazing Management for biodiversity conservation and landscape function in the semi-arid rangelands of north-west NSW	Local Land Services Western	\$5,000
Prof Nick Reid	Sarah McDonald (PhD project): Grazing management for biodiversity conservation and landscape function in the semi-arid rangelands of north-west NSW	NSW Department of Primary Industries	\$15,000
Prof Nick Reid	Pest control services provided by native birds in agricultural landscapes	Birdlife Australia Research Award	\$4,734
Prof Nick Reid	Spatial resource-use by birds and microbats in intensive agricultural landscapes: Incentives for habitat restoration	Holsworth Wildlife Research Endowment	\$4,000
Prof Nick Reid	Management of wild canids and trophic cascades: how is vegetation influenced by top-order predators?	Holsworth Wildlife Research Endowment	\$6,000
A/Prof Darren Ryder	Ecohealth: A catchment health monitoring program for the Port Macquarie Hastings	Port Macquarie Hastings Council/Northern Rivers CMA/DECCW	\$320,466
A/Prof Darren Ryder	Long Term Intervention Monitoring Project: Gwydir River System Selected Area	EcoLogical Australia	\$582,936
A/Prof Darren Ryder	Biological Monitoring of low flows in the Nymboida River August 2014	Clarence Valley Council	\$17,460
A/Prof Darren Ryder	Upgrade of Richmond River Ecohealth Program	NSW Government Local Land Services North Coast	\$50,000
A/Prof Darren Ryder	Smart Rocks: real-time modelling of sediment movement in rivers	UNE Seed Grants 2014	\$18 763
A/Prof Darren Ryder	Long Term Intervention Monitoring of the Gwydir River system	Commonwealth Environmental Water Office.	\$3.25mil <i>pro parte</i>
A/Prof Nigel Andrew	Impacts of climate change on ants: an altitudinal study	UNE - Seed Grants 2014	\$18,530

A/Prof Lalit Kumar	Modelling Climate Change Impacts on Endemic Biodiversity of the Pacific Region	UNE - Seed Grants 2014	<b>\$19,330</b>
A/Prof Lalit Kumar	Multi-criteria analysis of spatial layers for climate change	NSW Government Local Land Services Northern Tablelands	<b>\$15,000</b>
A/Prof Karl Vernes	Catching Cats with Camera Traps: Establishing Robust Monitoring Protocols for Feral Cats	Holsworth Wildlife Research Endowment	<b>\$7,000</b>
A/Prof John Paterson	Cambrian organic microfossils from Australia and their evolutionary significance	UNE - Seed Grants 2014	<b>\$19,290</b>
A/Prof John Paterson	Understanding the evolutionary tempo and significance of the first animals through exceptional fossil preservation	Australian Research Council - Future Fellowship	<b>\$714,528</b>
A/Prof Stephen Wroe	The reptile-mammal jaw transition as revealed by 3D imaging, embryology, and computational biomechanics: new approaches to some age old questions.	Australian Research Council - Discovery	<b>\$504,180</b>
Dr Julian Prior	Sustainable and Resilient Farming Systems Intensification in the Eastern Gangetic Plains	International Maize and Wheat Improvement Center	<b>\$22,690</b>
Dr Romina Rader	The impacts of the Asian honey bee on pollinator behaviour, efficiency and wild pollinator contribution to crop yields	UNE - Seed Grants 2014	<b>\$19,000</b>
Dr Rhiannon Smith	Surface and groundwater use by <i>Eucalyptus camaldulensis</i> in northern NSW	UNE - Seed Grants 2014	<b>\$19,000</b>
Dr Paul McDonald	Monitoring native game birds for sustainable agricultural management purposes	NSW Department of Primary Industries	<b>\$249,000</b>
Dr Paul McDonald	PhD (Katherine Lambert) funds: soil analysis for BMAD project	National Parks and Wildlife Service	<b>\$16,000</b>
Dr Paul McDonald	Cooperative Breeding in the Noisy Miner ( <i>Manorina melanocephala</i> )	Australia New Zealand Holsworth Wildlife Research Endowment	<b>\$7,000</b>
Dr Paul McDonald	How important is invertebrate diversity and the presence of Lantana to Bell Miner distribution? Implications for effective Bell Miner Associated Dieback management	Birdlife Australia Research Award	<b>\$3,070</b>
Dr Paul McDonald	Recovery of woodland birds by experimental control of Noisy Miners.	Environmental Trust 2014 Environmental Research Major Grants	<b>\$149 572</b>
Dr Hamish Campbell	Building cyber-infrastructure to enhance national collaborative innovation in agricultural research.	UNE Seed Grant	<b>\$20, 000</b>
Dr Luke Milan	Geochemical affinity of dredged rocks from the Perth Abyssal Plain	UNE Seed Grant	<b>\$19, 775</b>
Dr Hamish Campbell	The Ecology of the Mary River Turtle	Tiara District LandCare Community Group	<b>\$10,000</b>

Dr Hamish Campbell	Living longer through greater activity: how does the intensity and complexity of motor activity affect locomotor function and ageing in wild animals	ARC Discovery	<b>\$394, 757</b>
Dr Hamish Campbell	Investigating movement, distribution, abundance and diet to support management objectives for endangered and threatened riverine predators in Northern Australia.	ARC Linkage	<b>\$385, 000</b>
Dr Phil Bell	Opalised fossils from Lightning Ridge and the evolution of dinosaurs	UNE Seed Grant	<b>\$9, 885</b>
Dr Luca Fiorenza	Leading-edge digital reconstruction and biomechanical modeling meet the Neanderthal skull: so why the long face?	ARC Discovery	<b>\$339,204</b>
Dr Luca Fiorenza	Three-dimensional digital imaging of hominoid teeth	UNE Seed Grant	<b>\$10,000</b>
Dr Luca Fiorenza	Tooth wear analysis in two wild chimpanzee populations	UNE Seed Grant	<b>\$18,700</b>
Dr Rose Andrew	Hybridisation in the adaptation of <i>Eucalyptus</i> species to new environments.	ARC Discovery	<b>\$465, 088</b>
Dr Rose Andrew	Hybridisation genomics of woodland eucalypt: genetic mapping and natural hybrids	UNE Seed Grant	<b>\$10, 000</b>
Dr Clare Stawski	Phenotypic plasticity and Climate Change	UNE Seed Grant	<b>\$9, 692</b>
Mr Steven McAlpine	Biology and ecology of the threatened Yakka Skink <i>Egernia rugosa</i>	Australia New Zealand Holsworth Wildlife Research Endowment	<b>\$5,000</b>
Mr David Mackay	Can figs beat changing climate?	Australia New Zealand Holsworth Wildlife Research Endowment	<b>\$6,500</b>
Ms Margaret Stimpson	Fieldwork and phenetic analysis resolve species limits in the <i>Banksia spinulosa</i> complex (Proteaceae) from central Queensland	Australian Systematic Botany Society - Hansjorg Eichler Scientific Research Fund	<b>\$1,949</b>
Ms Heidi Kolkert	Heidi Kolkert - Travel Grant	Ecological Society of Australia - Travel Grant	<b>\$540</b>



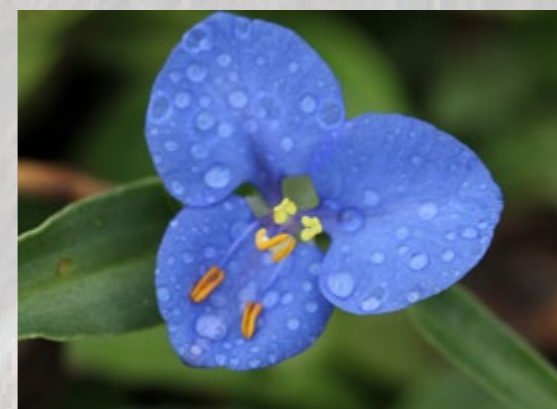


## Plant Reproduction Ecology



Chief Investigator  
Prof Caroline Gross

In our group we work on questions that shed information on how plants reproduce in the environment – especially where there are disturbances to the ecology of the ecosystem. We are interested in threatened plant species, invasive species, the impact of fragmentation on plant populations and their pollinators and the impacts of introduced bees on native pollinator networks. Recently we have been studying the seed bank in an endangered ecological community to unravel why some species are missing from passively recovering sites. As field ecologists we study plant populations in situ and we also use molecular techniques and glasshouse studies to complement our work



## Aquatic Ecology & Restoration



Chief Investigator  
A/Prof Darren Ryder

The Aquatic Ecology and Restoration Research Group have a focus on applying rigorous science to inform the management of a range of freshwater and estuarine ecosystems. Much of our research is based in the regulated floodplain rivers of the northern Murray-Darling Basin and in the unregulated coastal rivers and estuaries of eastern Australia. The applied focus of our research means we work closely with community, industry and government to solve actual management issues in our region we work closely with community, industry and government to solve actual management issues in our region.



## Mammal Ecology and Conservation



Chief Investigator  
A/Prof Karl Vernes

Northeastern NSW has an impressive, and largely intact mammal fauna, and our research aims to better understand the ecology of these mammals so we can better conserve them. Much of our work also focuses on introduced mammals so we can understand the relationship between native and introduced species, and contribute to solutions to their effective management. Some of our research also extends further afield, including projects that aim to better manage and conserve mammals in Bhutan and Mexico.



## Movement and Landscape



Chief Investigator  
Dr Hamish Campbell

Research in the Movement and Landscape Ecology Lab is concerned with the study of animal movement, how they interact with the landscape, and respond to environmental heterogeneity. We experiment with a range of telemetry technologies, including GPS, Argos, VHF, acoustic telemetry, and tri-axial accelerometers. We are also involved in the construction of eScience infrastructure to advance the application of animal movement data into ecosystem science and management.



## Other Research Staff & Students



### Research Fellows

Dr Adrienne Burns: Research Fellow – Aquatic Ecology & Restoration  
Dr Sarah Mika: Postdoctoral Research Fellow – Aquatic Ecology & Restoration

### Adjuncts & Honorary

Emeritas Prof Andrew Boulton: Adjunct Aquatic Ecology & Restoration  
Dr Guy Ballard: Honorary – Mammal Ecology & Conservation: Vertebrate Pest Research Unit, Biosecurity NSW

### Honours

Phoebe Haslett (Honours): *Developing geochemical fingerprints for determining the source of fine sediment in degraded coastal rivers.*  
Nathan Eager (Honours): *Does riparian restoration improve instream biodiversity in urban streams?*  
Kaitlin Formosa: *Demography and Distribution of Feral horses in Guy Fawkes River National Park.*  
Anthea Slack (Honours): *Habitat usage of the Australian Lungfish in a water impoundment*

### Research Masters

Andrew Smolders (MEnvSc): *Developing best-practice management in water supply catchments*

### PhD (candidates)

Karlie McDonald: *Integrated modelling of trophic shifts in unregulated coastal rivers: A Bayesian network approach.*

Lisa Thurtell: *The response of aquatic communities to water quality, land use, flow variability and extraction in an unregulated Australian coastal river.*

Solomon Birhanie: *Influence of dams on malaria transmission in Sub-Saharan Africa*

Mat Birch: *Linking habitat availability, biodiversity and trophic resources in intermittent streams*

David Mackay: *Habitat Fragmentation in the Rusty Fig (Ficus rubiginosa)*

Rokeya Sultana: *Reproductive Isolation in sympatric Wahlenbergia.*

Aaron Mulcahy: *The effects of canopy position on the reproductive output and fig wasp community composition of Ficus rubiginosa*

Sangay Dorji: *Use of Biological Corridors by the Bhuranesse Takin, Bhutan.*

Trent Forge: *Quoll ecology*

Catie Gowen: *Rock-wallaby ecology*

Paul Meek: *Camera trapping technology*

Helen Morgan: *Predator-prey relationships*

Tiger Sangay: *Takin ecology in Bhutan*

Michal Smielak: *Predator-prey relationships*

Dana Vickers: *The influence of ephemeral water on food web dynamics*

Frances Zewe: *The ecology of feral cats Felis silvestris catus in north-eastern New South Wales and interactions with the spotted-tailed quoll Dasyurus maculatus*

Steve McAlpine: *The ecology of the Yakka Skink*

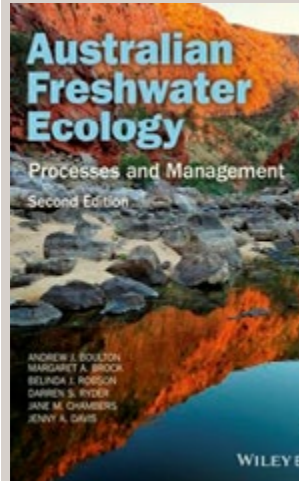
Marilyn Connell: *The population dynamics of the endangered Mary River Turtle*

Tom Lawton: *The influence of anthropogenic food sources on the movement ecology of the Southern Cassowary*



# ECOLOGY: Research Snapshots in 2014

## Aquatic Ecology and Restoration: A/Prof Darren Ryder



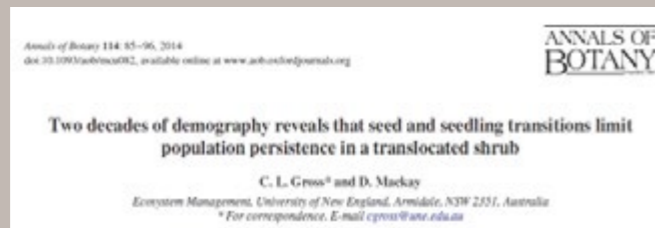
As pressures on Australia's inland waters intensify from population growth, expanding resource development and climate change, there is an urgent need to manage and protect these special areas. Understanding their ecology underpins their wise management and conservation.

Australian Freshwater Ecology vividly describes the physical, chemical and biological features of wetlands, lakes, streams, rivers and groundwaters in Australia. It presents the principles of aquatic ecology linked to practical management and conservation, and explains the causes, mechanisms, effects and management of serious environmental problems such as altered water regimes, eutrophication, salinization, acidification and sedimentation of inland waters. Concise descriptions of ecological processes and newly developed conceptual models illustrated with original, high-quality diagrams and photographs are used to convey the complex interactions among groundwaters, biodiversity, temporary and tropical waters, climate change, invasive species and freshwater conservation. Readable and logically structured, this book supports

undergraduate and postgraduate courses in aquatic ecology and management. It is a valuable reference for consultants, restoration ecologists, water resource managers and other professionals with an interest in the ecology of surface and groundwaters.

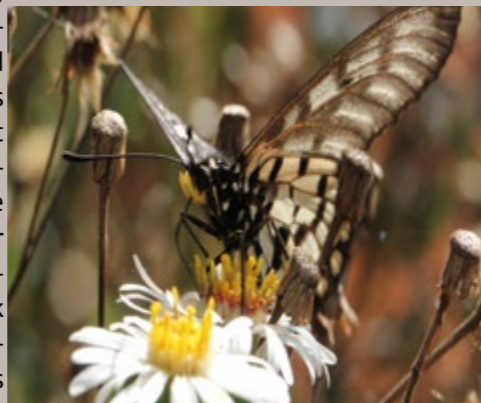
Available at: <http://au.wiley.com/WileyCDA/WileyTitle/productCd-1118568230.html>

## Conservation Ecology of endangered plants : Prof Caroline Gross



**Rare species with very restricted distributions are at the forefront of extinction risk simply because all of their populations may experience the same catastrophic event. Pioneer species are likely to survive a catastrophe if new opportunities for range expansion occur so offer much for the study of extinction.**

*Olearia flocktoniae* is an endangered shrub that was passively translocated from its natural ecosystem where it has since gone extinct. In a 20 year study, population colonization, longevity and extinction were investigated using 133 populations to explore the sensitivities vital to populations persisting in human-created areas. Seedling establishment was promoted by recent disturbances and increased number of disturbance events. Severe disturbances that almost extirpate populations significantly increased longer-term population persistence. Only populations with an annual disturbance regime survived the full 20 years, requiring actively managed disturbances for translocated populations of *O. flocktoniae* to persist. Studying the ecology of displaced species, especially the responses of their seed bank to disturbance, is important for understanding and predicting the consequences of climate change particularly when suitable environments are still emerging. <http://aob.oxfordjournals.org/content/114/1/85.full>

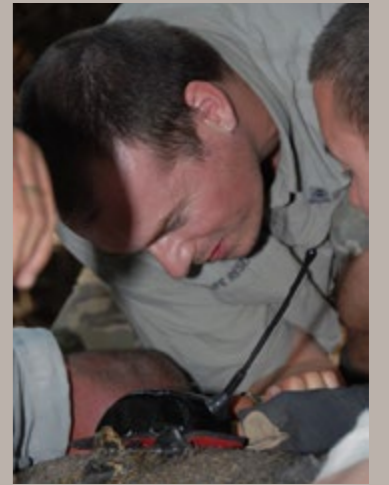


## Movement and Landscape Ecology: Dr Hamish Cambell

### Predicting the probability of large carnivore occurrence: A strategy to promote crocodile and human coexistence.

Preserving large carnivores that perceive humans as prey brings conservation values into direct conflict with human security. Informing when and where humans and large carnivores occupy the same space, may reduce attack frequency and promote coexistence. Here we demonstrate a methodology to better understand the spatiotemporal relationship between a population of large carnivores and humans.

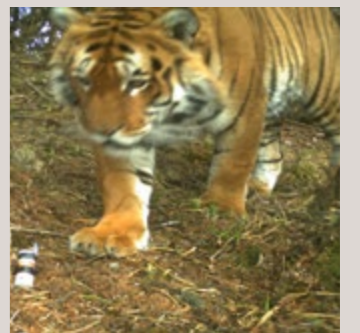
We studied the estuarine crocodile (*Crocodylus porosus*); a large semi-aquatic predator responsible for 705 recorded human-attacks over the last 20 years. Crocodiles were captured each August over three years, and individuals greater than 2.5 m in length implanted with an acoustic transmitter (n = 84). The transmitter emitted a coded pulse; detected when in proximity to underwater hydrophones deployed throughout the river. Over three years, 24 of the tagged crocodiles were detected 269 times moving through a shallow-water area where humans entered the water. Between September and December the probability of crocodile presence within the human entry zone was  $0.97 \pm 0.01$  during darkness but decreased to  $0.07 \pm 0.01$  during daylight, except around periods of high-tide when it increased to  $0.71 \pm 0.02$ . Human visitors confined their activity to shallow-water during daylight hours, but no consideration was given to the significant rise in crocodile presence with season and tide. The observed patterns in crocodile and human behaviour, around this shallow-water river crossing, exhibited parallels with historical incidences of crocodile attack.



## Mammal Ecology & Conservation: A/Prof Karl Vernes

**My research in 2014 has continued to build an understanding of the ecology and distribution of threatened mammals primarily through field-based research that uses infrared motion-activated cameras ('camera traps') to capture videos and still images of wildlife. These cameras allow observations on animal behaviour, and the gathering of point-distributions for rarely seen mammals that until recently were virtually unattainable.**

Research locations for my work include the Eastern Himalayas where I have deepened my collaboration with Bhutanese wildlife ecologists to study the fauna that use the protected areas network, Mexico's Yucatan Peninsula where I have begun working with local grass-roots conservation groups to study the use of subterranean water sources called 'cenotes' by native mammals, and work closer to home



at several sites in Australia. These projects have generated data on large and charismatic mammals like tigers, leopards, jaguars, and pumas, as well as a host of lesser known but equally important species. Publications stemming from my camera trapping work in 2014 work include a paper on foraging by long-nosed potoroos in Tasmania (see Australian Mammalogy 36: 128-130) and four chapters in a book published late in 2014 dedicated to camera trapping research (see Camera Trapping: Wildlife Management and Research, CSIRO Publishing) that cover work done in Australia, Canada, and Bhutan. Other research work in 2014 has included a major review on the translocations of kangaroos, wallabies and rat-kangaroos (see Mammal Review 44: 109-123).



## Biodiversity, Landscapes and Ecosystem Stewardship

Chief Investigator  
Prof Nick Reid



I am interested in how governments, industry, public and private organisations and the community can work together to pursue sustainable development, ecosystem stewardship and resilience-based, natural resource management and planning at local and regional scales. My current research interests include landscape revegetation and ecosystem restoration; the environmental impact of wild dog control in temperate wilderness and agricultural landscapes; the nature, value and assessment of ecosystem services; invasive native scrub: soil function, erosion, management and biodiversity correlates; sustainable farming and grazing systems; the role and management of biodiversity in production landscapes; tree-grass interactions; fire and protected area management; ecology and management of plant and animal communities; and environmental dispute resolution. Most of my time is committed to Academic Board presently, as well as the Invasive Animals CRC and the CRC for Spatial Information.

## Ecosystem services in agricultural landscapes

Chief Investigator  
Dr Romina Rader



Romina is interested in the role of biodiversity in providing ecosystem processes/services and how communities respond to drivers of global change (i.e. climate change, land use change). She is particularly interested in understanding how communities assemble and disassemble, change in functioning and how different forms of diversity are impacted at local and landscape scales, and environmental degradation.



# ENVIRONMENTAL MANAGEMENT



## Environmental Policy



Chief Investigator  
Dr Julian Prior

My research interests lie in the areas of natural resource policy, institutional analysis and capacity development, agricultural and natural resource extension, social capital-building for sustainable natural resource management, community-based natural resource management (including community adaptation to climate change), environmental dispute resolution, and natural resource and environmental management in developing countries.



## Remote Sensing and Environmental Modelling



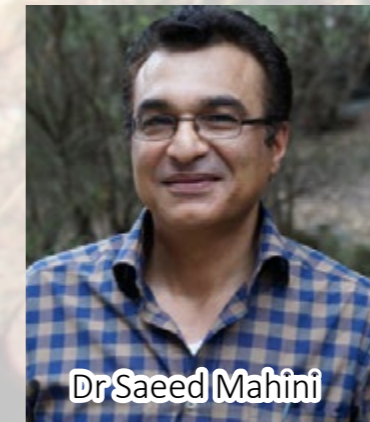
Chief Investigator  
A/Prof Lalit Kumar

My main research interests are in the fields of environmental modelling and Hyperspectral Remote Sensing. Currently I am involved in projects dealing with monitoring health and condition of wetland vegetation, developing indices based on Hyperion data for mapping tannin and nitrogen concentrations in forests, and modelling species distribution based on the tannin and nitrogen maps. In the past I have been involved in using GIS/RS technology for rangeland degradation, habitat mapping, biodiversity & conservation, salt-marsh vegetation mapping, and mapping the distribution of eucalyptus species based on potential solar radiation modelled in a GIS.

## Sustainable Engineering



Rex Gencross-Grant



Dr Saeed Mahini



Dr Janelle Wilkes

We are at the forefront of the transition to a carbon-constrained world. Sustainable technologies are required to allow the world to adapt whilst ensuring a good quality of life for all its residents. Engineers can provide these technologies only through innovation and entrepreneurship. However it must be recognised that a vital link is required to facilitate the work of engineers.



Sprayed Fibre Reinforced Polymer for strengthening timber beam/bridge girders.

### Our Purpose

Using 'Sustainable Technologies' to protect the environment and to develop and offer sustainable and energy-saving solutions with low greenhouse gas emissions.

## Other Research Staff & Students

### Research Fellows

Dr Rhiannon Smith (Postdoctoral Fellow) - Biodiversity, Landscapes and Ecosystem Stewardship

Dr Subhashni Taylor (Postdoctoral Fellow) - Remote Sensing

### Adjuncts & Honorary

A/Prof Richard Faulkner - Sustainable Engineering

### Research Masters

Sue Jagger : Wild Insect Pollinators of Mango Crops

Yasser Maklad : Development of a practical, user-friendly decision-making tool for householders to help in their evaluation process of utilizing small scale wind turbines and/or solar photovoltaic panels as an alternative source of electricity.

### PhD (candidates)

Isabelle Balzer: Modelling the past, mapping the present and envisaging the future: employing species distribution models and GIS to investigate the impact of climate change on the past environment and archaeology of the Kimberley bioregion, northern Australia

Sharon L Brown: Cost-effective revegetation technology: restoring connectivity in the Border Rivers – Gwydir catchment

Heidi Kolkert: Quantifying the pest control services provided by insectivorous birds and microbats in intensive agricultural areas

Kathryn Lambert: Are bell miners *Manorina melanophrys* a primary cause of dieback: importance of lantana *Lantana camara* infestation, removal of psyllid predators and miner dynamics on forest health

Rachel Lawrence: Biodiversity of the ground layer of alternatively managed grazing properties

Michelle McKemey: Cultural burning: exploring Indigenous knowledge of country to support fire management in northern New South Wales and the Northern Territory

Helen Morgan: Management of wild canids and trophic cascades: how is vegetation influenced by top-order predators?

Justine Philip: Traversing the barrier fence: exploring the cultural life and afterlife of the *Canis dingo*

Lorena Ruiz Taloniati: Restoration of native vegetation: ecological and genetic considerations associated with seed germination

Abbas Vahedian: Retrofitting of older timber buildings using Sprayed Fibre Reinforced Polymer (SFRP) composites.

Robert Baker: Potential for biofuels from natural algal communities in sewage treatment ponds: nutrients and zooplankton as regulatory process.

Hanieh Saremi: Use of LiDAR data to quantify the influence of topography on *Pinus radiata* D. Don at the sub-compartment level.

Nadiezhdha Cabral: Modelling Climate Change impacts and effects on common bean and maize in Mexico.

Mofza Algahtany: Modelling spatial distribution and association between economic and social factors and criminal issues in Saudi Arabia.

Dymphna Javier: Use of high-resolution satellite imagery in generation of landslide hazard and risk maps in the Municipality of Tublay, Province of Benguet, Northern Philippines.

Rasha Al-Jaryian: The impacts of climate change on agricultural crops and their pests using distribution modelling: A case study of Iraq.

Mark Cameron: An image processing and classification/segmentation procedure for natural landscapes in NSW.

Abdullah Alqurashi: Detecting and modelling the complexity of urban change and its impact on the environment in selected Saudi Arabian Cities.

Chidumeje Okonkwo: Use of GIS and Remote Sensing in Assessing the Impacts of Oil Pollution and Land Use Land Cover (LULC) Changes on Nigerian Niger Delta Wetlands and its Effects on Fisheries Biodiversity.

Farzin Shabani: Effects of climate change on future distribution of date palms: modeling exercise with correlative and mechanistic models in relation to climatic and non-climatic parameters.

Amal Allbed: Using geographic information system and remote sensing technologies to assess and map soil *salinity* in *Al Hassa oasis in the Eastern province of Saudi Arabia*.



## ENVIRONMENTAL MANAGEMENT: Research Snapshots

### Biodiversity, Landscapes and Ecosystem Stewardship: Prof Nick Reid

#### Broad-scale patterns in plant diversity vary between land uses in a variegated temperate Australian agricultural landscape NICK L. SCHULTZ,<sup>1\*</sup> NICK REID,<sup>1</sup> GREG LODGE<sup>2</sup> AND JOHN T. HUNTER<sup>3</sup>

*Ecosystem Management, School of Environmental and Rural Science and <sup>3</sup>School of Behavioural, Cognitive and Social Sciences, University of New England, Armidale, and Department of Primary Industries, Tamworth Agricultural Institute, Calala, New South Wales, Australia*



#### Habitat specificity indices such as Landscape Diversity Contribution (or gamma diversity) may be useful indicators of conservation value that distinguish patches and land uses with species that are rare in the landscape from those with mainly common species.

Our understanding of patterns of plant diversity in threatened vegetation types and many agricultural landscapes is mainly based on small-scale (<1000 m<sup>2</sup>) observations of species richness. Such studies are insufficient for detecting the spatial heterogeneity of vegetation composition. In a case-study farm on the North-West Slopes of New South Wales, Australia, we observed species richness at four scales across five land uses. Native pastures had less variation between patches than grazed and ungrazed woodlands, and hence were less species-rich at the landscape scale, despite having similar richness to woodlands at the quadrat and patch scale. Habitat specificity was significantly higher for ungrazed woodland patches than all other land uses. Our results showed that in this landscape, ungrazed woodland patches had a higher contribution than the grazed land uses to landscape species richness. These results have implications for the conservation management of this landscape, and highlighted the need for greater consensus on the influence of different land uses on landscape patterns of plant diversity.

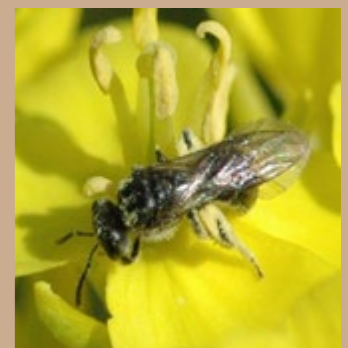
### Ecosystem services in agricultural landscapes: Dr Romina Rader



Land use change is frequently associated with loss of biodiversity. This can have functional consequences upon pollinators because particular functional traits can be especially vulnerable to decline.

The consequences of land use

change are particularly important for insect pollinators which provide pollination services for between 78-94% of all flowering plants and 75% of the leading global food crops. This study examined insect pollinators each month for 1 year across four land use types of increasing intensity in New Zealand, being gardens with native vegetation, blackcurrant orchards, dairy farms, and rotational cropping farms. The order of species loss under increasing land use intensity was non-random and pollinators with a narrow diet breadth, large body size, solitary behaviour and non-floral larval resources were lost first, under increasing land use intensity. The losses of particular functional groups will likely reduce the insurance value provided by functionally dissimilar communities. <http://onlinelibrary.wiley.com/doi/10.1111/ddi.12221/abstract>



## Strengthening institutional capacity, extension services and rural livelihoods, Myanmar (Burma): Dr Julian Prior



Dr Julian Prior is the Project Leader of the \$2M (2014-2017) project funded by the Australian Centre for International Research (ACIAR) entitled: Dr Michelle Carnegie is the UNE Research Fellow working on this project, which involves collaborators from Myanmar agricultural organisations, CSIRO and the Asian Institute of Technology. The project provides the socioeconomic background to agricultural technologies formulated in the 4 technical components (focussing on improving the production of rice, grain legumes, fish and livestock).

We work with the Myanmar extension services to help build a new strategy in Myanmar, and collaborate with agricultural research institutions to ensure ongoing institutional capacity development and policy support. In particular, the component conducts research activities in three major areas: (1) understanding rural household economics, farmer and landless livelihood portfolios, and drivers of decision making; (2) extension pathways for technological change and farmer adoption; (3) institutional analysis and capacity development of the Myanmar agricultural research and extension sector.

During 2014, the project undertook an extensive quantitative livelihoods survey of 750 rural households in the Central Dry Zone and Ayeyarwaddy Delta regions; as well as conducted qualitative focus group interviews with farmers in the target regions. The project also commenced agricultural extension teaching curriculum development and capacity building at the Yezin Agricultural University.



## Teaching Research in Environmental Science: Dr Janelle Wilkes



### Using the Results of Teaching Evaluations to Improve Teaching: A Case Study of a New Systematic Process

John M. Malouff, Jackie Reid, Janelle Wilkes, and Ashley J. Emmerton  
COLLEGE TEACHING, 63: 1-5, 2015

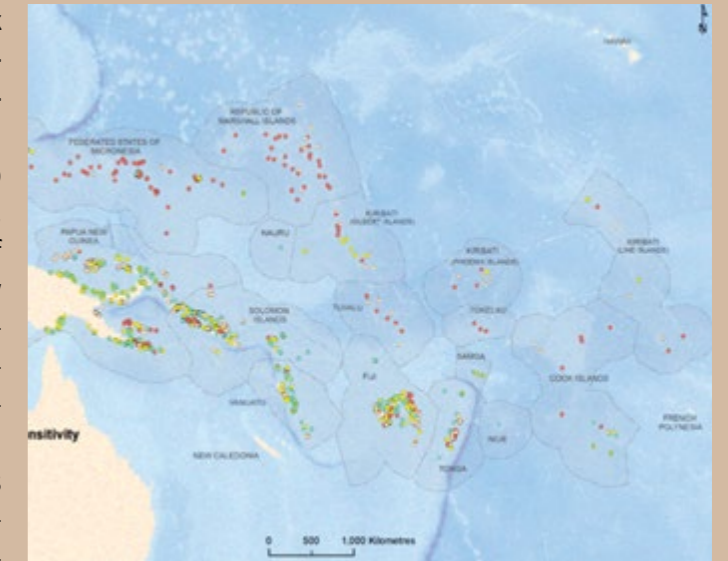
This article describes a new 14-step process for using student evaluations of teaching to improve teaching. The new process includes examination of student evaluations in the context of instructor goals, student evaluations of the same course completed in prior terms, and evaluations of similar courses taught by other instructors. The process has steps to help maximize instructor motivation as well as to help identify good targets for improvement. The article describes as an initial case study the experiences of academics in three disparate fields in using the new process. This initial use of the process led to deeper reflection than usual for the instructors and to ideas for ways to improve their teaching. Results indicate that the new process holds potential as a systematic way of using student numerical ratings and comments to produce plans for improvements in teaching. DOI: 10.1080/87567555.2014.956681

## Remote Sensing & Environmental Modelling: A/Prof Lalit Kumar

Combining island geometry, lithology and broad scale climate drivers to develop a regional-scale index of relative vulnerability of Pacific islands to environmental change

The main aim of this project was to develop a Coastal Vulnerability Framework as a component of the Pacific-Australia Climate Change Science and Adaptation Planning (PACCSAP) program.

The PACCSAP Program is intended to help partner countries including Cook Islands, Fiji, Kiribati, Marshall Islands, Federated States of Micronesia, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu and their communities better understand and respond to climate-associated impacts. The database developed shows potential vulnerability of 1532 islands in the Pacific to climate change and will inform managers of priority areas where resources need to be devoted.



# EVOLUTIONARY BIOLOGY

## Biogeography & taxonomy of Australian plants



Chief Investigator  
Prof. Jeremy Bruhl

My main research interests are in the biology, ecology and systematics of Cyperaceae. I am part of the international network of researchers working on the Cyperaceae. My contributions to the Flora of North America were published in Volume 23 (2002).

I also have been and am involved in studies on a wide range of Australian plant groups (including ferns, wattles, Myrtaceae, Euphorbiaceae, Phyllanthaceae, and Juncaceae).

## Molecular ecology, landscape genetics and genomics

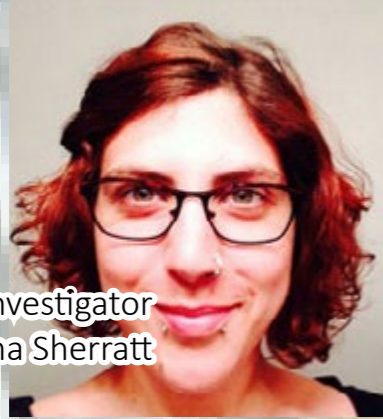


Chief Investigator  
Dr. Rose Andrew

I have a diverse background in the ecology, genetics and evolution of wild and domesticated organisms. My recent research involved ecological experiments, landscape genetics and population genomics in a recently-diverged sunflower (*Helianthus*) ecotype growing in extreme conditions in active sand dunes. My current focus is on the genomics of adaptation and speciation, with particular emphasis on their relationship to the landscape. Along the way, I have collaborated on corals, diatoms, birds and crops.



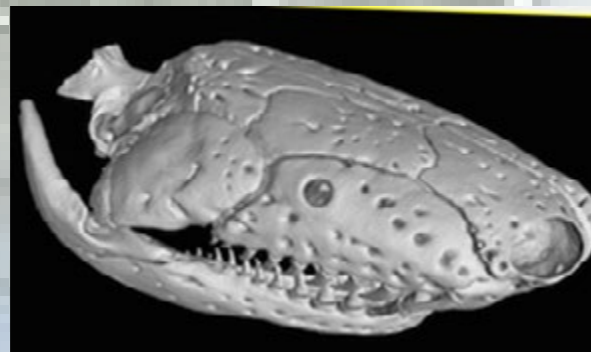
## Morphological evolution in burrowing animals



Chief Investigator  
Dr Emma Sherratt

I am an evolutionary biologist, focused on developing and applying comparative methods and morphometric tools to studying phenotypic evolution. I research macroevolutionary trends in the morphological evolution of vertebrates to understand the factors responsible for biodiversity.

My empirical research has covered reptiles and amphibians, mammals and recently, molluscs. I apply my expertise in 3D digital imaging (micro-CT, surface scanning and microscopy) to characterising morphological variation. I use these data to contribute to systematics (taxonomy) and phylogenetics. And



## Other Research Staff & Students

### Research Fellows

Dr Kerri Clarke - Botany

### Adjuncts & Honorary

A/Prof Ralph Whalley

### Honours

Ken Mills: *Reproductive Biology of Lepidosperma gladiatum (Cyperaceae)* (UNE/UWA)

### Research Masters

Iain Moore

### PhD (candidates)

Virgilio Linis

George Plunkett

Christina Prychid

Margaret Stimpson

Ian Telford

Nannette Thomas



## EVOLUTIONARY BIOLOGY: Research Snapshots

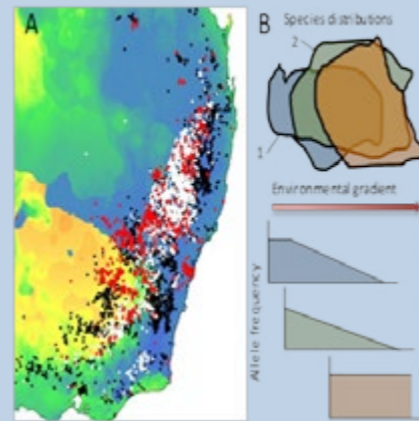
### Genomic signatures of adaptive diversification in woodland Eucalyptus: Rose Andrew.

An emerging pattern in speciation research is the importance of ancient introgressed alleles, rather than new mutations, in recently diverged or incipient species.

The source of raw material for evolution can have significant impacts on the speed with which populations can adapt and on the genomic signatures left by selection. There is growing evidence that interspecific gene flow has played an important role in at least one large vertebrate radiation, but its relative importance in plants speciation is a major gap.

Woodland Eucalyptus species offer a unique opportunity to understand whether hybridisation speeds up adaptation, as there are several closely-related species in the box-ironbark group that co-occur and encounter the same environmental challenges.

In 2014 I was successful in applying for an ARC Discovery Grant for research on the role of hybridisation in the adaptation of Eucalyptus species to new environments. This project is a collaboration with plant genomics expert Justin Borevitz at the Australian



A) Distribution of *E. albens*, *E. sideroxylon* and *E. melliodora*, overlain on a climate variable (the temperature of the driest quarter). B) Schematic of comparative landscape genomics analysis of three species with overlapping distributions along an environmental gradient. An allele shows parallel environment associations in species 1 and 2, but not in species 3.

### Digging heads, amniote genitalia, and the analysis of organismal form. Emma Sherratt.

DOI 10.1007/s11692-014-9287-2

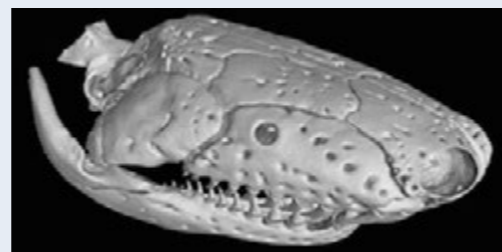
RESEARCH ARTICLE

#### Evolution of Cranial Shape in Caecilians (Amphibia: Gymnophiona)

Emma Sherratt · David J. Gower · Christian Peter Klingenberg · Mark Wilkinson

In September 2014 I moved to UNE from Iowa State University (USA; where I had been a postdoctoral researcher) to take up an appointment as Lecturer in Zoology. I have also joined the FEAR lab headed by Associate Professor Stephen Wroe.

My research in 2014 has spanned several fields of Evolutionary Biology. In the journal *Nature* in a collaboration with colleagues from Harvard Medical School, we published a paper documenting a shift in the developmental origin of external genitalia in amniote evolution (Tschopp, Sherratt et al. 2014 *Nature*). I also published an essential paper from my thesis work describing the patterns of cranial shape evolution in a relatively-unknown group of burrowing vertebrates, caecilian amphibians (Sherratt et al. 2014 *Evol. Biol.*). This paper is leading the field in studies of organismal form, since it documents 70% of the known species across an order of vertebrates and uses entirely micro CT data entirely to capture complex 3D geometry of these cryptic animals. Finally, the software that I co-write with Prof. Dean C. Adams of Iowa State University has significantly impacted the research of hundreds of researchers; geomorph, a package in R, has been cited in six publications of 2014, and the accompanying help guide has been downloaded more than 600 times.



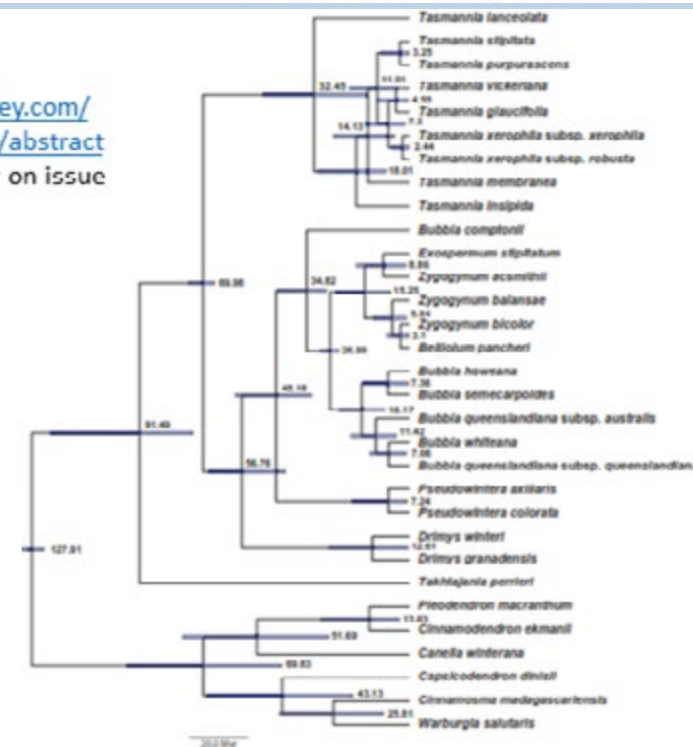
### Biogeography of basal relictual lineages of flowering plants : Jeremy Bruhl

ORIGINAL ARTICLE

## Molecular dating of Winteraceae reveals a complex biogeographical history involving both ancient Gondwanan vicariance and long-distance dispersal

Nanette Thomas<sup>1,2\*</sup>, Jeremy J. Bruhl<sup>1</sup>, Andrew Ford<sup>3</sup> and Peter H. Weston<sup>2</sup>

<http://onlinelibrary.wiley.com/doi/10.1111/jbi.12265/abstract>  
Images left from cover on issue



A BEAST derived, fossil calibrated, molecular chronogram provides evidence that Takhtajania is the product of vicariance, while the biogeography of its sister clade is a mix of vicariance and long-distance dispersal events.



Figures: Representative of the three major clades of Winteraceae: red-flowered *Takhtajania perrieri* (Madagascar) sister to the rest of the family, white-flowered *Drimys winteri* (South America), and purple-fruited *Tasmannia stipitata* (Australia). Photo credits: George Schatz (MO), Peter Weston (NSW) and Jeremy Bruhl (NE).

# EARTH SCIENCE

## Palaeozoic fossil arthropods



Chief Investigator  
A/Prof John Paterson

John's research contributions have primarily focused on documenting the palaeo-biodiversity of Australian Cambrian and Ordovician biotas (ca. 444 to 541 million years ago) and using these key fossils to answer major questions relating to evolution, biogeography and palaeoecology during this critical time interval. He has also used these fossils in the relative dating and correlation of strata around the globe in order to refine the geologic timescale. The multidisciplinary nature of his work includes numerous publications on taxonomy, phylogeny, biostratigraphy, biogeography, taphonomy and palaeoecology.

## Mesozoic vertebrates and palaeoecology



Chief Investigator  
Dr Phil Bell

Phil is especially interested in Australia's own Mesozoic past, particularly the range of dinosaurs and other vertebrates. Working with the Australian Opal Centre in Lightning Ridge, Phil is investigating an exciting new cache of dinosaur and other vertebrate fossils from the Early Cretaceous of Australia. His other main research focus lies with the dinosaur fauna of the Late Cretaceous Wapiti Formation (Alberta, Canada) and its intermediate position between the polar dinosaurs from Alaska and the better-known fauna from southern Alberta and Montana. Phil's research is multifaceted, covering a range of subject areas systematics including taphonomy, behaviour, palaeopathology, and palaeoecology.





## Tectonics, sedimentology and biostratigraphy.



Chief Investigator  
Dr Alan Baxter

Alan's main research interests are in subduction and volcanism, that occur at tectonic margins. This has led him to work on the extant Central American subduction system, as well as ancient examples such as the India-Asia collision zone and the New England Orogen. The geological history of convergent margins can be understood by studying the marine fossils found in these environments, so that we can apply time constraints to major events that occurred over their evolution. His current focus in micropalaeontology spans calcareous nannofossil and radiolarian biostratigraphy.



## Virtual Anthropology



Chief Investigator  
Dr Luca Fiorenza

Luca is a Palaeoanthropologist, expert in Virtual Anthropology and in Neanderthal Ecology. Luca's main research interests focus on functional morphology of the masticatory apparatus in human and non-human primates, and on the importance of the diet in human evolution. He is currently working on the reconstruction of African Plio-Pleistocene hominin diets from dental wear studies, combining 3D digital modeling, biomechanics and functional morphological analysis.



## Structural & metamorphic geology



Chief Investigator  
Dr Luke Milan

Luke's main research interests are in Volcanics, geochemistry and geophysics. His current research focuses on volcanology in the Wandsworth, Drake and Demon Faults and E-W faulting in the Wongwibinda Metamorphic Complex. He has also worked on regional scale sources of arsenic particularly around the Mole River. He has been recently awarded funding to investigate the Geochemical constraints on the affinity and origin of rocks from the Perth Abyssal Plain, in which he aim is to produce a plate tectonic model for the rifting of India-Australia-Antarctica and the birth of the Eastern Indian Ocean.

## Other Research Staff & Students

### Adjuncts & Honorary

Dr Paul Ashley



### Honours

Dale Vrenegoor - Arsenic dispersion at the Taronga Sn prospect, Emmaville NSW  
Thomas Walters - The geology of the Wandsworth Volcanic Group to the south west of Emmaville  
Chris Slominski - Arsenic dispersion in the Emmaville district.

### PhD (candidates)

Robert Brown - The Mallee Bull Deposit, Cobar  
Lee-Ann Hally - Cambrian trilobites from Central Australia  
Natalie Schroeder - Cambrian palaeontology



## EARTH SCIENCES: Research Snapshots

### The changing face of dinosaurs : Dr Phil Bell



**Soft tissues, such as skin and muscle rarely fossilise, therefore our perception of extinct animals are inherently limited. A 'mummified' Canadian dinosaur reveals not only the scaly skin of the animal but an unprecedented fleshy head crest, similar to a rooster's comb.**

Edmontosaurus regalis is one of the most common and well-known dinosaurs from the Late Cretaceous (approx. 72 million years ago) period in North America. Like most dinosaurs, our current knowledge of the appearance and biology of this animal is derived from commonly-fossilised bones and teeth. Discovery of a 'mummified' Edmontosaurus reveals not only the intricate details of the scaly hide but also the presence of a soft tissue head crest, similar to a rooster's comb.

The fleshy crest in Edmontosaurus not only dramatically alters the appearance of this species but also the first indication that dinosaurs sported such soft tissue structures and opens the possibility for similar excrescences in a wide variety of other dinosaurs. We surmise that the comb structure in Edmontosaurus was used as a sexual signalling device as in modern birds to attract mates or assert dominance within the herd.

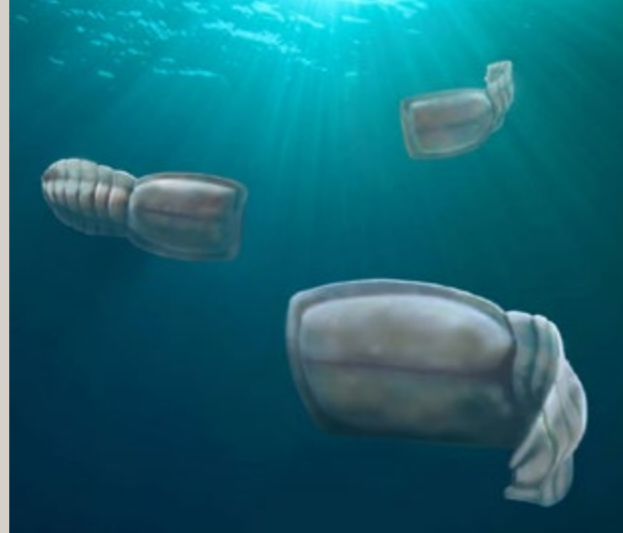
## Early evolution of marine animals: A/Prof John Paterson

Some of the world's most bizarre fossils have been identified as distant relatives of vertebrates based on a new study led and co-authored by ARC Future Fellow A/Prof John Paterson

The fossils belong to 500-million-year-old blind marine creatures, known as "vetulicolians" (pronounced: ve-TOO-lee-coal-ee-ans). Alien-like in appearance, these animals were "filter feeders" shaped like an hourglass and reaching up to 15 cm in length. Their strange anatomy has meant that no one has been able to place them accurately on the tree of life, until now.

We argue for a change in the way these creatures are viewed, placing them within phylum Chordata. It appears that vetulicolians are more closely allied to a chordate group called the tunicates. The discovery of a new species from Kangaroo Island provides novel anatomical details, specifically a rod-like feature in the tail of the animal that has been interpreted as a notochord – the structure that forms part of the backbone in vertebrates.

Vetulicolians are further evidence that life was very rich in diversity during the Cambrian period, in some aspects more than it is today, with many extra branches on the evolutionary tree. The research involved collaboration between UNE, the University of Adelaide, South Australian Museum, University of South Australia, and the Natural History Museum, London. <http://www.biomedcentral.com/1471-2148/14/214/abstract>



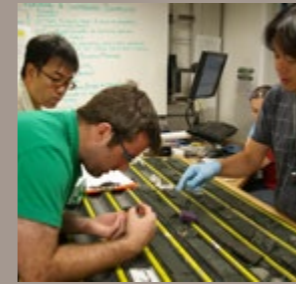
## To meat or not to meat? New perspective on Neanderthal ecology: Dr Luca Fiorenza

Neanderthals are undoubtedly the most studied and best-known group in the human fossil record. Despite that, for more than 100 years since their discovery, research on Neanderthal ecology, subsistence strategies, and diet have received remarkably little attention.

Neanderthals have been commonly depicted as top predators who met their nutritional needs by focusing entirely on meat. This information mostly derives from faunal assemblage analyses and stable isotope studies: methods that tend to underestimate plant consumption and overestimate the intake of animal proteins. Several studies in fact demonstrate that there is a physiological limit to the amount of animal proteins that can be consumed: exceeding these values causes protein toxicity that can be particularly dangerous to pregnant women and newborns. Consequently, to avoid food poisoning from meat-based diets, Neanderthals must have incorporated alternative food sources in their daily diets, including plant materials as well. This research project involved collaborations with some of the most important experts in dietary reconstruction of fossil species, including the Max Planck Institute for Evolutionary Anthropology, the Senckenberg Research Institute and the Neanderthal museum (Germany), the University of Bologna (Italy), the Gibraltar Museum (Gibraltar) and the University of Cape Town (South Africa).

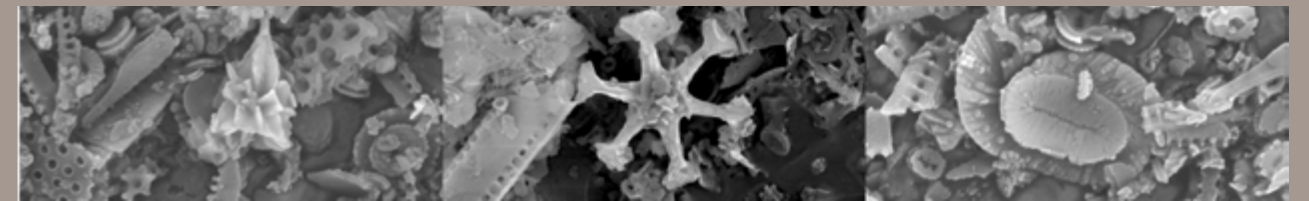


## Devonian and carboniferous sediments & calcareous nannofossil biostratigraphy : Dr Alan Baxter



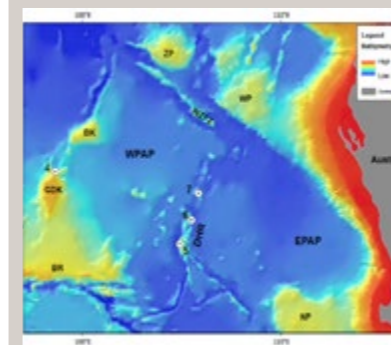
In 2014 my research focused on two areas. The first relates to the Devonian and Carboniferous Tamworth Belt sediments in the New England Orogen. These sediments record the geological history of Eastern Australian when it was subject to similar processes as those taking place in the Himalaya or the Andes. By characterizing the source and age of these sediments we can constrain when important geological events occurred. This work is in collaboration with a number of researchers from the Earth Science discipline and 3 undergraduate students completing SCI395 projects under my supervision.

The second area of research focused on calcareous nannofossil biostratigraphy from the Central American Trench (CAT), offshore Costa Rica. This is part of a larger study (Integrated Ocean Discovery Project (IODP) Expedition 344: CRISP A2) that aims to understand the inputs that control seismicity (earthquakes) along the CAT. We can tell when sediments were deposited by identifying the different species of nannofossils present. This is important when calculating the recurrence interval for events such as earthquakes or volcanic eruptions along the CAT. We can tell when sediments were deposited by identifying the different species of nannofossils present. This is important when calculating the recurrence interval for events such as earthquakes or volcanic eruptions.



## Geochemical constraints on the affinity and origin of rocks from the Perth Abyssal Plain: Dr Luke Milan

The Perth Abyssal Plain is a poorly understood ocean basin located offshore of Perth, WA, that hosts a critical early record of the continental breakup of the supercontinent Gondwana at ~130 – 100 million years ago. This project investigates the affinity and origin of seafloor basalts and continental granites that have been dredged from the seafloor. We aim to produce a plate tectonic model for the rifting of India-Australia-Antarctica and the birth of the Eastern Indian Ocean.



It has been often said that we know more about the topographies of Earth's Moon, Mars and Venus than we do of Earth's ocean floors. This was recently highlighted when passenger jet, MH370 was calculated to have disappeared in the vicinity of the Perth Abyssal Plain (PAP), a deep ocean basin offshore of southern WA (Fig. 1), where just 5% of the sea floor had been mapped in the designated search area prior to the incident (Smith & Marks, 2014). The PAP was formed between ~130-100 million years ago during the breakup of the supercontinent Gondwana, near the triple junction between Australia, Antarctica and Greater India. The first samples recovered from this enigmatic abyss will focus on two outstanding gaps in knowledge: (1) What are the geochemical affinities of the seafloor basalts in the PAP? Do these rocks support the current hypothesis of seafloor spreading from 136 Ma and interaction with the

Kerguelen Hotspot at ~100Ma? (2) What are the geochemical affinities of the 540-520 million year old granites that comprise a large volume of the newly discovered submarine micro-continents in the PAP? This project was funded by the UNE small grants scheme for 2015 in collaboration with Whittaker, JHalpin, and Watson (The University of Tasmania) and Daczko (Macquarie University). The rocks were collected in 2011 during a CSIRO National Marine Facility cruise aboard the RV Southern Surveyor.



# ZOOLOGY

## Thermal energetics



Chief Investigator  
Prof Fritz Geiser

Fritz is Professor of Zoology and the Director of the Research Centre for Behavioural and Physiological Ecology. His research focus is on ecological physiology, comparative physiology and biochemistry with a specific interest in thermoregulation and energetics relating to hibernation and daily torpor. His studies include an extensive range of vertebrates including monotremes (Echidnas) and marsupials (Dasyurids, Pygmy-possums, Gliders, Opossums) placentals (Bats, Rodents, Elephant Shrews), Honeyeaters and other passerines (Kookaburras, Owlet-nightjars, Tawny Frogmouths) and reptiles and amphibians.

### ARC: Discovery Outstanding Researcher Award (DORA)

Professor Fritz Geiser is a world leader in the organismal biology of hibernation and torpor and is an ARC Discovery Outstanding Researcher. His contributions to the current knowledge about the ecological physiology of mammals and birds, especially with regard to energetics and thermal biology, are substantial and work was instrumental in changing the international perception that torpor is used by many species and that this energy conserving strategy is crucial to their survival in all climate zones and seasons. Recently, he has identified predator avoidance as a new function of torpor, which is the likely reason why mammals that can use torpor are less likely to become extinct, a novel concept in conservation biology.



## Form and function in living and fossil species



Chief Investigator  
A/Prof Stephen Wroe

Our primary interest is to improve our understanding of relationships between shape and function in living and fossil animals. We use computer based 3D modelling (Finite Element Analysis) and geometric morphometrics to predict and analyse mechanical behaviour in skulls and other biological structures.

In addition to providing detailed information on how animals are adapted to particular behaviours and predictions for behaviour in fossil species, we apply these techniques to answer a wide range of biomedical questions.



## Insect Ecology



Chief Investigator  
A/Prof Nigel Andrew

My current research focuses on a range of interlinked topics of significance to biological and geographical diversity. We are answering questions relating to responses of insects to habitat change along environmental gradients, and climate change. Our current research focuses on the impacts climate change will have on insect behaviour, ecology and physiology, insect community structure along environmental gradients, and insect-plant interactions.

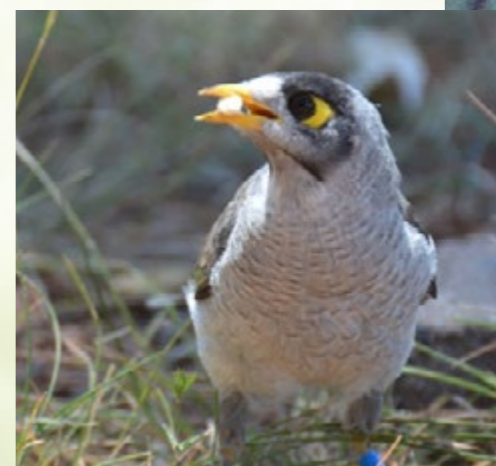


## Avian Behaviour



Chief Investigator  
Dr Paul McDonald

My research seeks to understand both how and why animals behave the way that they do. Our research therefore targets both the proximate and ultimate factors underpinning behaviour, and spans topics from applied questions with important conservation implications (e.g. BMAD) right through to fundamental science examining important evolutionary questions such as the evolution of cooperation (e.g. Noisy Miner project). Most of our projects use birds as a model due to their amenability and, when it comes down to it, their pretty amazing behaviours.



## Parasite Evolution and Ecology



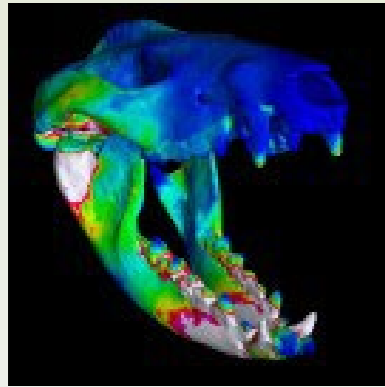
Chief Investigator  
Dr Tommy Leung

Because parasitism is such a common way of life and has independently evolved in many different groups, parasites are useful study organisms for asking various different questions which are applicable to most free-living organisms like fish, birds, or trees. At the same time, there are interesting challenges. Parasites are often overlooked due to their comparatively small sizes and because they are tucked away inside the body of their hosts. The study of parasitism offers us a glimpse into a hidden world of biological drama and intrigue which sometimes can have larger ramifications for the rest of the ecosystem.

## Other Research Staff & Students

### Research Fellows

Dr Julia Nowack (Postdoctoral Fellow) – Thermal Energetics  
Dr Clare Nowack (Postdoctoral Fellow - Thermal Energetics  
Dr James Neenan (Posdoc.Fellow Uni of Zurich) - Form and function in living and fossil species.  
Dr Laura Wilson (Postdoctoral Fellow, UNSW)- Form and function in living and fossil species  
Dr Maria Attard (Postdoctoral Fellow) - Form and function in living and fossil species  
Dr Willian Parr (Postdoctoral Fellow) - Form and function in living and fossil species  
Dr Jean Drayton (Postdoctoral Fellow) – Insect Ecology  
Dr John McEvoy (Postdoctoral Fellow) - Monitoring native game bird population densities and movement patterns.



### Adjuncts & Honorary

Dr Kirsti Abbott (Associate Lecturer) - Insect Ecology  
Dr Steve Debus (Honorary Research Associate) – Avian Behaviour  
A/Prof Phillip Clausen (Uni of Newcastle) – Form and function in living and fossil species  
A/Prof Graham Hall – Insect and vertebrate ecology

### Honours

Samantha Doohan: The impact of habitat on predator-prey interactions using Noisy Miners as natural sentries  
Annalie Dorph : Vocalisations in Eastern and Spotted-tail Quolls  
Telishia Laegel : The use of vocalisations as an indicator of stress in dogs  
Penny Wright: Lantana (*Lantana camara*) Invasion in areas of Bell Miner (*Manorina melanophrys*) Associated Dieback and its Implications on Terrestrial Mammal and Microbat Population Biodiversity.

### Research Masters

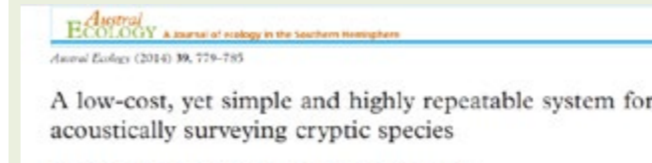
Matthew Godson: “Ecology of Stubble quail in South Australia”.  
Phillip Hannay: How can we control *Athena tumeda* in honeybee hives?  
Ellie Saadati: Interactions between two-spotted mites and predators”.  
Tina Roshan: Evaluation of Bioactivity of Plant Extracts against Greenhouse Whitefly in Commercial Tomato Glass-houses.

### PhD (candidates)

Ahmad Barati : The social dynamics of cooperative behaviour in the Noisy Miner  
Martin Dillon: Camouflage of motion in lizards and snakes  
Kathryn Lambert: Bell miners, psyllid invasions and Eucalypt dieback: which comes first?  
Leah Tsang: Facultative zygodactyly (FZ) in the Black-shouldered Kite (*Elanus axillaris*): is it facultative, and does it reveal new insights into the phylogenetic relationships of raptors?  
Ada Klinkhamer: Functional limb morphology of Australian sauropod dinosaurs.  
Alannah Pearson (UNE/ANU): Individual cranial bone morphology and morphology of the brain lobes taken from endocasts of hominoids  
John Cook: Evolution of marsupials and how saltation (hopping) locomotion has become a primary form of locomotion in macropods  
Dr Peter Aquilina : Maxillofacial Biology  
Matt Binns : Predicting the effect of climate change on community structure and function: an assessment *using temperate grassland invertebrates*  
Isobel Roberts: *The influence of climate on insect-plant communications*  
Behnaz Ghaedi: *Impact of repeated stress exposures on the thermal tolerance abilities in the green peach aphid (Myzus persicae)*  
Zac Hemmings: *The thermal games dung beetles play: assessing how temperature and competition influence a critical ecosystem service provider*

## ZOOLOGY: Research Snapshots

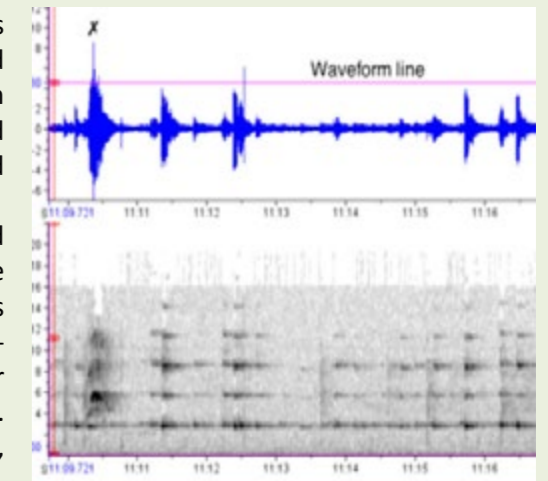
### Avian Behaviour: Dr Paul McDonald



We aimed to solve survey problems that most researchers encounter: finding a reliable, but low cost means of monitoring cryptic species. We used Bell Miners (*Manorina melanophrys*) as a case study of a visually cryptic species that is difficult to monitor using traditional means.

Utilising acoustic monitoring technology, this paper demonstrates how a relatively cheap digital note taker (<\$100USD) can be used to produce highly accurate censuses of bell Miner abundance in even the densest, most difficult habitats. Our method recorded more individuals than traditional avian survey approaches, and required minimal observer training.

We present methods for calibrating other recording devices and detecting vocalisations of other species using readily available freeware, enabling these methods to be easily adapted to census a variety of acoustically distinctive species, offering a more effective, yet cheaper and likely more efficient census technique for a range of otherwise difficult to survey species in other systems. Lambert, K.T.A. and McDonald, P.G. (2014). *Austral Ecology*. 39, 779–785



### Evolutionary Ecology of Parasitism: Dr Tommy Leung



Fish are the most diverse group of vertebrates on this planet. With over 32000 known living species, they have diversified to fill a wide variety of ecological niches. Some species have formed close ecological interactions with other aquatic species, both invertebrates and vertebrates that can be best described as symbiotic or even parasitic.

In the review, I discussed the different ways that some fish species have evolved to parasitise invertebrates and the effects they have on their hosts. This range from using their body as a site for depositing their eggs and larvae, which can cause impaired respiration in the host, to some species such as pearlfishes that actually sheltering inside the body of sea cucumber and feed on its gonad, resulting in host castration.

I also discussed fish species that are frequently associated with larger aquatic vertebrates, attaching to them for either dispersal or feeding purposes or both. These range from remoras that simply attach themselves to large marine animals using a highly modified dorsal fin, to the candiru – a blood-sucking catfish that inserts itself into the gill chamber of larger fishes.

This review provides an overview of some general patterns in these symbiotic or parasitic relationships, comparing them with more ‘traditional’ parasites and symbionts (such as leeches, parasitic worms, and even parasitoid wasps), and discuss the insight they can offer on the evolutionary pathways of fishes, and how an animal’s life-style is reflected in its morphology.

Since parasitism seems to be a relatively rare strategy for vertebrates in general, comparing invertebrate parasite taxa with these “parasitic” fishes provide a unique perspective on the evolutionary origin and transition of parasitism as a life-style and the limits of morphological and behavioural adaptations. <http://onlinelibrary.wiley.com/doi/10.1111/jzo.12148/full>

## Thermal energetics: Prof Fritz Geiser

Torpor and hypothermia: reversed hysteresis of metabolic rate and body temperature

Fritz Geiser, Shannon E. Currie, Kelly A. O'Shea, and Sara M. Hiebert  
Centre for Behavioural and Physiological Ecology, Zoology, University of New England, Armidale, Australia  
Submitted 21 May 2014; accepted in final form 21 August 2014

a substantially reduced body temperature ( $T_b$ ) and metabolic rate (MR), but differ physiologically despite the terms being used interchangeably in the literature. We demonstrate a clear diagnostic physiological difference between the two states that can be used experimentally to confirm whether torpor or hypothermia has occurred. We examined the interrelations between  $T_b$  and MR in a mammal (*Sminthopsis macroura*) undergoing torpor, and the hypothermic response in a similar sized juvenile rat (*Rattus norvegicus*). The interrelations between MR and  $T_b$  during the cooling and rewarming phases of torpor were opposite to those during hypothermia, with hysteresis observed during hypothermia reverse that of torpor. Consequently, we recommend using the terms 'torpor' and 'hypothermia' in ways that are consistent with the underlying regulatory differences between these two physiological states. *Am J Physiol Regul Inter Comp Physiol*, 2014. 307.



We demonstrate a fundamental and easily measured physiological difference between regulated torpor and unregulated hypothermia, providing a new and robust diagnostic tool for distinguishing between these two superficially similar states.

Regulated torpor and unregulated hypothermia are both characterised by

## Insect Ecology: A/Prof Nigel Andrew

### Methods in Ecology and Evolution

Methods in Ecology and Evolution 2014, 5, 344–352 doi: 10.1111/2041-210X.12163

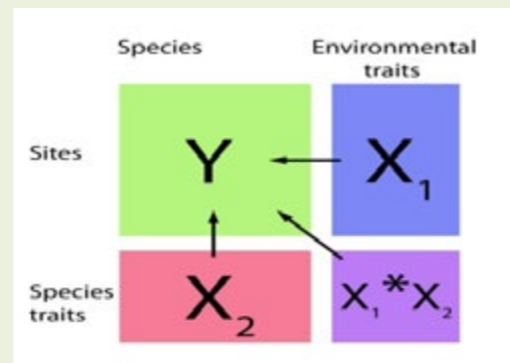
The fourth-corner solution – using predictive models to understand how species traits interact with the environment

Alexandra M. Brown<sup>1\*</sup>, David I. Warton<sup>1</sup>, Nigel R. Andrew<sup>2</sup>, Matthew Binns<sup>2</sup>, Gerasimos Cassis<sup>3</sup> and Heloise Gibb<sup>4</sup>

There are currently few methods for modelling how environmental response is mediated by species traits and an approach is needed to species distribution modelling which can incorporate traits directly. Within the multivariate analysis literature, the problem of associating species traits and environmental variables using species abundance or presence/absence data is known

as the fourth-corner problem.

To overcome the problem we describe a simple, generic approach with the core idea being to fit a predictive model for species abundance as a function of environmental variables, species traits and their interaction. Compared with existing approaches, the proposed model-based approach has advantages in interpretability and its capacity to perform model selection and make predictions. Predictive performance of the model is compared with that of fitting SDMs separately to each species, and in each case, it is shown that the trait model, despite being much simpler, had comparable predictive performance, even significantly outperforming separate SDMs in some cases. Our model predicts abundance ( $Y$ ) from environment ( $X_1$ ), species traits ( $X_2$ ), and their interaction ( $X_1 * X_2$ ). The matrix of coefficients for the interaction between  $X_1$  and  $X_2$  is the fourth corner.



# PhD Graduates in 2014

**Name: Khaled Abdallah Alqadi**

Title: 'Using Spatial Analyses Tools to Study the Impact of Changing Demographics, Agricultural Extents and Urban Growth on Water Quality and Availability in the Amman-Zarqa Basin, Jordan'  
School: School of Environmental and Rural Science  
Principal Supervisor: Associate Professor Lalit Kumar,

**Name: Artiom Bondarenco**

Title: 'Topor and Thermal Energetics in Australian Arid Zone Bats'  
School: School of Environmental and Rural Science  
Principal Supervisor: Professor Fritz Geiser

**Name: Thomas James Mooney**

Title: 'Response of Soil Invertebrates to Petroleum Hydrocarbon Contaminated Soils at Macquarie Island'  
School: School of Environmental and Rural Science  
Principal Supervisor: Associate Professor Nigel Andrew

**Name: Jaqueline Thorner**

Title: 'Effects of Rising Sea Levels on Habitat Diversity and Biodiversity of Intertidal Rocky Reefs'  
School: School of Environmental and Rural Science  
Principal Supervisor: Associate Professor Lalit Kumar





# 2014 Research Outputs

## PUBLICATIONS

### Books

1. Boulton, A. J., Brock, M.A., Robson, B.J., Ryder, D.S., Chambers, J.M. & Davis, J.A. 2014. Australian Freshwater Ecology. Wiley & Sons, New York.

### Book Chapters

2. Boon, P.I., P.C. Pollard, & Ryder, D.S. in press. Wetland microbial ecology and biogeochemistry. in Batzer and Sharitz, editors. Ecology of Freshwater and Estuarine Wetlands. University of California Press.

3. Fry, B.G., Scheib, H., Messenger, K., Hocknull, S., Wroe, S., Sunagar, K., Goldstein, E.J.C., Tyrrell, K.L., Citron, D.M., Jackson, T.N.W. In Press. Poisons and bacteria in Venomous reptiles and their toxins: evolution, pathophysiology and biodiscovery. Oxford University Press, Oxford.

4. Holwell, G. & Andrew, N.R. in press. Protecting the small majority: insect conservation in Australia and New Zealand. Austral Ark: the state of wildlife and conservation in Australasia eds. A. Stow & G. Holwell. Cambridge University Press. ISBN: 9781107033542

5. Leung, T.L.F., Mora, C., & Rohde, K (2015) Patterns of diversity and distribution of aquatic invertebrates and their parasites. In. eds. S. Morand, B.R. Krasnov, & D.T.J. Littlewood, Parasite Diversity and Diversification: evolutionary ecology meets phylogenetics. Cambridge University Press, England ISBN: 9781107037656

6. Reid, N., Norton, D.A. & Stafford Smith, M. 2014. Environmental management, in eds. D. J. Cottle & L. Kahn, Beef Cattle Production and Trade. CSIRO Publishing Melbourne.

7. Wright J & McDonald. P.G. 2014. Sex, showing off and relatedness in helping decisions of the Bell Miner. in eds. W. Koenig, & Dickenson, J. Cooperative Breeding: Studies of Ecology, Evolution and Behaviour. Cambridge University Press, Cambridge.

### Peer Reviewed Journals

#### In press

1. Aquilina, P., Parr, W, Chamoli, U., Wroe, S. & Clausen, P. in Press. Finite element analysis of patient specific condyle fracture plates: A preliminary study. Craniomaxillofacial Trauma and Reconstruction.

2. Bell, P.R., Currie, P.J. in press. Albertosaurus (Dinosauria: Theropoda) material from an Edmontosaurus bonebed (Horseshoe Canyon Formation) near Edmonton; clarification of palaeogeographic distribution. Canadian Journal of Earth Sciences.

3. Bell, P.R., Campione, N.E. in press. Taphonomy of the Danek Bonebed: a monodominant Edmontosaurus (Hadrosauridae) bonebed from the Horseshoe Canyon Formation, Alberta. Canadian Journal of Earth Sciences.

4. Bell, P.R. & Campione, N.E. in press. Taphonomy of the Danek Bonebed: a monodominant Edmontosaurus (Hadrosauridae) bonebed from the Horseshoe Canyon Formation, Alberta. Canadian Journal of Earth Sciences.

5. Bell, P.R. & Currie, P.J. in press. Albertosaurus (Dinosauria: Theropoda) material from an Edmontosaurus bonebed (Horseshoe Canyon Formation) near Edmonton; clarification of palaeogeographic distribution. Canadian Journal of Earth Sciences.

6. Berney, P.J., Wilson, G.G., Ryder, D.S., Whalley, D. Duggin, J. & McCosker, R.J. in press. Divergent responses to long-term grazing exclusion among three plant communities in a flood pulsing wetland in eastern Australia. Pacific Conservation Biology.

7. Birhane, S., Wilson, G., Ryder D.S., Petros, B. in press. Influence of dams on malaria transmission in Sub-Saharan Africa. Ecohealth.

8. Bourke, J M., Ruger Porter, W.M., Ridgely, R.C., Lyson, T.R., Schachner, E.R., Bell, P.R., Witmer, L.M. in press. Breathing Life into Dinosaurs: Tackling Challenges of Soft-Tissue Restoration and Nasal Airflow in Extinct Species. Anatomical Record.

9. Campbell, H.A., Dwyer, R.G., Wilson, H. Irwin, T., Franklin, C.E. in press. Predicting the probability of large carnivore and human co-occurrence: A conservation strategy to promote human coexist-

ence with crocodiles. *Animal Conservation*.

10. Dwyer, R.G, Campbell H.A, Brooking C, Brimblecombe W., Hunter J., Watts, M.W., Franklin C.E. in press. Can the provision of free, open source analytical tools change attitudes to data sharing? An open access system for animal tracking data. *Animal Biotelemetry*.
11. Eberth, D.A. & Bell, P.R. in press. Stratigraphy of the Danek Bonebed (Upper Cretaceous Horsehoe Canyon Formation, central Alberta) and correlations with strata in the Drumheller and Grande Prairie regions. *Canadian Journal of Earth Sciences*.
12. Gibb, H., Stoklosa, J., Warton, D.I., Brown, A.D., Andrew N.R. & Cunningham S.A. in press. Does morphology predict trophic position and habitat use of ant species and assemblages? *Oecologia*, Accepted 13 September 2014.
13. Gibb, H., Muscat, D., Binns, M., Silvey, C.J., Peters R.A., Warton D.I. & Andrew N.R. in press Responses of foliage-living spider assemblage composition and traits to an environmental gradient in Themeda grasslands. *Austral Ecology*, Accepted 26th August 2014.
14. Hanson, J.O., Salisbury, S.W. Campbell, H.A., Dwyer, R.G., Jardine, T.D., Franklin, C.E. in press. Feeding across the food web: the interaction between diet, movement, and body size. *Austral Ecology*.
15. Koprivnikar, J., & Leung, T.L.F. in press. Flying with diverse passengers: greater richness of parasitic nematodes in migratory birds. *Oikos*. DOI: 10.1111/oik.01799
16. Kobayashi, T., Ralph, T. Ryder, D.S. Hunter, S., Shiel, R. & Segers, H. in press. Spatial dissimilarities in plankton structure and function during flood pulses in a semi-arid floodplain wetland system. *Hydrobiologia*: 1-13.
17. Koprivnikar, J., & Leung, T.L.F. in press. Flying with diverse passengers: greater richness of parasitic nematodes in migratory birds. *Oikos*. DOI: 10.1111/oik.01799.
18. Lambert, K.T.A., Andrew, N.R., McDonald, P.G. in press. The influence of avian biodiversity and a weedy understorey on canopy arthropod assembly. *Open Journal of Ecology*.
19. Leseberg, N.P., Lambert, K.T.A., McDonald, P.G. in press. Fine-scale impacts on avian biodiversity due to a despotic species, the bell miner (*Manorina melanophrys*). *Austral Ecology*.
20. Lambert, K.T.A., McDonald, P.G. in press. A low-cost, yet simple and highly repeatable system for acoustically surveying cryptic species. *Austral Ecology*. doi:10.1111/aec.12143.
21. Malouff, J., Reid, J., Wilkes, J., & Emmerton, A. in press. Using the results of teaching evaluations to improve teaching: a case study of a new systematic process. *College Teaching*.
22. Marks, C., Obendorf, D., Pereira, F., and Hall, G. (in press). Anecdotal reports are not fox (*Vulpes vulpes*) survey data: why empirical data quality matters in eradication programs. *Biological Invasions*
23. McGrath, S.P., Reichelt-Bruschett, A.J., Butcher, P.A. & Cairns, S.C. in press. Absorption of metals in mullaway (*Argyrosomus japonicus*) after ingesting nickel-plated carbon-steel hooks. *Marine Environmental Research*.
24. Prieto-Marquez, A., Wagner, J.R., Bell, P.R., Chiappe, L.M. in press. The late-surviving 'duck-billed' dinosaur *Augustynolophus* from the upper Maastrichtian of western North America and crest evolution in *Saurolophini*. *Geological Magazine*.
25. Radar, R., Bartomeus, I. Tylanakis, J. M. & E. Laliberte., E. in press. The winners and losers of land use intensification: pollinator community disassembly is non-random and alters functional diversity. *Diversity and Distributions*.
26. Ruger Porter, W.M., Ridgely, R.C. Lyson, T.R. Schachner, E.R., Bell, P.R. & Witmer, L.M. in press. Breathing Life into Dinosaurs: Tackling Challenges of Soft-Tissue Restoration and Nasal Airflow in Extinct Species. *Anatomical Record*.
27. Smith R., Tongway, D. Tighe, M. & Reid, N. in press. When does organic carbon induce aggregate stability in vertosols? *Agriculture, Ecosystems and Environment*, accepted.
28. Stork, N.E., Kitching, R.L., Cermak, M., Davis, N.E. & Abbott, K.L. in press. The impact of aerial baiting for control of the yellow crazy ant, *Anoplolepis gracilipes*, on canopy-dwelling arthropods and selected vertebrates on Christmas Island (Indian Ocean). *Raffles Bulletin of Zoology*. Special Supplement on Christmas and Cocos (Keeling) Islands.
29. Twongyirwe, R., Sheil, D., Majaliwa, J. G. M., Ebanyat, P., Tenywa, M. M., van Heist, M., Kumar, L. in press. Variability of Soil Organic Carbon stocks under different land uses/cover: A study in an afro-montane landscape in Southwestern Uganda. *Geoderma*.

30. Warrington, M.H., McDonald, P.G., Griffith, S.C. in press. Within-group vocal differentiation of individuals in the cooperatively breeding apostlebird. *Behavioral Ecology*.
31. Wilkes, J. & Burton, L. in press. Get set for success: applications for engineering and applied science students. *International Journal of Innovation in Science and Mathematics Education (Special Issue - Assumed knowledge in maths: its impact on tertiary STEM programs)*

## 2014

32. Abbott, K.L., Green, P.T. & O'Dowd, D.J. 2014. The reproductive phenology and forager bait preference of the invasive yellow crazy ant, *Anoplolepis gracilipes*, in supercolonies on Christmas Island. *Austral Entomology* 53:337-346.
33. Allbed, A., Kumar, L. & Aldakheel, Y. 2014. Assessing soil salinity using soil salinity and vegetation indices derived from IKONOS high-spatial resolution imageries: Applications in a date palm dominated region. *Geoderma* 230-231:1-8.
34. Allbed, A., Kumar, L. & Sinha, P. 2014. Mapping and Modelling Spatial Variation in Soil Salinity in the Al Hasa Oasis Based on Remote Sensing Indicators and Regression Techniques. *Remote Sensing* 6:1137-1157.
35. Arbour, V. M., Burns, M.E., Bell, P.R. & Currie., P.J. 2014. Epidermal and Dermal Integumentary Structures of Ankylosaurian Dinosaurs. *Journal of Morphology* 275:39-50.
36. Attard, M.R G., Parr, W.C. Wilson, L.A., Archer, M. Hand, S.J. Rogers, T.L. & Wroe. S. 2014. Virtual Reconstruction and Prey Size Preference in the Mid Cenozoic Thylacinid, *Nimbacinus dicksoni* (Thylaciniidae, Marsupialia). *PLoS ONE* 9.
37. Barnes, P., Wilson, B, Reid, N. Bayerlein, L. Koen, T. & Olupot., G. 2014. Examining the impact of shade on aboveground biomass and NDVI of C3 and C4 grass species in north-western NSW, Australia. *Grass and Forage Science*.
38. Bayat, S., Geiser, F. Kristiansen, P. & Wilson, S.C. 2014. Organic contaminants in bats: Trends and new issues. *Environment International* 63:40-52.
39. Bell, P.R., Fanti, F. Currie, F.P.J. & Arbour, V.M. 2014. A Mummified Duck-Billed Dinosaur with a Soft-Tissue Cock's Comb. *Current Biology* 24:70-75.
40. Bell, P.R., Fanti, F., Mitchell, M.T. & Currie, P.J. 2014. Marine reptiles (Plesiosauria and Mosasauridae) from the Puskwaskau formation Santonian-Campanian), west-central Alberta. *Journal of Paleontology* 88:187-194.
41. Betts, M.J., Topper, T.P., Valentine, J.L., Skovsted, C.B., Paterson, J.R. & Brock, G.A. 2014. A new early Cambrian bradoriid (Arthropoda) assemblage from the northern Flinders Ranges, South Australia. *Gondwana Research* 25:420-437.
42. Bidder, O. R., Campbell, H. A. Gomez-Laich, P., Urge, J. Walker, J. Cai, Y.Z., Gao, L.L., Quintana, F., & Wilson, R.P. 2014. Love Thy Neighbour: Automatic Animal Behavioural Classification of Acceleration Data Using the K-Nearest Neighbour Algorithm. *PLoS ONE* 9.
43. Bieber, C., Lebl, K., Stalder, G., Geiser, F., & Ruf, T. 2014. Body mass dependent use of hibernation: why not prolong the active season, if they can? *Functional Ecology* 28:167-177.
44. Bondarenko, A., Körtner, G. , Geiser, F. (2014) Hot bats: extreme thermal tolerance in a desert heat wave. *Naturwissenschaften*. 101: 679-685
45. Brown, A.M., Warton, D.I., Andrew, N.R., Binns, M., Cassis, G. & Gibb, H. 2014. The fourth-corner solution - using predictive models to understand how species traits interact with the environment. *Methods in Ecology and Evolution* 5:344-352.
46. Campbell, H.A.D., Sullivan, R.G., Mead, S. & Lauridsen, D. 2014. Chemical immobilisation and satellite tagging of free-living southern cassowaries. *Australian Veterinary Journal* 92:240-245.
47. Castañeda, M.D., Sherratt, E. & Losos, J.B. 2014. The Mexican amber anole, *Anolis electrum*, within a phylogenetic context: implications for the origins of Caribbean anoles. *Zoological Journal of the Linnean Society* 172:133-144.
48. Chi, N., Bahar, M.H, Baker, G. & Andrew. N.R. 2014. Thermal tolerance limits of diamondback moth in ramping and plunging assays. *PLoS ONE* 9:e87535-e87535.
49. Clarke, P.J., Knox, K.J.E., Bradstock, R.A., Munoz-Robles, C. & Kumar, L. 2014. Vegetation, terrain and fire history shape the impact of extreme weather on fire severity and ecosystem response. *Journal*



of Vegetation Science, 25:1033-1044.

50. Clayton, J.A., Pavey, C.R., Vernes, K. & Tighe, M. 2014. Review and analysis of Australian macropod translocations 1969-2006. *Mammal Review* 44:109-123.

51. Currie, S.E., Kortner, G. & Geiser, F. 2014. Heart rate as a predictor of metabolic rate in heterothermic bats. *Journal of Experimental Biology* 217:1519-1524.

52. Currie, S.E., Noy, K. & Geiser, F. 2014. Passive rewarming from torpor in hibernating bats: minimising metabolic costs and cardiac demands. *Am J Physiol Regul Integr Comp Physiol* 308:

53. Curtis D.J., Reid, N. & Reeve, I. 2014. Towards ecological sustainability: observations on the role of the arts. *S.A.P.I.EN.S* 7(1): 15 pp. <http://sapiens.revues.org/1655>

54. Drury, R.L., Geiser, F. 2014. Activity patterns and roosting of the blossom-bat *Syconycteris australis*. *Australian Mammalogy* 36: 29-34.

55. Dwyer, R.G., Campbell, H.A., Franklin, C.E. 2014. Does the telemetry technology matter? Comparing estimates of aquatic animal space-use generated from GPS-based and passive acoustic tracking. *Marine and Freshwater Research*.

56. Etezadifar, F., Barati, A. 2014. Factors affecting offspring growth and daily nest survival rates in the coastal breeding Western Reef Heron (*Egretta gularis*) in the Persian Gulf. *Marine Ecology*. In press. DOI: 10.1111/maec.12147.

57. Esmaeili, A., Pourbabaee, A.A., Alikhani, H.A., Shabani, F. & Kumar, L. 2014. Colonization and Biodegradation of photo-oxidized Low-density Polyethylene (LDPE) by New Strains of *Aspergillus* sp. and *Lysinibacillus* sp. *Bioremediation*, 18: 213-226.

58. Fiorenza L., Benazzi S., Henry A., Salazar-García DC., Blasco R., Picin A., Wroe S. and O. Kullmer, 2014. To meat or not to meat? New perspectives on Neanderthal ecology. *Yearbook of Physical Anthropology*. DOI: 10.1002/ajpa.22659.

59. Fiorenza L., 2014. Reconstructing diet and behaviour of Neanderthals from Central Italy through dental macrowear analysis. *Journal of Anthropological Sciences* 93: DOI 10.4436/JASS.93002.

60. Fiorenza L., Benazzi S., Moggi-Cecchi J., Menter C.G. and K. Ottmar, 2014. Dental macrowear analysis in Great Apes. *American Journal of Physical Anthropology* Volume 153 Issue S58, pages 117-118.

61. Geiser, F., Currie, S.E., O'Shae, K.A., Hiebert, S.M. (2014) Torpor and hypothermia: reversed hysteresis of metabolic rate and body temperature. *Am J Physiol Regul Integr Comp Physiol*. 307:

62. Good, M.K., Clarke, P.J., Price, J.N. & Reid, N. 2014. Seasonality and facilitation drive tree establishment in a semi-arid floodplain savanna. *Oecologia* 175:261-271.

63. Gross, C. L. & Mackay, D. 2014. Two decades of demography reveals seed and seedling transitions limit population persistence in a translocated shrub. *Annals of Botany*. 114:85-96.

64. Gross, C. L., Nelson, P., Haddadchi, A. & Fatemi, M. 2014. Somatic mutations contribute to genotypic diversity in sterile and fertile populations of the threatened shrub, *Grevillea rhizomatosa* (Proteaceae).

65. Gross, C. L. & Vary, L.B. 2014. Arrested recovery in sandy woodland correlates with a lack of heavy and long seeds in the seed bank. *Ecosphere* 5:70.

66. Growns, I., Ryder, D.S., Kobayashi, T., & García, A. 2014. Freshwater macroinvertebrates of Lord Howe Island. *Journal of Natural History*.

67. Haddadchi, A., Fatemi, M. & Gross, C.L. 2014. Clonal growth is enhanced in the absence of a mating morph: a comparative study of fertile stylar polymorphic and sterile monomorphic populations of *Nymphoides montana* (Menyanthaceae). *Annals of Botany* 113:523-532.

68. Hally, L.A. & Paterson, J.R. 2014. Biodiversity, biofacies and biogeography of middle Cambrian (Series 3) arthropods (Trilobita and Agnostida) on the East Gondwana margin. *Gondwana Research* 26:654-674.

69. Jacquet, S.M., Brock, G.A. & Paterson, J.R. 2014. New data on *Oikozetetes* (Mollusca: Halkieridae) from the lower Cambrian of South Australia. *Journal of Paleontology* 88:1072-1084.

70. Kelly, R., Lundy, M.G., Mineur, F., Harrod, C. Maggs, C.A., Humphries, N.E. Sims, D.W. & Reid, N. 2014. Historical data reveal power-law dispersal patterns of invasive aquatic species. *Ecography* 37:581-590.

71. Khormi, H. & Kumar, L. 2014. Climate change and the potential global distribution of *Aedes aegypti*: spatial modelling using GIS and CLIMEX. *Geospatial Health* 8:405-415.

72. Khormi, H., Kumar, L. & Elzahrany, R. 2014. Regression model for predicting adult female *Aedes aegypti* based on meteorological variables: A case study of Jeddah, Saudi Arabia. *Journal of Earth Science & Climatic Change*, 5(1): 1-8. <http://dx.doi.org/10.4172/2157-7617.1000168>.

73. Kumar, L. & Sinha, P. 2014. Mapping salt-marsh land cover vegetation using high-spatial and hyper-spectral satellite data to assist wetland inventory. *GIScience and Remote Sensing*.

74. Kumar, L., Sinha, P. & Taylor, S. 2014. Improving image classification in a complex wetland ecosystem through image fusion techniques. *Journal of Applied Remote Sensing* 14:083616-083611.

75. Lambert, K.T.A., Andrew, N.R., McDonald, P.G.M. 2014. The influence of avian biodiversity and a weedy understorey on canopy arthropod assembly. *Open Journal of Ecology* 4:1003-1013. doi: 10.4236/oje.2014.416083.

76. Lambert, K.T.A., McDonald, P.G. 2014. A low-cost, yet simple and highly repeatable system for acoustically surveying cryptic species. *Austral Ecology*. 39: 775-785. doi:10.1111/aec.12143.

77. Laurie, J.R., Paterson, J.R. & Brock, G.A. 2014. Cambro-Ordovician Studies V. *Memoirs of the Association of Australasian Palaeontologists* 45:1-419.

78. Leung, T.L.F. 2014. Evolution: How a Barnacle Came to Parasitise a Shark. *Current Biology* 24:R564-R566.

79. Leung, T.L.F. 2014. Fish as parasites: an insight into evolutionary convergence in adaptations for parasitism. *Journal of Zoology*.

80. Maddin, H.C. & Sherratt, E. 2014. Influence of fossoriality on inner ear morphology: insights from caecilian amphibians. *Journal of Anatomy* 225:83-93.

81. Marks, C. A., Ivo Edwards, I., David Obendorf, D., Filipe Pereira, F. and Graham P. Hall, G.P. (2014). Did 'precautionary' 1080 baiting have a realistic potential to eradicate Red Foxes (*Vulpes vulpes*) in Tasmania without in situ monitoring data? *Ecological Management and Restoration* 15(3): doi: 10.1111/emr.12121

82. Marks, C., Obendorf, D., Pereira, F., and Hall, G. (2014). The dispersion and detection patterns of mtDNA assigned Red Fox (*Vulpes vulpes*) scats in Tasmania are anomalous. *Journal of Applied Ecology* doi: 10.1111/1365-2664.12278

83. Marks, C., Obendorf, D., Pereira, F., and Hall, G. (2014). Opportunistically acquired evidence is unsuitable data to model fox (*Vulpes vulpes*) distribution in Tasmania. *Wildlife Society Bulletin*. DOI: 10.1002/wsb448.

84. McAllan, B.M., Geiser, F. (2014) Torpor during reproduction in mammals and birds: dealing with an energetic conundrum. *Integrative and Comparative Biology* DOI: 10.1093/icb/icu93. Invited Review.

85. McDonald, P.G. 2014. Cooperative breeding beyond kinship: why else do helpers help? *Emu* 114:91-96.

86. Moore, B., Andrew, R.L., Kulheim, C. & Foley, W.J. 2014. Explaining intraspecific diversity in plant secondary metabolites in an ecological context. *New Phytologist*.201:733-750.

87. Moore, B. D., Andrew, R.L., Kulheim, C. & Foley, W.J. 2014. Causes and consequences of intraspecific chemical diversity (Tansley Review). *New Phytologist*.

88. Nooten, S.S., Andrew, N.R. & Hughs, L. 2014. Potential impacts of climate change on insect communities: a transplant experiment. *PLoS ONE* 9:e85987.

89. Parr, W.C.H., Soligo, C., Smaers, J., Chatterjee, H.J, Ruto, A., Cornish, L. & Wroe, S. 2014. Three-dimensional shape variation of talar surface morphology in hominoid primates. *Journal of Anatomy*. 225:42-59.

90. Paterson, J.R., Edgecombe, G.D. & Jago, J.B. 2014. The 'great appendage' arthropod *Tanglangia*: biogeographic connections between early Cambrian biotas of Australia and South China. *Gondwana Research*.

91. Paterson, J.R. 2014. Trilobites in early Cambrian tidal flats and the landward expansion of the Cambrian explosion. *Comment. Geology*, 42 42:e341

92. McDonald, P.G. 2014. Cooperative breeding beyond kinship: why else do helpers help. *Emu*.

93. Prieto-Marquez, A., Wagner, J.R., Bell, P.R. & Chiappe, L.M. 2014. The late-surviving 'duck-billed' dinosaur *Augustynolophus* from the upper Maastrichtian of western North America and crest evolution in *Saurolophini*. *Geological Magazine*.

94. Nguyen, C., Bahar, H., Baker, G. & Andrew, N.R. (2014) Thermal tolerance limits of diamondback

moth in ramping and plunging assays. PLoS ONE, 9, e87535. doi: 10.1371/journal.pone.0087535

95. Rader, R., Bartomeus, I., Tylianakis, J.M. & Laliberte, E. 2014. The winners and losers of land use intensification: pollinator community disassembly is non-random and alters functional diversity. *Diversity and Distributions* 20:908-917.

96. Reid, S. & Reid, N. 2014. Carbon storage value of native vegetation on a subhumid–semi-arid floodplain. *Crop and Pasture Science* 64:1209-1216.

97. Riek, A. & Geiser, F. 2014. Heterothermy in pouched mammals - a review. *Journal of Zoology* 292:74-85.

98. Rojas, A.D., Kortner, G. & Geiser, F. 2014. Torpor in free-ranging antechinus: does it increase fitness? *Naturwissenschaften* 101:105-114.

99. Ruf, T., Geiser, F. (2014) Daily Torpor and hibernation in birds and mammals. *Biol Rev.* doi:10.1111/brv.12137.

100. Saremi, H., Kumar, L., Stone, C., Melville, G. & Turner, R. 2014. Inventory Estimates in Pine Plantations (*Pinus radiata* D. Don) can be Improved through the Use of Airborne LiDAR Data. *Remote Sensing*.

101. Saremi, H., Kumar, L., Turner, R. & Stone, C. 2014. Impact of local slope and aspect assessed from LiDAR records on tree diameter in radiata pine (*Pinus radiata* D. Don) plantations. *Annals of Forest Science*.

102. Saremi, H., Kumar, L., Turner, R. & Stone, C. 2014. Airborne LiDAR derived canopy height model reveals a significant difference in radiata pine (*Pinus radiata* D. Don) heights based on slope and aspect of sites. *Trees - Structure and Function* 28:733-744.

103. Schultz N., Reid, N., Lodge, G. & Hunter, J. 2014. Broad-scale patterns in plant diversity in a variegated temperate Australian agricultural landscape. *Austral Ecology* 39, 855–863. <http://onlinelibrary.wiley.com/doi/10.1111/aec.12154/pdf>

104. Schultz N., Reid, N., Lodge, G. & Hunter, J. 2014. Seasonal and interannual variation in vegetation composition: implications for survey design and data interpretation. *Austral Ecology* 39, 755–766. DOI: 10.1111/aec.12141

105. Shabani, F., Kumar, L. & Esmaeli, A. 2014. Future Distributions of *Fusarium oxysporum* f. spp. in European, Middle Eastern and North African Agricultural Regions under Climate Change. *Agriculture, Ecosystems and Environment* 197:96-105.

106. Shabani, F., Kumar, L. & Taylor, B. 2014. Projecting date palm distribution in Iran under climate change using topography, physicochemical soil properties, soil taxonomy, land use and climate data. *Theoretical and Applied Climatology*.

107. Shabani, F., Kumar, L., Taylor, S. 2014. Suitable regions for date palm cultivation in Iran are predicted to increase substantially under future climate scenarios. *Cambridge Journal of Agricultural Science*, 152: 543-557. doi:10.1017/S0021859613000816

108. Sherratt, E., Gower, D.J., Klingenberg, C.P. & Wilkinson, M. 2014. Evolution of Cranial Shape in Caecilians (Amphibia: Gymnophiona). *Evolutionary Biology*. 41(4): 528-545

109. Smith, P.M., Brock, G.A. & Paterson, J.R. 2014. Fauna and biostratigraphy of the Cambrian (Series 2, Stage 4; Ordian) Tempe Formation (Pertaoorrt Group), Amadeus Basin, Northern Territory. *Alcheringa. Memoirs of the Association of Australasian Palaeontologists*

110. Smith, P.M., Brock, G.A., Paterson, J.R. & Topper, T.P. 2014. New bradoriid arthropods from the Giles Creek Dolostone (Cambrian Series 3, Stage 5; Templetonian), Amadeus Basin, central Australia. *Memoirs of the Association of Australasian Palaeontologists* 45:233-248.

111. Stawski, C., Willis C.K.R., Geiser, F. 2014. The importance of temporal heterothermy in bats. *Journal of Zoology* 292: 86-100 Invited Review.

112. Stimpson, M. L., Bruhl, J.J. & Weston, P.H. 2014. Could this be Australia's rarest *Banksia*? *Banksia vincentia* (Proteaceae), a new species known from fourteen plants from south-eastern New South Wales, Australia. *Phytotaxa* 163:269-286.

113. Stork, NE, Kitching, RL, Cermak, M, Davis, NE & Abbott, KL (2014) The impact of aerial baiting for control of the yellow crazy ant, *Anoplolepis gracilipes*, on canopy-dwelling arthropods and selected vertebrates on Christmas Island (Indian Ocean). *Raffles Bulletin of Zoology. Special Supplement on Christmas and Cocos (Keeling) Islands*.

114. Rayner, GM, Papakonstantinou, T., Gleadow, RM & KL Abbott (2014) Iterative writing programs

may generate higher student confidence about their ability to write, but not necessarily improved writing ability. *Journal of Academic Language & Learning* 8(2): 1-12.

115. Taylor, S. & Kumar, L. 2014. Impacts of climate change on invasive *Lantana camara* L. distribution in South Africa. *African Journal of Environmental Science and Technology*.8:391-400.

116. Thomas, N., Bruhl, J.J., Ford, A. & Weston, P.H. 2014. Molecular dating of Winteraceae reveals a complex biogeographical history involving both ancient Gondwanan vicariance and long-distance dispersal. *Journal of Biogeography*. 41:894-904.

117. Tschopp, P., Sherratt, E., Sanger, T.J., Groner, A.C., Aspiras, A.C., Hu, J.K., Pourquié, O., Gros, J. & Tabin, C.J 2014 A relative shift in cloacal location repositions external genitalia in amniote evolution. *Nature*, doi:10.1038/nature13819

118. Vavrek, M. J., Murray, A.M., Bell, P.R. 2014. An early Late Cretaceous (Cenomanian) sturgeon (Acipenseriformes) from the Dunvegan Formation, northwestern Alberta, Canada. *Canadian Journal of Earth Sciences*.

119. Verma N.V., Reid, N. & Wilson, B. 2014. An allometric model for estimating DBH of isolated and clustered Eucalyptus trees from measurements of crown projection area. *Forest Ecology and Management* 236:125-132.

120. Verma, N.K., Lamb, D.W., Reid, N. & Wilson, B. 2014 A comparative study of land cover classification techniques for 'farmscapes' using very high resolution remotely sensed data. *Photogrammetric Engineering & Remote Sensing* 80, 461–470.

121. Vernes, K. 2014. Seasonal truffle consumption by long-nosed bandicoots (*Perameles nasuta*) in a mixed rainforest-open forest community in north-eastern New South Wales. *Australian Mammalogy*. 36:113-115.

122. Vernes, K. & Jarman, P. 2014. Foraging behaviour and handling times for long-nosed potoroos (*Potorous tridactylus*) foraging for buried truffles. *Australian Mammalogy* 36:128–130.

123. Vernes, K. & Jarman, P. 2014. Long-nosed potoroo (*Potorous tridactylus*) behaviour and handling times when foraging for buried truffles. *Australian Mammalogy*.36:128-130.

124. Vines, T.H., Albert, A.Y.K., Andrew, R.L., Debarre, F., Bock, D.G., Franklin, M.T., Gilbert, K.J., Moore, J.S., Renaut, S. & Rennison, D.J. 2014. The Availability of Research Data Declines Rapidly with Article Age. *Current Biology* 24:94-97.

125. Warrington, M.H., McDonald P.G., Rollins L.A., Griffith S.C. 2014. All signals are not equal: acoustic signalling of individuality, sex and breeding status in a cooperative breeder. *Animal Behaviour* 93: 249-260.

126. Warrington, M.H., McDonald P.G., Sager A., Griffith S.C. 2014. The vocal repertoire of the cooperatively breeding Apostlebird, *Struthidae cinerea*. *Emu*. 114:206-221.

127. Wilkinson, M., Presswell, B., Sherratt, E., Papadopolou, A., Gower, D.J. A new species of striped Ichthyophis Fitzinger, 1826 (Amphibia: Gymnophiona: Ichthyophiidae) from Myanmar. 2014 *Zootaxa*: 3785 (1): 045–058

128. Yates, M.L., Andrew, N.R., Binns, M. & Gibb, H. 2014. Morphological traits: predictable responses to macrohabitats across a 300 km scale. *Peer J*, 2, e271. doi: 10.7717/peerj.271

129. Zewe, F., Meek, P., Ford, H. & Vernes, K. 2014. A vertical bait station for black rats (*Rattus rattus*) that reduces bait take by a sympatric native rodent. *Australian Mammalogy*. 36:67-73.

### Published Conference Proceedings

130. Bell, P. R., Sissons, R., Burns, M.E., Fanti, F., & Currie, P.J. in press. New hadrosaurine material from the upper Campanian Wapiti Formation, west-central Alberta. in D.A. Eberth. & D. C. Evans, editor. *The Hadrosaurs: Proceedings of the International Hadrosaur Symposium*. Indiana University Press, Bloomington and Indianapolis.

131. Bell, P. R. in press. A review of hadrosaurid skin impressions. in D.A. Eberth. & D.C. Evans, editor. *The Hadrosaurs: Proceedings of the International Hadrosaur Symposium*. Indiana University Press, Bloomington and Indianapolis.

132. Bell, P. R. in press. A review of hadrosaurid skin impressions. In D.A. Eberth & D.C. Evans (eds.) *D.A. Eberth & D.C. Evans. Proceedings of the International Hadrosaur Symposium*. Bloomington and Indianapolis. Indiana University Press.

133. Bell, P. R., Sissons, R., Burns, M.E., Fanti, F., & Currie, P.J. in press. New hadrosaurine material from the upper Campanian Wapiti Formation, west-central Alberta. *The Hadrosaurs: Proceedings of the International Hadrosaur Symposium*. Indiana University Press, Bloomington and Indianapolis. in D.A. Eberth & D.C. Evans, editors. *The Hadrosaurs: Proceedings of the International Hadrosaur Symposium*. Indiana University Press, Bloomington and Indianapolis.



### HDR Awards and Honours

#### Scholarships and Trusts

Ahmad Barati - Holsworth Wildlife Research Endowment, \$7,000 Holsworth Wildlife Research Endowment. *Cooperative breeding dynamics in the Noisy Miner*.

Phoebe Haslett - Hunter Regional Landcare scholarship, \$5k for honours project *Erosion in the Pages River, NSW*.

Kathryn Lambert - BirdLife Australia Stuart Leslie Award, \$3,070 *How important is invertebrate diversity and the presence of Lantana to Bell Miner distribution? Implications for effective Bell Miner Associated Dieback management*.

David Mackay Holsworth Wildlife Research Endowment, \$6500 per annum, renewable for 3 years (2014-2016).

#### Conference Awards

Heidi Kolkert - ESA: best speed talk. *Microbats as pest agents in intensive agricultural area in northern NSW*.

Lorena Ruiz Talonia - ESA :3rd prize for her poster. *Germination of two challenging native shrubs for restoration*.

David Mackay – Winner of ERS 3 minute thesis. *Can native figs beat climate change?*

### Seminar Series

The LEE Seminar Series brings exciting speakers from around the world to UNE and showcase our UNE talent. The two aims are to bring our diverse theme together and as a community, and to facilitate collaboration and networking with researchers at other institutions. We have had a series of New Lecturer Double Bills aimed at introducing recent appointments to the rest of the School to foster engagement and collaboration. Together with advertising the seminars through emails and posters, staff have been persistent in encouraging their postgraduate students to attend. This is essential to both the success of the seminar series and to the students' own development. The series has been well attended by staff and students of the LEE theme, as well as undergraduates and members of the other two themes in the School. (Dr Rose Andrew and Dr Hamish Campbell).

#### Presenters and Titles

A/Prof Peter Clarke (Botany): *FIRE ON EARTH: Evolution, Ecology and Implication for Agriculture and the Environment*.

Talia Moore (Harvard University): *Characterisation and Evolution of bipedal desert rodent locomotion*.

A/Prof Nigel Andrew (Zoology): *Assessing Invertebrate Responses to Global Warming: from individual through to biogeographic responses*.

Dr Kirsti Abbott (Zoology): *School of Ants Australia – a national citizen science project*.

A/Professor Karl Vernes (Ecology): *Resolving the identity of Himalayan Rodents and cave use by Mexican Mammals: an update on two camera-trapping projects*.

Professor Caroline Gross (Ecology): *Can the fig-fig wasp mutualism persist in a fragmented landscape?*

Dr Emma Sherratt (Evolutionary Biology): *Macroevolution in the Underworld: large-scale patterns of morphological evolution in burrowing animals*.

Dr Romina Rader (Environmental Science and Management): *To bee or not to be – are crops pollinated by insects other than bees?*

Dr Phil Bell (Earth Science): *Tracking Dinosaurs Around the World*.

Mr Peter Doherty (Program Manager of the Atlas of Living Australia, CSIRO): *The Atlas of Living Australia*.

Dr Eleanor Slade, (Oxford University): *Dung Beetles*.

Dr Rose Andrew (Evolutionary Biology): *Integrating geographic and genomic landscapes*.

Dr Hamish Campbell (Ecology): *Movement Science – An Emerging Paradigm*

For seminar summaries and podcasts please visit our website : <http://www.une.edu.au/about-une/academic-schools/school-of-environmental-and-rural-science/research/life-earth-and-environment/lee-seminar-series>

# LEE in the Media and the Community

## Many of our program leaders have been putting research out into the public arena

### News

#### Report cards for NSW river systems



On Tuesday 16/9/2014 the results of a major collaborative project between the Clarence Valley Council and A/Prof Darren Ryder assessing the health of the Clarence River under the banner of a flagship projects Eco-Health was launched.

<http://www.nbnnews.com.au/media/coffsclarencriver160914.mp4>

Details can also be found on UNE Research Blog : <http://blog.une.edu.au/news/2014/09/30/report-cards-for-nsw-river-systems/>

#### Extinct Australian predator was fierce but no Tasmanian devil

A Feature article on the Research of A/Prof Stephen Wroe's Function, Evolution and Anatomy Research Laboratory.

A fox-sized marsupial predator that roamed Australia from about 23 to 12 million years ago had plenty of bite to go along with its bark. But while it was certainly fierce, it was no Tasmanian devil, Australia's famously ferocious bantamweight brute. REUTERS:Wed Apr 9, 2014 5:03pm EDT . <http://www.reuters.com/article/2014/04/09/us-science-marsupial-idUSBREA381YD20140409>



### Radio

#### Creepy but Curious

Every Tuesday morning, an academic from Zoology makes an appearance on ABC New England radio to regale us with tales from the natural world. This segment is hosted by Kelly Fuller and she is joined by Tommy Leung, Paul McDonald, Nigel Andrew, or Kirsti Abbott to talk about the weird and wonderful side of nature that most people might not have noticed. Each week this team of academics open a window into the life of animals that can be rather curious, and sometimes a bit creepy, but always fascinating.



For an idea of what kinds of topics they talk about, here's a sample of what was covered in 2014:

Emerald Jewel Wasp - "...an exquisitely nightmarish life-style that no monsters in any horror movie or TV series or novel have ever come to matching." [www.abc.net.au/local/audio/2014/03/17/3964799.htm](http://www.abc.net.au/local/audio/2014/03/17/3964799.htm)

Dastardly acts in songbirds - "Is the chirp a happy song or a warning to stay out? Is the lark a musical tribute or a sign of menace?" <http://www.abc.net.au/local/>

[audio/2014/03/04/3956593.htm](http://www.abc.net.au/local/audio/2014/03/04/3956593.htm)

Plant SOS - "Are aromatic scents from our favourite herbs a cry for help, a warning sign, or an SOS?" <http://www.abc.net.au/local/audio/2014/08/05/4061181.htm>

Insect poo - "Frass and honeydew and it might even be a part of the your beauty regime" <http://www.abc.net.au/local/audio/2014/06/24/4032027.htm>

Creepy but Curious 2014: <http://www.abc.net.au/local/stories/2014/02/18/3947258.htm>

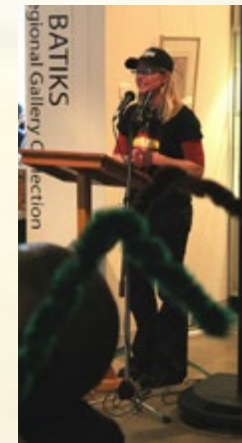
## Out in the Community



### Where the wild things go.

6th Annual Steve Irwin Memorial Lecture (Uni Queensland and Australia Zoo) Dr Hamish Campbell

From whales to wombats, from bats to bees – throughout Australia thousands of animals are being tracked and monitored. This research is helping scientists to better understand the patterns, causes and consequences of animal movement. However, the application of animal movement information is still in its infancy. Will knowing “where the wild things go” help us conserve them? .



### Little Things that Run the World at NERAM

Dr Kirsti Abbott and the Insect Ecology Lab set up a new exhibition and community outreach program at NERAM : The North Western Regional Science Hub presented a “Science Meets Art” event at NERAM to celebrate National Science Week (and beyond) – introducing children to the School of Ants Project through an interactive and creative experience exploring the life of ants. From 16 August to 19 October, Little things that run the world offered the community an opportunity to imagine life as an ant. This also involved an AntBlitz at Black Gully on 21 September. Over a 24 hour period ants were hunted, counted and identified. <https://vimeo.com/112469888>.

Kirsti was also featured in a recent ABC radio conversation with Richard Fidler <http://www.abc.net.au/local/stories/2015/02/05/4174187.htm>

## Citizen Science Projects



**School of Ants Australia** (Kirsti Abbott). <http://schoolofants.net.au/>

The School of Ants is an exciting citizen-scientist driven project launched at UNE as a module of the original school based in the US. The project aims to document the ants around homes and schools in urban areas, but also to examine the diversity, distribution and diets of ants in rural and remote inhabited regions too.

**Bell Minor Birds** (Kathryn Teare-Lambert)

## Blogs



Dr Tommy Leung co- hosts The Parasite of the Day Blog featuring weird and wonderful parasites as and some of the latest research being published on all manners of parasitic and infectious organisms. <http://dailyparasite.blogspot.com.au/>



Dr Romina Rader has an article cutdown on *you tube* for a Journal of Applied Ecology publication on plant diversity response to organic farming and heterogeneity. [http://youtu.be/vBy0OfZ\\_HX8](http://youtu.be/vBy0OfZ_HX8). and the JAE blog. <http://jappliedecologyblog.wordpress.com/>



The Insect Ecology Laboratory led by A/Prof Nigel Andrew has a blog featuring latest publications, international visitors, their activities in the community and latest publications . <http://blog.une.edu.au/insectecology/>

## International Research & Education : Bhutan



During November 2014, 18 undergraduate and postgraduate students together with A/Prof Karl Vernes Professor Caroline Gross, and Ian Simpson from the LEE theme (School of Environment and Rural sciences) and Dr Raj Rajaratnam (School of Behavioural Cognitive & Social Sciences), embarked on a field course of a lifetime to Bhutan that focussed on the unique ecology and biogeography of the Eastern Himalayas. UNE has a Memorandum of Understanding with Ugyen Wangchuck Institute for Conservation and Environment (UWICE) which facilitated this international research and education program. The group focused on conservation biology, wildlife ecology, water resource management and environmental sustainability. The team were guided by UWICE research officer and UNE PhD student, Tiger Sangay, who is studying the movement ecology of the Takin, Bhutan's national animal and Richen Singye and Norbu Pangal completed the team.

Bhutan lies at the junction of three major biogeographic regions and is recognised as one of the world's biodiversity hotspots. The country encompasses subtropical lowlands, mountainous temperate forests and alpine zones that play host to a vast diversity of vascular plants, mammals, birds and invertebrates, the majority of which are poorly studied. The field experience at Himalayan altitudes between 2700 to 4000m covered three research themes, riverine ecology, vegetation changes across altitudinal gradients and wildlife ecology.

During two-week field trip, camera trapping studies found two different colour morphs of the Asiatic Golden Cat interacting together, which previously were thought to occur at different altitudes. Botanical collections found plant and truffle samples that are yet to be identified and possible a plant species new to science. These and other discoveries will be shared with colleagues at UWICE to add to their growing knowledge of Bhutan's rich biodiversity and fascinating ecology.

This intensive field course gave the students a taste for research work and for many it was a life changing experience that has put them on track for a research degree.

*There are further opportunities for overseas research experience in the 2015 ER381/581 program.*





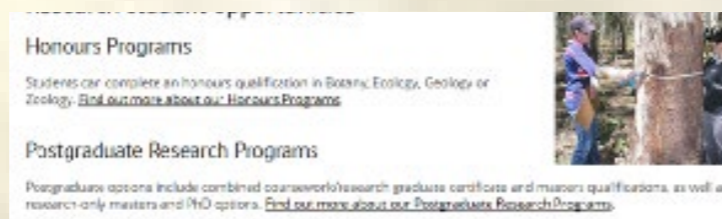
Together with recent upgrades of the School of Environmental and Rural Sciences (ERS) a website for LEE has been linked to the Research Themes of ERS, and has a linking button from the main ERS webpage. <http://www.une.edu.au/about-une/academic-schools/school-of-environmental-and-rural-science/research/life-earth-and-environment>.



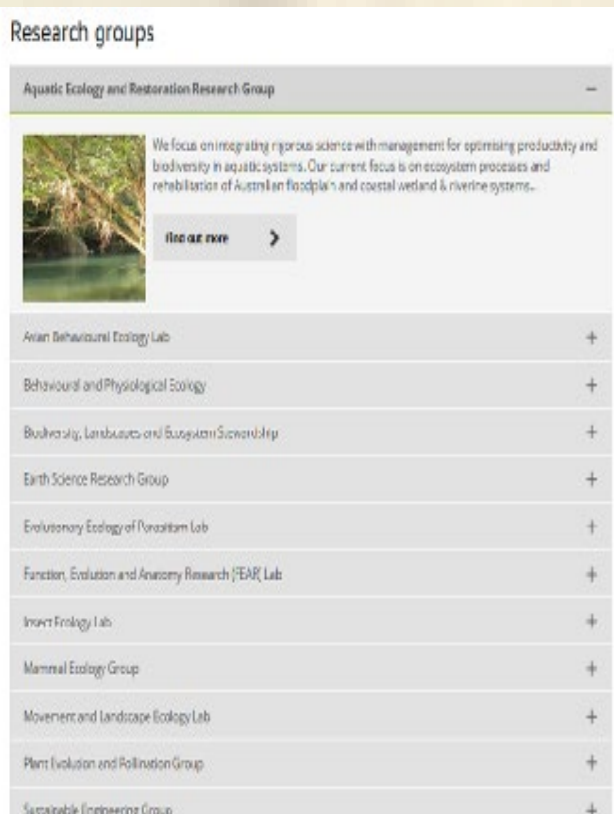
Within this are direct links to the main research programs and research staff profiles within each of the five ERA subthemes.

There are direct links to Honours programs and coordinator contacts within the theme and information for

further study in relevant disciplines for other coursework and research higher degrees, together with links to scholarship information .



A link to a LEE seminar information page is included with details of upcoming events and a link to videos of all LEE seminar Series presentations, and a summary of all completed seminars in an expandable box.



Each Research Laboratory and Group within the theme has a separate webpage including details of :

- Research interests
- Potential Student Projects ( both honours and higher levels)
- Our People
- Facilities ( Laboratory and Field)
- Major Publications
- And a primary contact.

Finally there is page with Staff Resources including Induction information and general WHS guidelines. Links are also included to relevant UNE:

- fieldwork assessment policies and risk assessment forms
- Incident reporting
- Hazardous substance management
- And contact and location details of First aid officers and supplies

# Facilities



## Laboratory Upgrades

The 3rd floor reserch Laboratories on Level 3 of W55 were closed in during the latter part of the year. These now provide safe working spaces for research in:

- Plant ecology, conservation and pollination
- Mammalian Ecology and Conservation
- Movement and Landscape Ecology
- Ecosystem services in agricultural landscapes



## Herbarium

The N.C.W. Beadle Herbarium (NE) at UNE consists of c.100 000 vascular plant specimens, housed in a purpose built facility with excellent stereomicroscopes and specimen imaging equipment. Herbarium NE was the first university-only herbarium to deliver data to Australia’s Virtual Herbarium and Atlas of Living Australia (c. 83 000 records from 2013). Herbarium NE is internationally recognised, and is able to exchange specimens with, borrow from and lend to other recognised herbaria. For more details and contacts please look on our website, <http://www.une.edu.au/about-une/academic-schools/school-of-environmental-and-rural-science/facilities/ncw-beadle-herbarium>.

## Zoology Museum

The Zoology museum was established in 1969 as a teaching museum with displays primarily designed to support the teaching of the Zoology department’s own students. The displays stress form, anatomy, taxonomy and evolutionary relationships within all of the major Zoological groups and include several fine sequences of associated fossils.

Anyone is welcome to visit the museum, and entry is free of charge. Teachers proposing to make use of this facility need firstly to make a booking and perhaps visit the museum beforehand to work out a study schedule for the class to use on its visit. Due to space limitations, numbers should be limited to 25. Guided visits for more senior students with specific interests can be arranged by appointment. For more details and contacts please look on our website at: <http://www.une.edu.au/about-une/academic-schools/school-of-environmental-and-rural-science/facilities/zoology-museum>

## Geology Collection

The School maintains a comprehensive collection of rock and fossil samples from research collections. These are predominantly from the New England region (the most comprehensive collection of New England rocks worldwide). Approximately 75,000 rock samples are catalogued. The School also maintains a small core library, with a selection of drill core from Eastern Australia. The Mineral, Rock, Fossil and Drill Core Collection is available for research work undertaken by all students and staff of UNE, as well as other universities and research institutions. Curated by: Malcolm Lambert, E: [mlamber7@une.edu.au](mailto:mlamber7@une.edu.au)

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## Photography Credits

Pg4: *Eastern Long Necked turtles, Chelodina longicollis in the Gwydir wetlands* – Ryder  
Pg5: Earth Science studentns, 2013 - Vickery  
Pg9: *Eucalyptus albopurea* - Gross  
Pg10: *Eastern Quoll, Dasyurus viverrinus* – Forge  
Pg11 (lft): *Commelia cyanea* – Gross  
Pg11 (rt): *Old Dromana Wetland (near Moree)* - Ryder  
Pg12(lft): *Eastern Quoll, Dasyurus viverrinus* – Forge  
Pg12 (rt): *attaching satellite transmitter in estuarine crocodile* – Campbell  
Pg13 (top): *Aerial of Gwydir River* – Ryder  
Pg13 (bottom): Tagging wild dogs – Zewe  
Pg14 (top): Australian Freshwater Ecology Book cover - Wiley Publications  
Pg14 (bottom): Butterfly on Olearia – Gross  
Pg15 (top): *Hamish Campbell fixing transmitter on Estuarine Crocodile.*  
Pg15 (bottom): *Bengal Tiger (Panthera tigris) by camera trap (Bhutan), Jaguar (Panthera onca) in Cenote (Mexico)* – Vernes  
Pg16: *RSNR class 2013* - Ryder  
Pg17 (lft): *Ecosystem Rehabilitation Class, 2014* – Rader  
Pg17 (rt): *Mango plantation Nth QLD* – Rader  
Pg18 (lft): *Teaching environmental management (Myanmar, Burma)* – Prior  
Pg19: *Sprayed fibre reinforced polymer for strengthening timber bridge girders* – Mahini  
Pg 20 (top): *Blue Blowfly pollinator on Mango flower* – Rader  
Pg21 (top): *Nick Schulz in north west slope, NSW.* – Reid  
Pg21 (bottom): *Native bee on Brassica* – Rader  
Pg22 (top) *Julian Prior with members of Myanmar Agriculture and Asian Institute of Technology. and Students form Yezin Agricultural University* (rt). Prior  
Pg 23 (top) : *Islands that are vulnerable to effects of climate change* – Kumar  
pg23 (mid) Calliphonidae (common blowfly) - Rader  
pg23 (bottom) *Teaching environmental management (Myanmar, Burma)* – Prior  
Pg 24 : *Sunflower (Helianthus) hybrids in glass house* – Andrew, R.  
Pg21 (lft) *Lepidosperma gladiatum* - Mills  
Pg 25 (rt): *Helianthus ecotypes* - Andrew, R.

pg 27 sunflower crop - Rural Science stock  
 pg28 (bottom) caelian amphibian from CT scan - Sherratt  
 pg29 major clades on Winteraceae - Bruhl  
 Pg 30 *Alan Baxter in Tibet* – Baxter  
 Pg31(ift): *Redlichia tachoensis (Trilobite)* – Paterson  
 Pg31 (rt) *Lower jaw of a tyrannosaurid, Gorgosaurus, from the Late Cretaceous of Alberta, Canada*– Bell  
 Pg32 (lft): *The JOIDES Resolution drill ship off the coast of Costa Rica.* – Baxter  
 Pg32 (rt): *Dr Luke Milan recording geological data from the Tamworth Belt.* – Baxter  
 pg32 (bottom) Homoniid skull - Fiorenza  
 pg 33 (top) Orminston gorge, NT - Geology stock  
 pg 33 (mid) Ammonite (spain) - Paterson  
 Pg33 (bottom): *Cover of Current Biology Vol24,1: CellPress*  
 Pg34 (top) *500 mill YO blind marine creatures (Ventulicolians)* – Biomed Central  
 pg34 (bottom) Neanderthal skull - Fiorenza  
 Pg 35 (top) *Discussing a core on board the ship, with colleagues from Japan and America. Photomicrographs of calcareous nannofossils.* - Baxter  
 Pg 35 (bottom): *Dredge locality map in the Perth Abyssal Plain* – Milan  
 Pg37 *Eastern Pygmy Possum, Cercartetus nanus* – Geiser  
 Pg 38 (lft): *Extinct sabretooth, Thylacosmilus secured a kill with its very powerful neck muscles* - Wroe  
 Pg 38 (lft): *Ant* - Andrew  
 Pg 39 (lft): *Noisy Miner at nest* – McDonald  
 Pg 39 (rt): *Parasitic nematode larvae embedded in the stomach lining of a Litoria frog.*– Leung  
 Pg 40: *Finite element model, Didelphis virginiana (opossum)* - FEAR Lab  
 Pg 42 (top) *Smithsopsis macroura* – Fritz Geiser  
 Pg43 Graduation Oct, 2014 - UNE stock  
 Pg44: *Aerial photograph, Clarence River estuary* – Ryder  
 Pg52 (bottom) Buck Quarry - Bell  
 Pg 54: *Photographer* – Abbot  
 Pg 55 (top): *Clarence River* – Ryder  
 Pg 55(middle): *Fox sized marsupial predator (23-12 mill YO)* – FEAR lab  
 Pg 55 (bottom) *Creepy but curious image* – Leung  
 Pg56 (from top to bottom)  
*Steve Irwin Memorial Lecture (Hamish Campbell, mid back row; Irwin family – front)*  
*Kirsti Abbott at Science meets Art at NERAM* – NERAM  
 School of Ants Logo - c/o citizen science programs  
*Dr Tommy Leung avatar* – Leung

*Dr Romina Rader netting pollinators on mango trees.* – Jagger  
*Ant* - Koertner  
 Pg57 *images from the Bhutan trip* - Vernes  
 pg59 Plant ecology and pollination laboratory - Gross  
 pg62 Waratah - Gross



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