

LINNEAN SOCIETY OF NEW SOUTH WALES

LINN S'O'C' NEWS

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Dr Helene A. Martin
 School of BEES
 University of New South Wales
 SYDNEY NSW 2052
 h.martin@unsw.edu.au

SOCIETY OFFICE:

Suite 3, 40 Gardeners Road
 KINGSFORD NSW 2032

Telephone:**(02) 9662 6196****POSTAL ADDRESS:**

PO Box 82
 KINGSFORD NSW 2032

Mobile Service**0408 693 974****E-MAIL:** linnsoc@inet.net.au**WEB SITE:** <http://linneansocietynsw.org.au>

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INCLUDED WITH THIS ISSUE

Form for tax-deductible donations
 Record of the 2018 AGM
 Warrumbungles Symposium circular

NEW MEMBERS

We welcome

Mr Yi-Yang Chen, Australian National University. Field of interest: marine ecology.

Mr Richard J. Dimon. Sydney University. Fields of interest: taxonomy and systematics, evolution, phylogenetics, botany.

Ms Eva Fernandez Fernandez, University of Technology, Sydney. Fields of interest: microbiology, climate change.

Mr Kawsar Khan, Macquarie University. Fields of interest: behavioral ecology, evolutionary biology, conservation biology, taxonomy

Dr Lizzy Lowe, Macquarie University. Fields of interest: Ecology, behavior, invertebrates.

Mr Max Mallen Cooper, University of NSW. Fields of interest: biological soil crusts, functional traits, climate change, biopedturbation

Dr Jacqueline Nguyen, Australian Museum. Fields of interest: palaeontology, ornithology, evolution, taxonomy, systematics.

Dr Katrina Mikac, University of Wollongong. Fields of interest: wildlife conservation and ecology.

Mrs Anita Perkins, Southern Cross University. Fields of interest: multifunctional role of fungi Ascomyta, mycology, biochemistry, environmental science.

Dr Mitchell Tulau, Office of Environment and Heritage (OEH). Fields of interest: geology, soils, geomorphology.

Miss Jenna Wraith, Griffith University. Fields of interest: using big data to access conservation issues of threatened species, including orchids.

ROBERT DANIEL WALSH, OAM 28th December 1923 – 6th March 2018

Bob Walshe was a gentle and humble man who touched so many lives and he leaves our world a better place. Bob was twice named Sutherland shire Citizen of the year, and has been recognised as an environmental champion, a prodigious author and writer, a community advocate, as a teacher and an historian. When the Linnean Society of New South Wales produced its book on the Royal National Park, Bob was an enthusiastic supporter buying well over 100 copies which he generously gave as gifts to friends and colleagues. He also wrote two positive reviews published in the local press. He will be sorely missed by all his friends and acquaintances.

Robert King

AWARDS FROM THE SCIENTIFIC RESEARCH FUNDS

The current low interest rates limit funds available and the Society is unable to fund as many applications as it would like or to provide the full amount requested by the applicants. Decisions on where to make the cuts have been difficult and regrettable, worthwhile projects go unfunded because we do not have the money.

A most generous donation to the Research Funds by Roger Carolin has funded one extra grant and this will continue for the next five years. Thank you, Roger from the Society and on behalf of the applicants for your generosity.

Julian E. Tenison Woods Award (provided by the Sisters of St Joseph to the Linnean Society of NSW).

Timothy **Frauenfelder**, University of New England

Project: **Description of sauropod remains from the Griman Creek Formation at Lightning Ridge NSW and Bymount Queensland.**

The Early Cretaceous age Griman Creek Formation at Lightning Ridge is unique on a global scale, being the only locality that preserves a terrestrial fauna as natural casts in precious and non-precious opal. Fossil discovery there is almost exclusively the result of mining activity, which results in damage and strips fossils of their geological/stratigraphic context. The only outcrop of the Griman Creek Formation that is not within the opal fields of Lightning Ridge occurs near Bymount in SE Queensland. Sauropod remains there are relatively plentiful and

potentially taxonomically more informative than the isolated teeth found at Lightning Ridge. Awarded \$820.

Alexandra **Murray**, James Cook University

Project: **Analysis and Description of a Complete Ichthyosaur Skull from Boulia, Queensland**

This project will formally describe QMF58949, an ichthyosaur found near Boulia, western Queensland, place it within its global taxonomic context, and discuss the specimen's implications for our understanding of Cretaceous ichthyosaur diversity. The specimen consists of a complete skull, anterior cervical vertebrae and the nearly complete right front limb. Due to the completeness of the skull of QMF58949 and the presence of diagnostic postcranial material, this specimen has the potential to bring further clarity to our understanding of Australian Cretaceous ichthyosaurs. Awarded \$430.

William Macleay Award for Microbiology Research

Miss Eva **Fernandez Fernandez**, University of Technology Sydney

Project: **Revealing the sulphur cyclers on Port Hacking natural sea waters (Australia)**

Dimethylsulphoniopropionate (DMSP) is a key sulphur compound in the marine environments, which satisfies 95% of the sulphur and 15% of the carbon demands of marine microbes. DMSP is also the precursor of the climatically active gas dimethylsulfide (DMS),

Once in the atmosphere, DMS can increase cloud formation and light scattering which results in a decrease in sea surface temperature. Therefore, DMS has the potential to regulate local climate and counteract some of the effects of climate change. Phytoplanktons are the major producers of DMSP and together with heterotrophic bacteria, recycle and transform DMSP that may be incorporated into the biomass or converted into DMS. However, the conditions required for each pathway are unknown. What work that has been done has concentrated on the heterotrophic bacteria that ventilate about 3% of the DMSP production and incorporates 10% into the biomass. This project will study both phototrophic and heterotrophic microbes in a temperate environment. The method was proven in tropical regions. Awarded \$1,700.

Betty Mayne Award for Scientific Research in the Earth Sciences

Thomas **Claybourn**, Macquarie University.

Project: **Multiproxy correlation of the stratigraphy of East Antarctica and South Australia**

The lower Cambrian Byrd Group of eastern Antarctica has yielded a new fauna of small primarily phosphatic and phosphatised shelly fossils which are ideal for correlation to the shelly fossil biozones of South Australia. A multiproxy approach utilising carbon isotope ($\delta^{13}\text{C}$) chemostratigraphic data from the Byrd Group and biostratigraphy from a second section collected in South Australia allows direct comparison to be made between these regions. This will create a more unified stratigraphic understanding of East Gondwana (East Antarctica + South Australia) and its context in the global Cambrian timescale. Awarded \$1,080.

Dr Jacqueline **Nguyen**, Australian Museum.

Project: **Evolution of the Australasian passerine avifauna: insights from the New Zealand fossil record.**

St Bathans, one of the richest fossil sites in New Zealand, is 19–16 million years old and provides the only insight into New Zealand's terrestrial vertebrate fauna (including 35 types of birds) during this period. Little is known about the evolution of passerines (perching birds) in New Zealand, even though passerines represent over 50% of the world's bird diversity. This project will describe new fossils of passerine birds from St Bathans and interpret their evolutionary relationships to living taxa by estimating the phylogenetic relationships of various New Zealand passerine groups with Australian and New Guinean taxa. These groups

are important in understanding the evolutionary and biogeographic history of the Australasian avifauna. Awarded \$1,729.

Surrey Jacobs Award for Scientific Field Work

Mr Timothy Lindsay **Collins**, University of New England

Project: **Study of *Xerochrysum* from the Pilbara and revision of the genus**

The number of species in the genus is in doubt. Revision requires collection of new material at the right stage of flowering and fruiting, requiring well timed trips to the Pilbara and SW of WA. Awarded \$1,500.

John Noble award for Invertebrate Research

Dr Lizzy **Lowe**, Macquarie University

Project: **Variations in the brain size and behaviour of urban and rural jumping spiders**

To survive in urban areas, animals must cope with a range of novel environmental conditions. Some species are able to navigate these challenges and thrive in urban areas (exploiters) whereas others cannot and are excluded (avoiders). Comparing functional traits between urban exploiters and avoiders should identify mechanisms driving community structure. Increase in brain size has been shown to facilitate environmental exploration in birds and mammals. This project will study brain size in relation to behavioural plasticity in urban and rural communities of jumping spiders. Experimental behavioural responses will be recorded in both groups and brain size found from Micro CT scanning. Awarded \$1,700.

Joyce W. Vickery Scientific Research Awards

Yi-Yang (Alex) **Chen**, Australian National University

Project: **How does tropical macroalgae epifauna respond to changing sea temperature?**

Epifauna are invertebrates, typically 0.5-10mm long, living attached to the canopy of other organisms such as macroalgae and corals. This epifaunal community can have high levels of productivity, sufficient to support high levels of macro-invertebrates and fish. Shallow water habitats along tropical coastlines are often dominated by seaweed meadows alongside of coral reefs. The meadows are typically dominated by the canopy-forming macroalga *Sargassum* that exhibits seasonal fluctuations in canopy. These canopies are a good home to epifaunal invertebrates that are targeted by carnivorous fish but it is not known how the epifauna respond to the changes in temperature during these changes over space and time. This project will investigate the response(s) to changes, particularly of temperature in the Ningaloo region. Awarded \$2,000.

Ms Olivia **Davies**, Flinders University

Project: **The influence of *Wolbachia* on mitochondria in an Australian native bee.**

The Australian bee fauna is most unusual, being dominated by one family, the Colletidae. One subfamily, the Hylaeinae arose in Australia and has gone on to colonise the globe. In the native bee *Amphylaeus morosus*, the only known colonial bee in the family, the mitochondrial DNA (mDNA) has no variation across its entire range, Qld to Vic, except for mitochondrial heteroplasmy (two or more types of mDNA within an individual) and infection with two strains of *Wolbachia*, a bacterial parasite. Mitochondrial heteroplasmy occurs occasionally in other animals, including humans where it causes mitochondrial disease. 100% of the bees have the same two types of mDNA –very unusual. *Wolbachia* infection is very common, and 70% of all land based insects are infected.

Wolbachia is maternally inherited and has profound effects on the host. It can remove mitochondrial variation from the population, act as a feminising agent but interactions that allow it to manipulate the host remain largely unknown. The combination of these two features have never been reported before. This project will investigate whether these two features together in *A. morosus* have enabled deviant genetic systems to develop by following the inheritance of mtDNA after *Wolbachia* has been eliminated. Awarded \$1,200.

Mr James **Dorey**, Flinders University

Project: **Systematics and evolution of the highly diverse bee genus *Homalictus***

Australia has such a wide range of habitats, from xeric to mesic, but were they all able to support evolution of new species, hence an increase in biodiversity or were only a few able to do this and new species move out to other habitats? This question becomes important with climate change. Native bees are important for their pollination services and understanding how they fared in past climatic changes and how they are likely to fare in the future becomes critical. This project focuses on the highly diverse genus *Homalictus* that is found in all biomes from harsh gibber desert to rainforest. It will revise the systematics and use the phylogenetic relationships to explore what radiations have involved adaptations to climatic niches.

Awarded \$1,200.

Miss Casey Marie **Gibson**, University of NSW.

Project: **Digging through the plant archives: herbarium specimens and plant traits**

The alpine flora has been sampled repeatedly for a long time and many specimens reside in herbarium collections, a data source to draw on to determine if there has been change in plant traits that may be linked to environmental changes. The first aim of this project is to assess whether there is any change, then to determine if there is any altitudinal difference in the velocity and magnitude of the change and if the change is conserved. The wide temporal range of the collections offer a rare chance to determine response trends through time (e.g flowering and fruiting). Trait measurements will follow standardised international protocol and the results will be useful at the local and global level. Awarded \$1,600.

Mr Alex **Kenins**, University of New England

Project: **Discovery of desmids in New England tableland Sphagnum bogs**

Desmids are microscopic green algae commonly found in freshwater *Sphagnum* bogs that are confined to montane and alpine regions. There are few collections and studies of desmids in Australia but what there is suggests a rich diversity. Sphagnum bogs are poorly drained, infertile and acidic. Due to the rarity of sphagnum bogs and the highly limited knowledge of the desmid flora, it is crucial to document the desmid flora, not only as an inventory but as the flora for distinct sites. Diversity and abundance will be compared. Awarded \$1,700.

Dr Thomas Edward **White**, University of Sydney

Project: **Illuminating the temporal structure of visual communication using butterflies.**

Communication with the outside world is visual and is crucial to animals' ability to adapt to the environment. Most research focuses on 'snapshots' of communication with little consideration on how communication is modified by behavioural, environmental and perceptual processes, i.e. the dynamic nature of communication. This project aims to integrate the spectral, spatial and - crucially, the *temporal* dimensions of visual communication. How does flashing colour, movement and a dynamic viewing environment enable effective communication in 'noisy' natural environments? Butterflies are good test subjects and will be used in this study.

Awarded \$1,700.

UNDERSTANDING AND MANIPULATING ANIMAL COMMUNICATION FOR CONSERVATION: a talk given by Dr Neil Jordan

When Humans come into conflict with predators, usually over livestock, the immediate and usual response is to kill the predator. All the large predators in Africa are in decline: the lion population was once 32,000, it is down 83% now; leopards, 250,000, down 37%; hyenas, 40,000, down 27%; African wild dogs, 5,000, down 90%; and cheetahs, 10,000, down 77%. On the other hand, the population of that other large predator, the Human is up to 7 billion. Dr Jordan is an affiliate of Taronga Zoo and works with the Botswana Predator Conservation Trust to find a way for the wildlife and the humans with their livestock to coexist without killing off the predators.

There are three main ways that animals communicate, scent, sound and visual. The wild dogs communicate predominantly by scent. A pack of wild dogs knows its territory by the scent of the dominant breeding pair, and their territories are huge. When reserves are set up, they are usually not big enough for a wild dog territory. The wild dogs know the scent of other dogs and the territorial boundaries. When they reach a boundary of their territory, they turn back. Can this behaviour be used to manage the dogs? Chemical analysis of the defining scent shows there are about 15 chemicals present. The scent in dingo urine has information about the species, sex and age of the individual. It is not known how long the scent markers would last if we were to use it for management. The scent is fresh for 4 days but after 30 days, the response of the dogs is no different. Trials will have to go longer.

Lions use sound for communication. Wild dogs move away from a lion's roar: hyenas usually do, but they may hang around hoping to get a chance steal the prey. Human sounds such as shouts, gunshots etc. are being trialled to see if they might keep lions away. Recordings of other lions' roars, either friend or foe are played at different times or may be activated by radio-collars to see if they can be used to control lions. If a lion can be driven away by a recorded roar, it goes somewhere else and this method may work for an exclusion zone but not the whole landscape. The roar may also attract other lions, as the sound can travel up to 5 km. But exclusion does not promote coexistence.

Lions are ambush predators and when the prey sees the lion, the alarm goes up and lion gives up the hunt once it is spotted. Wood cutters in mangrove forests of India wear painted face masks on the back of the head to deter attack from tigers, also an ambush predator. Inspired by this precedent, Dr Jordan set up a trial where half a herd of cattle (30) had eyes painted on their backsides and the other half were left unpainted. There have been four cows lost to lion attacks: all of them did not have eyes painted on them. None of the eye-painted cows were killed. These cattle are corralled and protected at night. At least this method is cheap and easy for the herders to adopt. It is not known if lions take livestock because there is nothing else or because they are easy pickings. The trial is continuing.

Probably no one approach would work by itself and it remains to be seen if the predator learns it is just a trick. It may be thought that big game hunting for trophies is the cause of the decline in numbers of big predators, but the over-riding reason is loss of habitat which continues apace with the expanding human population.

Communication manipulation for conservation is being trialled in Australia. The individual scent of a Tasmanian Devil could be used to mark out a territory for it to become used to upon release in the wild. It would keep out the neighbours for this critical time of adaptation to the change upon release. It is not known if it would work. Dingoes use both scent and sound for communication: they howl. Perhaps the dingo's howl would keep feral cats away from critical areas where wildlife is being released. There are many other ideas to promote coexistence of wildlife and human activities. The wildlife can be sustainable if the areas for conservation are large enough and they are managed right.

LINNEAN SOCIETY OF NEW SOUTH WALES

For Security reasons, there is now a locked gate between the carpark and the Classroom. If it is locked when you come to a lecture, just wait and someone will come and let you in.

PROGRAMME

**Wednesday 18 April at 6 pm, in the Classroom, Royal Botanic Gardens
Enter through the gate to the Herbarium Carpark on Mrs. Macquaries Rd.**

Dr ANN YOUNG

Wollongong University

**ENDANGERED ECOLOGICAL COMMUNITIES (EECs) AND ARCHIVES OF
CHANGE:**

UPLAND SWAMPS IN THE SYDNEY REGION

Upland swamps are islands of wetland in the midst of eucalypt-dominated woodland on the plateaus around Sydney. They also are archives of history fire and climate history and important to Sydney's drinking water catchments but underground coal mining, forestry and urbanisation are causing significant damage to them. Ann Young's interest in the swamps began 40 years ago and her recent book brings together the wide range of research now available on the swamps' ecology, hydrology and resilience to environmental impacts.

**Wednesday 23 May at 6 pm, in the Classroom, Royal Botanic Gardens
Enter through the gate to the Herbarium Carpark on Mrs. Macquaries Rd.**

Dr JOHN PICKETT

**CURRENT IDEAS ON THE GEOLOGICAL EVOLUTION OF THE BLUE
MOUNTAINS, NEW SOUTH WALES**

A brief outline of the regional geology of the Sydney and Blue Mountains areas is followed by presentation of the traditional ideas on the development of the Blue Mountains. It is generally accepted that the Blue Mountains proper begin west of the Nepean River at Penrith. In that area, the rise, or front, of the Blue Mountains coincides with a fold of the simplest kind, known as the Lapstone Monocline. This feature is oriented north-south, persists for many kilometres, and shows prominently on satellite and aerial photographs. The traditional view presents this feature as a post-depositional phenomenon, resulting from relatively recent crustal movements known collectively as the Kosciusko Uplift. Coarse gravels, which occur patchily at different altitudes along the monocline, and extensively on the Cumberland Plain, are interpreted in the traditional view as post-dating the monoclinical fold.

Some evidence, particularly from geophysical surveys, suggests that the folding along the monocline is actually syn-depositional, though some recent publications dispute this. The age of the folding is critical to interpretation of the post-depositional history.

The Nepean River has a course which can only be described as bizarre. Whereas most rivers rise in a mountainous area, flow through foothills, onto a plain and then into the sea, the Nepean rises not far from the ocean and flows INTO the mountains, a feat it performs no fewer than THREE times! A satisfactory explanation of this behaviour is a necessary corollary of any explanation of the post-depositional history.

Age control on the timing of the significant events of this history is poor. In the Blue Mountains themselves, the only dates are yielded by Jurassic spores recovered from the matrix of breccia within the volcanic necks scattered through the region, and an isotope age of Early Miocene. On the coast, estuarine sediments, also of Early Miocene age, imply minimal vertical movement of the terrain since that time. On the other hand, recent work on young sediments in Mountain Lagoon indicates movement of as much as 15 m along the Kurrajong Fault since that time.

The location of many of the basalt highs of the Blue Mountains, immediately adjacent to the gorges of the Grose and Wollangambe Rivers, implies that the gorges have developed since the Early Miocene.

A coherent explanation of all these phenomena is still lacking; an attempt is made to bring as many as possible of these together.

Refreshments will be served from 5.30 pm

EVERYONE WELCOME