LINNEAN SOCIETY OF NEW SOUTH WALES

LINN S'O'C' NEWS

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IN THIS ISSUE

NEW MEMBER

We welcome our new member:
Mr. Fernando Soley of San Jose, Costa Rica.

GIFT IN MEMORY OF SURREY JACOBS

Mrs Betty Jacobs has made a gift to the Joyce Vickery Scientific Research Fund, in memory of her late husband Dr Surrey Jacobs.

Surrey Jacobs had a long career as a botanist at the National Herbarium of New South Wales in Sydney. He was a grass specialist but worked on the systematics of other groups of plants as well. In a collaborative research project on the taxonomic significance of the variations in photosynthesis, he successfully took the experiments into the field and it proved to be a break though. The actual behaviour of the plants in the field bore scant resemblance to previous results from studies in

controlled environments.

He worked on many different projects, one of them being completing the projects started by Dr. Joyce Vickery, after her death. He and a colleague worked on the first census of plants in New South Wales. His greatest impact was probably his work on water plants. In recognition of this, he received the T. Wayne Miller Distinguished Services Award from the international Aquatic Plant Management Society. He was posthumously made a member of the International WaterLily and Water Garden Society. He advised on wetland plant management and provided forensic advice to police. Surrey has authored or co-authored over 60 publications, including a range of semi-popular books.

From Wilson, K.L. (2011). Surrey Wilfred Laurence Jacobs 1946-2009, *Telopea* 13(1-3) 13-21.

DONATIONS TO THE SCIENTIFIC RESEARCH FUNDS are, in total, $8,385.

Donations to the Joyce Vickery Scientific Research fund were received from Dr. J.M.E. Anderson, two Anonymous, Prof. Bruce A. Auld, Ian Endersby, Dr. Michael J. Engelbretsen, Dr. Donald S. Horning, Prof. Betsey Jackes, Mrs Betty Jacobs, Prof. David Keith, Prof. Ian A. McDougall, Dr. A.O. Nicholls, Prof. L. Selwood, W.S. Semple, Mrs Karen Wilson and Dr. J.N. Yates.
Donations for the Betty Mayne Research fund for Earth Sciences were received from Dr. R.A.L. Osborne, and Dr. Lawrence Sherwin

We thank our most generous donors. The Research Grants awarded to students do more than provide financial assistance. Research workers must be skilled in the art of writing applications for grants that are highly competitive. Applying for grants from the Linnean Society is good practice for students, and if awarded a grant, it is a moral booster and something they can add to their CV.

All donations and gifts to the Scientific Research Funds are fully tax deductible.

GRANTS FROM THE SCIENTIFIC RESEARCH FUNDS

INAUGURAL AWARDS FROM THE Sir WILLIAM MACLEAY MICROBIOLOGY FUND

ARMBRECHT, Linda H. Macquarie University.
Project: Phytoplankton characteristics and related biochemical processes in a biological hotspot: Solitary Islands Marine Park
Marine phytoplankton accounts for about half of the annual net global primary production and plays a key role in biochemical cycles. In the light of climate change and changes in the temperature of currents, changes in phytoplankton are expected. Already, there is a long term decline in silica in the east Australian coastal waters and an earlier onset of the spring diatom bloom. Aim: to conduct a monthly 1-year survey of the phytoplankton and ecologically important factors in this hotspot and investigate the biochemical processes such as carbon, nitrogen and silica drawdown and export. Awarded $1,552 (part funded from the J. Vickery Scientific Research Fund).

VARDEH, David. School of Biotechnology and Biomolecular Sciences, University of NSW.
Project: Microbial composition of extant Australian stromatalites from different geochemical settings.
In the development of a stromatolite, phototrophic cyanobacteria settle on a substrate. Through filaments and production of Extracelluar Polymeric Substances, cyanobacteria create the foundation for biofilm development by providing microniches in which other microbes can find favourable conditions in terms of light, oxygen availability and pH. Stromatolites in Hamelin Pool in Western Australia are well known, but other stromatolites have been discovered in Australia in very different environments, and these have not been studied. Other stromatolites that will be studied are as follows:
Jenolan and Wombeyan Caves: Microbial speleotherms in semi-open Nettle cave in Jenolan and Victoria Arch at Wombeyan have filamentous cyanobacteria in the outer layers but the microbial content has not been

assessed. The environment in the caves is so different to that in the marine environment that a different microbial content is expected.
Magnetic Island: Initial tests in non-laminated stromatolites in an intertidal, normal salinity marine setting suggest a complex microbial community with phototrophs near the surface and heterotrophs at depth.
Marion Lake, a shallow ephemeral lake at the tip of Yorke Peninsular SA is fed by groundwater. Laminations are very fine and remains of filamentous cyanobacteria have been described.
Two shallow lakes in the Coorong Lagoon SA regularly dry out and thus salinity fluctuates. Three growth forms have been discerned here.
Lake Hawdon in the southeast of SA is fed by groundwater and dries out regularly. The protective mechanisms of microbes against seasonal desiccation are unknown.
It will be interesting to determine how related to each other the microbial communities are, given the isolation of some of the sites. There is a highly debated hypothesis that 'everything is everywhere' and all microbes are able to disperse freely around the globe, given a suitable environment. Awarded $1,198.

INAUGURAL AWARD FROM THE JOHN NOBLE FUND FOR INVERTEBRATE RESEARCH.

O'DWYER, Katie, Dept. Zoology, University of Otago
Project: Matching host-parasite biogeographical patterns: a comparative study of marine snails and their trematode parasites.
Trematodes are flatworms with a complex life cycle. Juvenile stages infect snails and they eventually end up infecting fish or bird hosts. The distribution of host and parasite are not necessarily the same. The Australian littorinid snail *Austrolittorina unifasciata* is similar to the New Zealand *A. antipodium*. There is little genetic structuring in the New Zealand snail, suggesting adequate dispersal. In Australia, an east-west biogeographic divide around Wilson's Promontory, corresponding to the Pleistocene land bridge to Tasmania, has been found for a number of marine organisms. This study will sample host-parasite across west to eastern Australia and incorporate it with the New Zealand study to determine dispersal patterns in host and parasite. There are a number of other factors that could influence distributions as well as the mobility of the bird host. Awarded $1,400.

AWARDS FROM THE JOYCE VICKERY SCIENTIFIC RESERCH FUND

BASS, Nathan, Department Biological Sciences, Macquarie University.
Project: Social preferences and individual recognition in adult Port Jackson sharks.
The hypotheses that sociability will be influenced by size and familiarity and not sex and genetics will be tested by experiments in a semi-wild environment. Whether Port Jackson sharks can recognise individuals will be tested also. The behaviour and sociability is important for conservation management. Awarded $1,000.

GILES, Jenny L. School of Biological Science, University of Queensland.
Project: Increased representation of rare tropical chondrichthyan faunas in shark fin identification methods,
The identification of severed shark fins at any point in harvest or trade depends upon a comprehensive reference collection. Both fin morphology and DNA may be used to identify the fin. An unusual illegal harvest of shark and ray fins has been seized in Darwin and there is an opportunity to sample it and expand the reference collection.
Awarded $1,200.

MARCUS, Lara, University of Tasmania.
Project: Environmental and biological factors driving whale shark occurrence on Ningaloo Reef.
It is generally believed that whale sharks are plankton feeders, but a biochemical approach suggests they also consume deep-water fish. The biochemical approach identifies signature fatty acids and stable isotopes. Using the "you are what you eat" approach, the method can distinguish krill from benthic invertebrates from fish. This project will determine the diet and foraging range of whale sharks at Ningaloo Reef. Whale shark numbers have fallen and this study will assist conservation management. Awarded $500.

MASON, Robert A.B. University of Queensland.

Project: Does ocean acidification enhance coral beaching, and if so, why?
Coral bleaching occurs when the symbiotic dinoflagellate algae are expelled from the coral. Bleaching is triggered by higher than average temperatures and high light intensity. Experimental corals in seawater with enhanced acidification and higher temperatures were paler in colour, and this was interpreted to indicate that acidification exacerbates bleaching, but this is controversial. Experiments with corals in higher temperatures, with and without acidification, will measure the photosynthetic activity of the algal content. If acidification does make a difference, the physiological causes will be investigated. Awarded $1,000.

McELROY, David J. University of Sydney.
Project: Determining the effects of contaminant-based disturbances on succession ecology using marine biofilms and invertebrates
Runoff from the land increases contaminants in coastal waters. Species exhibit different tolerances to heavy metals. Experiments will assess the effect of copper contamination on marine biofilms, the relationship between biofilms and microalgae and indirect influence on invertebrate settlement. Awarded $1,500.

MUNROE Samantha E.M., James Cook University.
Project: Migratory and dietary selection patterns of the sharpnose shark *Rhizoprionodon taylori* in coastal environments using stable isotopes.
It is important to understand the effects sharks have on the marine ecosystems, specifically resource use and diet and haw changes in the environment will impact on the population. Their inshore habitats in bays of northern Australia and migratory patterns will be defined. Diet (pelagic or benthic) will be determined using stable isotopes of carbon and nitrogen in muscle and blood. The results will determine the vulnerability to environmental change. Awarded $750.

PEARSON, Sarah K. Flinders University.
Project: Using molecular methods to investigate parasites within a social host (gidgee skink).
Molecular methods will be used to detect the presence of parasites and to determine the level of parasite infection. It will test the prediction that hosts with higher immune gene diversity are less parasitised than ones with lower immune gene diversity. Living in social groups may allow increased spread of disease, hence social species may require a better immune system. Awarded $1,000.

SANGER, Jennifer C. University of Tasmania
Project: Epiphyte diversity over varying spacial scales in three climatic zones in Australia
Epiphytes are plants that grow on other plants using them for support. They are a highly diverse group of flowering plants, ferns, mosses and liverworts. With no direct contact with the ground, they rely on rain, fog and mist for moisture and are confined to the humid rainforests. Epiphytes play an important role in the rainforest by capturing and storing moisture and atmospheric nutrients. This project will investigate epiphyte communities and their habitats in tropical, subtropical and temperate rainforests. The results could be used to model likely changes that will occur with climatic change. Awarded $1,750

SOWERBY, William G., Monash University.
Project: The role of polymorphism in maintaining population variability
The different colours that may be seen in a species, the cichlid fish 'red devil' in this case, is a polymorphic trait. Colour is easily seen and it may be linked to other characteristics. Recently, behavioural responses have been recognised as important to evolution. Theory suggests that behaviours remain constant through time and environmental context and are not flexible, and any variation is just noise about a mean. The hypothesis that body morph colour of these fish will be linked with aspects of their physiology and behaviour, and will be subjected to different selection pressures will be tested with experiments. Awarded $500.

UMBERS, Kate. Department of Biological Sciences, Macquarie University.
Project: Warning coloration and startle display in a colourful katydid
Acripeza reticulata has a red and blue startle display when disturbed. The little crow is the most likely predator but the display has been little studied. A liquid oozes out of the abdomen and the katydid may vomit also. This project will quantify the behaviour and colour of the startle display and determine what kinds of stimuli trigger the display. Awarded $1,000.

VOGEL, Sandra, School of BEES, University of NSW.
Project: Making healthy chicks – an immunogenetic marker to augment population genetic studies of Little Penguins.
The little penguin populations have been declining and the Manly population is listed as endangered. Human interference has had much to do with it, but natural factors, e.g. sea temperature, food availability may have an impact, especially if accompanied by novel parasites and pathogens. This study aims to gather genetic data and demographic estimations of the populations and use the information to construct a population viability analysis. A similar study in WA has shown significant population structuring and unexpected dispersal along the WA coast. Genetic analysis will show if individuals prefer to mate with the same or different immunogenetic markers. Awarded $1,000.

THE NATURAL HISTORY OF SYDNEY
Editors Daniel Lumney, Pat Hutchings and Dieter Hochnuli
Royal Zoological Society of New South Wales, September 2010
Soft cover, 438 pages
ISBN 978 0 9803272 3 6

There are over 30 chapters, each written by a well-known authority in the field. The topics cover the study of natural history, frogs, molluscs, vertebrates, marine fishes, reptiles, cicadas, changes in bird populations, yuppie bandicoots and more. There are chapters on regional areas and their particular wildlife: Narrabeen Lagoon Catchment, Ku-ring-gai council area, Campbelltown's koalas, Wolli Valley, the Sydney Metropolitan Catchment Management Authority, western Botany Bay. There are chapters on Aboriginal fishhooks and Aboriginal art in the Blue Mountains.

This book will appeal to those who value the remnants of the natural world in the urbanised landscape. It would be ideal for local and school libraries.

Books can be obtained from the royal Zoological Society of NSW, PO Box 20, Mosman NSW 2088, e-mail, office@rzsnsw.org.au, web site, rzsnsw.org.au. For price, contact Ms Hayley Bates at the Executive Office, phone O2 9969 3736, Tuesdays 10 am to 5pm.

LEAD: THE LEGACY THAT KEEPS ON GIVING, a talk given by Prof. Mark Taylor.

Prof. Taylor was introduced to the pollution problem in Australia in Mr. Isa. The mine is upstream of the town water supply and the water from the sewerage treatment facility was discharged into the creek downstream of the town, only to be later recycled, unless the dam overflowed which happened about once every 37 years. He discovered that lead and other pollutants were not being studied in Australia and nothing was known about them. The corporate interests dismissed the problem as natural: lead was there in the soil anyway, and they were not interested.

Now Prof. Taylor has a team of students working on environmental pollution. The historic aspects of lead pollution are being studied using mosses from herbarium collections. The mosses collect dust from the air and a hundred-year record of lead pollution should be obtained. Pollution from mining activities in the Hunter region is being studied using the wine produced there. Dust from mining may settle on grass in the paddocks, cows eat the grass and can suffer lead poisoning. Pollution released by bushfires is also being studied.

Lead is not the only pollutant released from mines and smelters. Arsenic, cadmium, chromium and sulphur dioxide are also released in smaller quantities, but even less is known about them. Mt Isa, a mining and smelting town is a very big emitter of 1600 kg of lead per year. Pt. Pirie, a smelting town emits less, about 44 kg per year and Broken Hill, a mining town has about 6 kg per year.

Mining and smelting are not the only sources of lead pollution: lead from petrol, old paints, and lead solder may be just as much a hazard. This is particularly so in the older inner suburbs where the houses have been renovated and the old lead paint removed. Brick houses near busy highways that have not been painted may have lead on the walls from lead in petrol that equals the concentration found in Mt Isa. Even though lead has been removed from petrol, the lead previously deposited remains there. The concentration of lead decreases with distance from the highway so that it is much lower 100 m from the highway.

There is no safe level of lead pollution. Particulate matter is bad because it is breathed in and absorbed by the lungs. The fine particulate matter is the worst and at Mt. Isa and Pt. Pirie, the fine particulate matter is the largest fraction of the emissions. Lead is particularly toxic to children because lead interferes with the development of their nervous systems. Exposure to lead leads to a lowered IQ and learning and behavioral difficulties. IQ is lowered the most with exposure to the lowest levels of lead and arsenic, and the effects never go away. This is a big loss to society: it loses the high IQ individuals and the need for remedial teaching and training to the low IQ children is a cost burden.

Lead will accumulate in the milk teeth of children. A study in Cincinnati of six year olds with a high lead content in their teeth found that they were prone to poor concentration, hyperactivity, a short attention span, frustration and compulsive behaviour: all symptoms of ADHD. As nineteen year olds, there was a high arrest rate amongst these individuals. A New Zealand study of lead in the dentine in children's teeth, derived from lead in petrol, found an increase assault rate 22 years later. A study in Earlwood, Sydney, where lead was removed from petrol between 1980 and 1990 found that as the lead concentration in the environment decreased gradually during the next 20 years, and so did the assault rate: the two graphs were parallel. Mt Isa is a violent town with a crime rate 700 times the Queensland average.

The health of adults is badly affected as well. Lead is rather like calcium in the body and interferes with a variety of body processes and is toxic to many organs and tissues, including the heart, bones, intestines, kidneys, reproductive and nervous systems.

High lead concentrations may be found in Boolaroo, North of Lake Macquarie, once the home of a lead/zinc smelter and Pt Kembla, a large industrial complex including a copper smelter. In Sydney, the City of Sydney, Rozelle and Lane Cove are also heavily polluted. Balmain and other areas to do with boats are heavily polluted from paint. Older areas with old houses are most likely to be affected. One back yard may be heavily polluted, the neighbour relatively free of pollution. The history of house renovation and distance from a busy highway are important factors. If doubtful, home veggie gardeners should have their soil tested. Vegetables grown in raised garden beds in clean soil brought in to the site are safe to eat.

The mining company in Mt Isa monitors pollution for licensing purposes. The EPA also monitors pollution but the results are not necessarily the same. If pollution is monitored on one day in the week and then averaged for the month, it does not look too bad, but this does not reflect what really happens. Hourly readings show times of no pollution and also very high spikes of pollution. The stacks of the smelter are on the edge of the town and the wind may blow the emissions over the town for an hour or two then blow them in the opposite direction. High emissions for short periods of time will do the damage.

Isotopes in the surface soil, aerosols over the town and wipes taken from in houses were measured and compared with the isotopes in the sub-soil to test if the lead pollution is all natural in Mt. Isa. The results showed clearly that the sub-soil was quite different to all the others: the pollution is not at all natural.

In Broken Hill, the lead/zinc ore was mined and sent for smelting by rail to Pt. Pirie. The ore was transported in uncovered wagons until 1996 when covers were introduced. Dust from spilt ore was blown all over the town and all along the track to Pt. Pirie. Broken Hill is highly polluted. Cockburn, a small town 70 km to the west and on the rail line, is just as polluted. The ore body comes to the surface at Broken Hill, so natural pollution can be expected. Isotopes showed that the lead was 50/50 natural/man induced pollution.

Pt. Pirie has had smelting for nearly 100 years hence a lot of its pollution problem is "inherited". Official data of pollution does not follow the blood level data. When the problem is detected, children are treated and the blood levels gradually reduce. Official data only reports the blood levels at he end of the year, no matter how long the child has been treated. 25% of the children have blood lead problems. Hand wipes taken before and after 20 mins of play in the playground show very high levels of pollution were collected by the child. Playgrounds are cleaned, but it only take the wind to stir up the dust to contaminate it again. The drinking water comes from a catchment that has the train line through it.

Much of the monitoring comes from industry and the government uses it for regulation. There is a conflict of interest here. Average the results over a year and they look good: it suits industry. The real story is much more complex and serious. Arsenic and sulphur dioxide emissions have slipped under the radar. There is little interest in doing more about the pollution problem.

LINNEAN SOCIETY OF NEW SOUTH WALES

SECURITY HAS BEEN INCREASED at the Botanic Gardens: there is now a locked gate between the carpark and the Classroom. When you come to a lecture, just

WAIT AND SOMEONE WILL COME AND LET YOU IN.

PROGRAMME

Wednesday 24 July, at 6 pm, in the Classroom, Royal Botanic Gardens.
Enter through the gate to the Herbarium Carpark, on Mrs. Macquaries Rd.

A/PROF. MIKE MANEFIELD

School of Biotechnology and Biomolecular Sciences, University of New South Wales

MICROBES MOVING MOUNTAINS

Unicellular organisms belonging to the bacterial and archaeal domains of life are influential in ways that most people never imagine. They are the oldest and most abundant inhabitants of the Earth and have been influencing the biogeochemistry of the planet long before heavy handed humans got in on the game. In this presentation three examples will be given of how the activity of microbes can be exploited to ameliorate some of the negative environmental impacts of human activity. The first example will discuss the ability of bacteria to break down common groundwater pollutants such as those under the Botany Industrial Park, Sydney. The second example will detail the ability of archaea to generate natural gas from renewable feedstock such as food waste, as illustrated by the EarthPower facility in Camellia, Sydney. The third example will describe the inner workings of a sewage treatment plant the likes upon which human civilisation is dependent, using a facility in St Mary's, Sydney. The overall goal of the presentation is to communicate the importance and utility of microbes (and microbiologists!) for continuing human occupancy of the planet.

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

PROF. DAVID J. MABBERLEY

Executive Director, the Royal Botanic Gardens and Domain Trust

THE STORY OF THE APPLE

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Drinks will be served from 5.30 pm

EVERYONE WELCOMED