



# The Bulletin 359

of

## The Royal Society of New South Wales

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### Future Events

Lectures in Sydney are held on the first Wednesday of the month at 6:30pm.

#### October

**Wednesday 3 October 2012**

**6:00pm for a 6:30 start.**

**"Outsmarting Superbugs"**

Delivered by Prof Liz Harry  
*Union, Universities & Schools Club  
25 Bent St, Sydney City*

**Please note dress code: Jacket and tie**  
Details at right.

#### Southern Highlands Branch

**Wednesday 27 September 2012**

**6:00pm**

**"The Wonderful World of Hydrogels"**

Delivered by Dr. Marc in het Panhuis  
*Performing Arts Centre, Chevalier  
College Bowral, enter off Charlotte St.*  
Non-members \$10 (Members \$5)

Following the lecture, there will be a dinner with the lecturer, open to members and non-members at The Briars, Burradoo.

Please contact Hub on 0411 192 917.

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Wednesday 3 October 2012  
1204th Ordinary General Meeting  
*"Outsmarting Superbugs"* delivered by Prof Liz Harry

Join us at the lovely Union, University and Schools Club in the city for a fascinating talk, delivered by Professor Liz Harry.

Attendees will need to register beforehand. Contact Emma in the Society's office by phone on 02 9036 5282 or by email at royalsoc@royalsoc.org.au.



Prof Liz Harry

Liz Harry is Professor of Biology and Deputy Director of the ithree Institute at the University of Technology, Sydney (UTS).

Liz obtained her PhD at the University of Sydney then went to Harvard University as a National Institutes of Health (NIH, USA) Postdoctoral Fellow. There she pioneered the development of microscopy techniques for 'seeing' where proteins are in a bacterial cell. These techniques have revolutionized our view of the internal organization of bacterial cells. Liz was an Australian Research Council (ARC) Postdoctoral Fellow and an ARC QEII Fellow at the University of Sydney.

Her research on bacterial cell division has had a significant impact on our understanding of how bacterial cells multiply, and how they control this process to ensure equal partitioning of chromosomes vital for survival. She has worked with industry to develop novel antibiotics that target this process in pathogens, and to examine how natural products function as effective therapeutics for infectious disease.

Liz was awarded an Australian Eureka Prize for Scientific Research in 2002 and the Australian Society for Microbiology Frank Fenner Award in 2008 in recognition of her distinguished contributions to Australian research in microbiology.

Antibiotic resistance is a major health concern and the community needs to know about it. There are now bacteria causing infections which we cannot treat with current antibiotics because they just don't work.

Scientific research is playing an increasingly vital role in addressing this issue on a number of levels, including the discovery of new antibiotics to which bacteria are not resistant, of effective vaccines to prevent infection, and of alternative treatments to reduce the resistance issue.

There are also several ways in which we can all do something about it, at an individual and community level. It starts with understanding what the problem is and this is what I would like to share with the community in a simple, easy-to-follow way.

The Society will be hosting a welcome drink on this occasion from 6 o'clock until 6:30 pm and dinner is available after the lecture at \$70 a head. **Please note the Club has a strict dress code of jacket and tie for gentlemen and appropriate similar attire for ladies.**

#### Patrons of The Royal Society of NSW

Her Excellency Ms Quentin Bryce AC CVO, Governor-General of the Commonwealth of Australia

Her Excellency Professor Marie Bashir AC CVO Governor of NSW

## From the President



The Council was delighted to recommend to the membership at the September meeting the appointment of two fellows of the society: Professor Brian Schmidt and Professor Barry Jones AO. Professor Schmidt presented the Dirac Lecture in July, in Sydney at the University of NSW and was kind enough to address the Southern Highlands branch on the same day. The lecture described elegantly the work which resulted in him sharing the Nobel Prize for Physics in 2011. He is no stranger to the Society, having delivered the Pollock Memorial lecture in 2009. Barry Jones is also well-known to the Society having participated in the inaugural Royal Society of NSW Forum in 2011. He is the only person to have been elected a fellow of all four Australian learned academies.

Attendance at monthly meetings continues to increase – a large group of both members and non-members attended the September meeting at the Union University and Schools Club to hear Professor Derek Eamus, a noted plant physiologist and ecophysiologicalist at UTS. He described some controversial research work on the response of forest to the types of climate conditions that might be experienced in a somewhat warmer global environment.

In early August, I was pleased to be able to meet the committee of the Southern Highlands branch to discuss ways in which the very vibrant group in the Southern Highlands and the membership in Sydney could collaborate more closely.

The awards process is continuing, led by Professor Brynn Hibbert, chairman of the awards committee. We were pleased to have the Deans of Science of the NSW universities join a panel chaired by Professor Mary O’Kane, the Chief Scientist and Engineer of NSW to provide some independent advice to the awards committee. This process is well advanced and we anticipate that the announcements of the awards will be made within the next six weeks or so.

The dates for the functions for the remainder of the year have been finalised and may be found on the Society website.

I am also pleased to note that Emeritus Professor Roy Macleod has joined the Council of the Society. Professor Macleod is the author of the book, *Archibald Liversidge: Imperial Science under the Southern Cross*, published by the Society in conjunction with Sydney University Press.

If there are any issues you would like to raise with me, I am easily contacted by e-mail at [president@royalsoc.org.au](mailto:president@royalsoc.org.au) and would like to hear from you.

**D**onald Hector

## Australian Institute of Physics

### Postgraduate Awards Day 2012

*Sponsored by the Royal Society of NSW, the AIP and the CSIRO.*

The NSW AIP branch will hold its annual Postgraduate Awards Day on **Tuesday 20 November 2012** in the Slade Lecture Theatre, University of Sydney. Each NSW University is **invited to nominate** one student to compete for the \$500 prize and Postgraduate medal on that day.

The Society will also award the **Jak Kelly Scholarship Prize** of \$500 as a separate award category for this event. Students nominated for the awards will also be invited as guests for the NSW AIP Branch annual dinner that follows the presentations. These awards have been created to encourage excellence in postgraduate work, and all nominees who participate in the Postgraduate Awards Day will receive a special certificate recognising their high standing.

The guest speaker is Dr Stephen Bosi, Research medical physicist and academic, Prince of Wales Hospital and University of Sydney. Dr Bosi will deliver his talk “Stupid Ideas That Worked”.

Dinner will be held at Buon Gusto. It is necessary to book. The cost for members of the AIP and their partners and accompanying visitors is \$50.00 per head (includes wine or beer) for a buffet dinner.

Please go to the AIP website at <http://www.nsw.aip.org.au> for a nomination form or to register for dinner. Contact Dr Fred Osman at [fred\\_osman@exemail.com.au](mailto:fred_osman@exemail.com.au) for further information.



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<https://www.facebook.com/RoyalSoc>

# Climate change, regional drought and forest mortality: are we seeing a new global

Professor Derek Eamus

Presentation to the Society's 1203rd OGM, 5 September 2012



Around the world, forests seem to be under stress. At the 1203rd OGM, Professor Derek Eamus, a plant physiologist at University of Technology Sydney, gave a fascinating talk on what is causing the major problems in the world's forests and the implications if there is a substantial increase in global temperatures. In every continent there are numerous examples of forest die-back in recent years. Understanding the background of this is critical given the importance of forests in the global ecosystem. Forests are large repositories of carbon, have a large influence on the way in which water moves through the environment, are important for biodiversity, have a major impact on the absorption of energy from the sun and have high amenity value.

There are two theories to explain die-back of forest during drought conditions. The first of these is carbon starvation. This is an important factor in forest health particularly with isohydric trees species (isohydric trees are those that regulate water flow in order to maintain canopy humidity within a relatively narrow range. They do this through opening and closing leaf stomata in response to changes in humidity). When the stomata close, no carbon dioxide can enter the leaf. One response of isohydric trees to drought conditions is to close the stomata in order to preserve water. Thus, during a protracted drought, the tree closes the stomata close and cannot absorb carbon dioxide and will gradually starve to death.

The second theory is that forests die due to hydraulic failure. This is a particular problem with anisohydric species (unlike isohydric trees these do not respond to drought by closing stomata, so the tree continues to absorb carbon dioxide). The problem is that if the ground water availability drops too low, there is insufficient water potential causing embolism in the xylem (the fine tubes that conduct water from the root system to the leaves) and this interrupts water flow to the leaf system.

Catastrophic failure of forests during drought conditions seems to be related to one or other of these effects. Observation suggests that droughts of long duration cause hydraulic failure, whereas droughts of high-intensity cause carbon failure followed by hydraulic failure. These observations may have substantial implications for Australia's forests. Australia has highly variable rainfall and the annual evaporation in many areas is higher than the annual rainfall. River discharges are also much lower than Europe, Asia, Africa or the Americas. The accepted wisdom is that temperature is the main determinant of forest mortality due to drought and usually occurs a couple of years after the drought finishes.

Professor Eamus and his co-worker, Nicolas Boulain, have developed a conceptual model that relates duration of drought conditions and their intensity to the reasons for forest failure. They question the conventional wisdom that temperature is the most influential determinant. They have developed a mechanistic model of forest behaviour that disaggregates a number of the parameters that have been incorporated into the highly sophisticated soil-plant-atmosphere (SPA) models. One important parameter is the vapour pressure deficit (VPD), a measure of canopy humidity. Modelling 15 scenarios indicated that temperature stress is not a major determinant of forest mortality; what is important is VPD. It is the combination of an unusually high temperatures and very dry conditions thereby reducing VPD that does the damage. They conclude that VPD is an important parameter that needs to be included in climate models.

Donald Hector

## New Members of the Society

We welcome the following new member to the Society:

- Edward Kehoe
- Kevin Wright

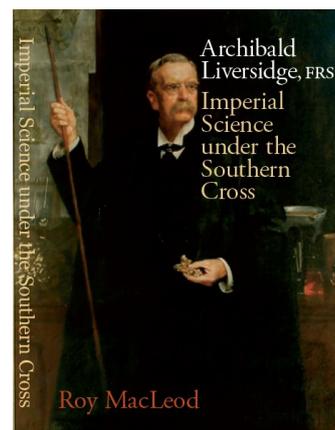
For information about membership please contact the Society's office or visit the Society's website at <http://royalsoc.org.au/membership/membership.htm> or contact Emma at [royalsco@royalsoc.org.au](mailto:royalsco@royalsoc.org.au)

## Royal Society of NSW Ties

Every purchase helps support the Society. Contact the Society's office for an order form.



Just \$40.00 plus postage & handling.



Copies of Roy MacLeod's wonderful book about the development of science in Australia are available from the Society's office.

Contact the office to order your copy at the special member's price of \$39.95.

# Southern Highlands Branch

## Report of August 2012 Meeting

### *"Understanding the extent and impact of rubbish in the marine ecosystem"*

Delivered by **Dr Chris Wilcox**, Senior Research Scientist CSIRO Marine and Atmospheric Research Division

Marine debris is becoming a major issue, damaging the aesthetic value of natural places, impacting commercial activities, and potentially causing significant harm to wildlife. The scale of human pressure is daunting, with the rate of plastic production increasing globally in an exponential manner. Over 640 million tons of fishing gear alone are lost into the ocean each year. Results from coastal cleanup efforts suggest that this is just the tip of the iceberg, as fishing gear is not even in the top ten items found on beaches.

Dr Chris Wilcox emphasized the impact that human debris exerts on wildlife. He noted that although incidental records of the effects of debris on some species, such as birds caught in fishing line and turtles that have swallowed plastic bags are available, so far there has been no synoptic picture of the scale of the issue. Now with funding from the Commonwealth Government, coastal NRM groups and Shell Australia, Wilcox and his team have been able to initiate comprehensive research studies with a view to understanding the impact of the debris threat to marine life on a national scale.

A large part of Wilcox's presentation concerned his methods of risk analysis and associated mathematical modeling over selected areas of the ocean. He uses risk analysis as a way of breaking down a complex problem into parts, then combining the sets of data from those parts.

For example, in predicting the impact of marine debris on turtles, he used overlapping studies in space and time for both the animals and the debris, mainly fishing nets in that case. He is finding strong correlation between actual surveys and the predicted outcomes from his modelling.

Plastic is everywhere all the time. Remote sites and densely populated sites have similar loads. Wilcox reported that experimentally cleaned beaches regained 50% of their load in three months. Unfortunately, these plastic items are extremely long-lasting: a life of up to 24 years has been documented for a gillnet and a 1994 UNESCO report stated that some plastics do not degrade for 500 years.

Plastics have two main modes of action on individual animals, entanglement and ingestion. Entanglement reduces the mobility of the animal and often causes physical damage due to constriction. Ingestion has many complications. It reduces the gut volume (displacement of food, especially seabirds), damages the gut, introduces toxicity due to breakdown products (bisphenol, an estrogen mimic) and also causes toxicity due to adsorbed pollutants (PCBs, etc). While these are significant effects on the individual animals, there are also population level consequences. Reduced migratory ability due to fat losses, significantly increased

mortality and significantly reduced fecundity have all been observed.

Chris Wilcox believes that ultimately there are solutions to the serious problems caused by plastic debris. Australia is currently considering a national bottle deposit system for beverage containers. Given that one third of the debris along the coastline globally is associated with the beverage industry, this seems a wise policy. However changing people's behavior is expensive financially and politically, so it is essential to have a solid basis, such as the Wilcox research, for targeting those resources that will have the greatest effect.

The 45 member audience asked numerous questions at the end of the lecture, prompting a prolonged informal discussion. They had all enjoyed a fascinating session.

**A** nne Wood



Find details of Society events in the Souther Highlands on Facebook.

<https://www.facebook.com/RoyalSoc>

## Contact your office bearers

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<b>Mr Clive Wilmot (SHB rep)</b>	<b>02 4886 4199</b>	<b>Dr William Kneprath</b>	<b>02 9581 6000</b>
<b>Professor Richard Banati</b>	<b>0408 121 362</b>		

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