



# The Bulletin 360

of

## The Royal Society of New South Wales

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Oct 2012

### Future Events

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

#### November

**Wednesday 7 November 2012**

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

**"The Unexpected Nuclear Renaissance:  
Nuclear techniques benefitting  
mankind"**

Delivered by Dr Adrian (Adi) Paterson  
*Union, Universities & Schools Club  
25 Bent St, Sydney City*

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

#### Southern Highlands Branch

**Saturday 20 October 2012**

**4:00pm**

**"The Artists and the Scientists:  
Bringing Prehistory to Life"**

Delivered by Patricia  
Vickers-Rich, Tom Rich and Peter  
Trusler

*Performing Arts Centre. Chevalier  
College Bowral, enter off Charlotte St.*

**Details page 4.**

The Royal Society of NSW

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Fridays.

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#### Wednesday 7 November 2012 1205th Ordinary General Meeting

*"The Unexpected Nuclear Renaissance:  
Nuclear techniques benefitting mankind"*  
delivered by Dr Adrian (Adi) Paterson

Dr Adi Paterson is the Chief Executive  
Officer of ANSTO. He has oversight and  
responsibility for ANSTO's multi-faceted  
portfolio of activities.

He's a Fellow of the Australian Academy  
of Technological Sciences and  
Engineering and a member of the  
Academy of Science of South Africa and  
the South African Academy of  
Engineering. He holds a BSc in Chemistry  
and a PhD in Engineering from the  
University of Cape Town.

He is regarded as a trusted voice to  
government stakeholders and is regularly  
invited to speak to business and scientific  
organisations on the nexus between  
science, innovation and business, nuclear  
science and technology issues and the  
international aspects of nuclear power.

*"The Unexpected Nuclear Renais-  
sance: Nuclear techniques benefitting  
mankind"*

There has been great excitement with  
the identification of the Higgs-like  
particle at CERN. It is perhaps less well  
known that positron emission  
tomography was initiated in a project  
between CERN and the University of  
Geneva. It is now used pervasively in  
diagnosis of cancer. The key to this  
technology is the production of F18 using  
cyclotrons. Cyclotrons form part of the

great tradition of accelerators which have  
underpinned the development of nuclear  
science and technology for generations.  
Applications continue to expand and a  
number of these will be highlighted.

A number of countries have decided to  
build new research reactors in the last 10  
years. The OPAL reactor has had more  
than five years of operations since its first  
criticality. Neutron scattering using the  
neutrons produced at OPAL is growing  
and developing apace. The instruments  
mirror equivalent techniques using light at  
the Australian Synchrotron. Examples will  
be presented of the great benefit and  
utility of having this critical landmark  
infrastructure available to the Australasian  
and global research communities.

Some remarks will be made on the  
application of nuclear techniques in  
therapy, including the growth of hadron  
therapy globally and the application of  
lutetium-177 therapeutically. The  
conclusion that the importance of nuclear  
science and technology for the future of  
Australia is growing cannot be avoided.

The Society will be hosting a welcome  
drink on this occasion from 6 o'clock until  
6:30 pm.

Dinner is available after the lecture at \$75  
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

# Outsmarting Superbugs?

Professor Liz Harry

Presented to the Society's 1204th OGM, 3 October 2012



Prof Liz Harry

Bacterial infections have become increasingly resistant to current antibiotics. The ability of bacteria to adapt rapidly to their environments, including the presence of antibiotics, is outstripping our ability to discover and refine novel agents.

Bacterial infections have become increasingly resistant to current antibiotics. The ability of bacteria to adapt rapidly to their environments, including the presence of antibiotics, is outstripping our ability to discover and refine novel agents.

At the 1204th OGM, Professor Liz Harry of the University of Technology Sydney delivered a lively and informative talk concerning the role of bacteria in our lives, the mechanisms by which they adapt, and tests of alternative methods for defeating them without producing resistant strains.

Prof. Harry first provided an overview of bacteria, particularly their prevalence in nearly every possible habitat on Earth. Nearly every surface – large or small – is covered by bacteria, as either free-living individual cells or in multicellular aggregates embedded in a self-produced extracellular polymeric substance, known more colloquially as “slime.” These biofilms can be particularly resistant to antibiotics.

In both these forms, bacteria constitute a total biomass that exceeds that of all plants and animals, even though an individual bacterium is typically a few micrometres length. Within human bodies bacteria, living most notably on our skin, in our digestive tracts, and in our respiratory tracts, outnumber human cells, possibly by a factor of ten. Prof. Harry quipped that we are more bacterium than human.

Commercial advertisements often paint bacteria as agents of disease that must be eradicated, preferably by the advertiser's product. In fact, the bulk of bacteria in and around humans are harmless or long-ago neutralised by our immune system. An attempt eradicate all bacteria from humans, apart from being futile, is likely to provide an opening for invasion by dangerous species. According to Prof Harry, ordinary cleanliness, especially handwashing, is sufficient to wash away invaders while retaining our familiar and possibly protective bacteria.

The ability of bacteria to adapt rapidly to new antibiotics is enhanced by the multiple ways by which they can introduce genetic variation. On the one hand, the most familiar form of bacterial reproduction is asexual cell division. Through this mechanism, bacteria can proliferate at astonishing rates, but evolution through cell division would have to rely entirely on random mutation to produce variation, which would leave bacteria largely open to attack by antibiotics.

(Continued on page 3)

## Calling all scientists and mathematicians!

Scientists in Schools is looking for more scientists and mathematicians to share their passion for science and/or maths with school students and their teachers.

Scientists in Schools is an Australian Government initiative designed to create and support long-term professional partnerships between scientists, mathematicians and teachers. The purpose is to give teachers a link to current, real-life science and maths, to promote a deeper understanding of the role of science and maths in our society and, importantly, to engage and excite students about working as a scientist or mathematician.

Over 500 Scientists in Schools partnerships have already been created in NSW, with scientists participating from all levels of Government as well as from the private sector. With over 100 teachers currently registered for the program, scientists and mathematicians are in high demand!

Recently retired scientists and mathematicians are most welcome to participate.

More information, including showcases of some of our partnerships, can be found [www.scientistsinschools.edu.au](http://www.scientistsinschools.edu.au)

Scientists in Schools is a fabulous opportunity for scientists and mathematicians to engage with the community, to make a difference to science and maths education and to inspire a new generation of researchers. It would be fabulous to have some new people involved

Information, including showcases of some of our partnerships, can be found at [www.scientistsinschools.edu.au](http://www.scientistsinschools.edu.au)

### Sabine Schreuder

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(Contd.)

On the other hand, bacteria readily recombine genetic material by a variety of methods, which include:

- Conjugation, sometimes called “bacterial sex,” in which DNA is passed from one bacterium to another by a tube called a pilus.
- Transformation, in which bacteria incorporate DNA floating in their environment, often originating from dead bacterial cells.
- Transduction, in which bacteria exchange DNA via viral infection and reproduction.

Notwithstanding attempts to identify new antibiotic agents, bacteria seem to have the upper hand through rapid adaptation to any single agent. The best strategy appears to be a combined approach, in which a diversity of agents simultaneously attack different pathways and structures in bacteria, thus flooding their adaptive capability. Rather than trying to synthesize a joint agent, one answer may already be available in the form of honey, which has long been a traditional remedy for a variety of conditions and injuries. Prof. Harry showed photographs of a case in which honey-impregnated dressings helped to heal infected skin ulcerations that had resisted other antibiotic treatments.

Prof. Harry and her colleagues have been experimentally testing the ability of honey to serve as a topical antibiotic. Honey appears to have a general antibiotic property that allows it to be safely stored by bees and on our kitchen shelves for extended periods. Some honeys seem to possess strong antibacterial properties, including a variety from New Zealand. The unique factor appears to arise from the nectar of certain plants; in Prof. Harry’s case, it is the Manuka plant. Prof. Harry suspects that the antibacterial properties of honey rely on the joint effect of a host of factors contained in the honey.

Prof. Harry concluded that, thanks to the effectiveness of antibiotics, modern society has become a bit blasé about basic cleanliness and too reliant on expecting a quick fix. At the same time, research on antibacterial agents of all varieties has languished, because effective antibiotics, which are commonly used for brief periods of time for acute conditions, are relatively unprofitable compared to drugs for managing chronic conditions, for example, hypertension.

**E** James Kehoe  
**J** Jude Allen

## Membership Survey

The Society is conducting a membership survey. To contribute your opinion to the Society’s future please either click on the following link or cut and paste into your internet browser:

<http://www.surveymonkey.com/s/TVD8JN8>

This ten question takes only five minutes to complete.



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## New Members of the Society

We welcome the following new member to the Society:

- Patrick McConnell

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

[royalsoc@royalsoc.org.au](mailto:royalsoc@royalsoc.org.au)

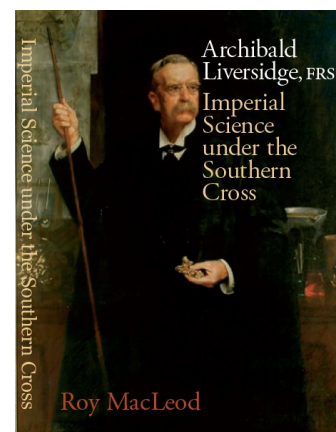
## Please Note

The Society’s **office will be closed** from **15 October to 26 October** while Emma Dallas, the Society’s Executive Officer, is away on leave.

The office will be open from 29 October 2012 at 11:00am.

In case of an urgent matter please contact a member of the Society’s Council.

Contact details can be found on page 4.



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

Saturday 20 October 2012

## *"The Artists and the Scientists: Bringing Prehistory to Life"*

Delivered by Patricia Vickers-Rich, Tom Rich and Peter Trusler

The extraordinary lives and works of the eminent paleontologists Patricia Vickers-Rich and Tom Rich, and the artist Peter Trusler, one of the finest artists of scientific realism Australia has produced.

For more than thirty years, Patricia, Tom and Peter have travelled across Eastern Europe, Asia, the Americas, Africa, Australia and New Zealand in search of the remains of early life, including fish, dinosaurs, birds and mammals.

Their successful expeditions and the many publications and exquisite artworks that have ensued are a testament to their scientific methodology, thirst for knowledge and eye for detail.

The audience will be given a unique insight into the process of preserving and recording the evolution of prehistoric life reported from the viewpoints of both scientist and artist.



**Come and hear this fascinating lecture firsthand on a Saturday afternoon in the beautiful Southern Highlands.**

\$15.00 Performing Arts Centre, Chevalier College Bowral, enter off Charlotte St. 4:00pm 20 October 2012.

Any queries please contact Hub 0411 192 917.

## Contact your office bearers

<b>Dr Donald Hector President</b>	<b>02 9484 9007</b>	<b>Prof Heinrich Hora Vice President</b>	<b>02 4627 7769</b>
<b>Mr John R Hardie Vice President</b>	<b>02 9363 9630</b>	<b>Prof D. Brynn Hibbert Vice President</b>	<b>02 9398 9134</b>
<b>Mr Colin Bradley Hon. Secretary</b>	<b>0421 478 670</b>	<b>Mr Tony Nolan OAM Hon. Librarian</b>	<b>0417 270 664</b>
<b>Mr David Beale Hon. Treasurer</b>	<b>02 9498 1503</b>	<b>Dr Frederick Osman</b>	<b>0418 444 477</b>
<b>Mr Brendon Hyde</b>	<b>02 9498 3520</b>	<b>A/Prof Maree Simpson (C/W Branch)</b>	<b>02 6365 7818</b>
<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>		

The Bulletin is issued monthly by the Royal Society of New South Wales  
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