



# The Bulletin 393

The Royal Society of New South Wales

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## Future Events

**Wednesday, 4 November 2015**  
1238<sup>th</sup> OGM

**Professor David Christian**  
Macquarie University

**Big History: From the Big Bang to Us**  
*Union, University & Schools Club*  
25 Bent St, Sydney, 6.00 pm for 6:30 pm

**Tuesday, 17 November 2015**

**Professor Michael Burton**  
UNSW

**AIP Postgraduate Awards Day and  
Jak Kelly Award Judging**  
Slade Lecture Theatre University of Sydney  
6.00 pm for 6:30 pm

**Thursday 19 November 2015**

Southern Highlands Branch Meeting  
**Det Snr Sgt Craig Harris**

Forensic Services Group, NSW Police  
**Forensic Science applied to Police  
investigations**

Performing Arts Centre, Chevalier College,  
Bowral.

Starting Time: 6:30 pm

**Wednesday, 2 December 2015**

**Royal Society of NSW 2015 Jak Kelly Award and  
presentation (1239<sup>th</sup> OGM) followed by the  
Society's Christmas Party**

*Union, University & Schools Club*  
25 Bent St, Sydney, 6.00 pm for 6:30 pm

## PUBLIC LECTURE – Wednesday, 4 November 2015

### Professor David Christian

Director of Big History Institute and Distinguished Professor in History  
Macquarie University

### “Big History: From the Big Bang to Us”

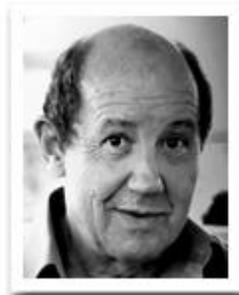
*Union, Universities, & Schools Club, 25 Bent St, Sydney*

**6:00 for 6:30 pm, Welcome drink at 6:00 pm**

*Fellows & Members \$5; Guests, \$20*

*Please note dress code: jacket and tie*

*Please join us for dinner afterward, \$75 per person*



Big History examines our past, explains our present, and imagines our future. It's a story about us. An idea that arose from a desire to go beyond specialised and self-contained fields of study to grasp history as a whole. This growing, multi-disciplinary approach is focused on high school students, yet designed for anyone seeking answers to the big questions about the history of our Universe. Thus, The Big History Project is a joint effort amongst teachers, scholars, scientists, and their supporters to bring a multi-disciplinary approach to knowledge to lifelong learners around the world. [www.bighistoryproject.com/home](http://www.bighistoryproject.com/home)

*David Christian* is by training an historian of Russia and the Soviet Union, but since the 1980s he has become interested in World History on very large scales. In 1989, he began teaching courses on 'Big History', surveying the past on the largest possible scales, including those of biology and astronomy; and in 2004, he published the first text on 'Big History'. He was founding President of the *International Big History Association*, and a co-founder with Bill Gates, of the Big History Project, a project that is building a free on-line high school syllabus in big history released in 2013. (Continued on page 4.)

### Patron of The Royal Society of NSW

His Excellency General The Honourable  
David Hurley AC DSC (Ret'd)  
Governor of New South Wales



# From the President

Nominations for the Society's 2015 awards closed on 30 September. We are delighted that there have been some outstanding entries again this year. Once again, the awards committee of the Council will be advised by a panel consisting of the Deans of science of the NSW-based universities and chaired by the Chief Scientist and Engineer of NSW, Professor Mary O'Kane. We anticipate announcing the award winners during November.

During November, the Jak Kelly award will be determined and it will be presented at the Christmas party on Wednesday 2 December. This award is made jointly with the Australian Institute of Physics. Presentations will be made by the various

candidates on Tuesday 17 November at the Slade Lecture Theatre at the University of Sydney. The winner will receive the Jak Kelly Award and a Royal society of NSW Scholarship.

We also have very interesting lecture plan for the AGM on Wednesday 4 November. Professor David Christian from the Big Industry Institute at Macquarie University. Following a rich tradition that has evolved over the 150 years, Big History surveys the past at all possible time scales, from those of cosmology to those of human history. It seeks to understand humanity's place in the world by looking at all aspects of knowledge, exploring fields such as astronomy, physics, geology, biology, climatology and archaeology.

The new website is finished and is currently being tested – there have been some minor delays but it is expected to go into production in the

next week or so. Once this is complete, we anticipate much greater reliability of our web presence and significant change in the functionality offered by the website.

I look forward to seeing you at the various events during the last couple of months of the year. As always, I am easily contacted by email at [president@royalsoc.all.au](mailto:president@royalsoc.all.au) and would like to hear from you.

Donald Hector

September 2015

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**Report of 15 September 2015  
Meeting of the Royal Society  
Southern Highlands Branch**



**Seed Conservation Biology  
Dr Lydia Guja  
Centre for Australian National Biodiversity Research**

Plants are a significant component of biological diversity, providing food, shelter, and other fundamental resources to almost all life on earth. Unfortunately, 1253 plant species are threatened with extinction in Australia alone. To protect plants from extinction, the National Seed Bank extends seed longevity by storing seeds under special conditions which exploit their inherent ability to both survive drying and delay germination.

In this presentation, Dr. Lydia Guja discussed the seed banking process and the science behind it, while taking her audience of 43 persons on a journey through the diverse ecosystems that are currently under a spotlight at the National Seed Bank. With a focus on Australian native seeds, she described her investigations into seed conservation biology, threatened species conservation, endangered species and communities, seed ecology, stress tolerance, and landscape restoration.

Seed banking, when managed expertly, relies on inherent seed traits to conserve plant material long-term. When carried out successfully, using methods which are constantly updated and informed by the latest research, it demonstrates clear advantages of being space efficient, resource efficient, having easy handling and accessibility, and low maintenance. The science behind seed banking is complicated, as

demonstrated by the seed viability equation published by Ellis and Roberts in 1981. In essence, the seed storage life is doubled by every 5 degree Celsius reduction in temperature, or every 1% reduction in seed moisture content (Harrington's rule). Long seed life is dependent on the combination of dryness and coolness.

In discussing the science of seed banking, Dr. Guja presented fascinating data on the factors of coolness and dryness, and the resultant outcomes on wheat stored in different environments. In moist tropics (76-90% RH, approx 30 degrees C), seeds survived for a few months. In dry tropics (20-90% RH, approx 21 degrees C), the survival was about 10 years. In arctic conditions (77% RH, minus 18 degrees C) survival was approximately 6 years. In a seed bank (10% RH, minus 20 degrees C), survival increased to 1539 years.

There are quite ambitious plans afoot for seed collecting projects. In the ACT, for example, it is hoped that by 2020, 62% (660/1070 taxa) will have seeds banked. The goal is 67% for species listed under the ACT Nature Conservation Act. Of the listed plant communities, the goals are 47% for natural temperate grasslands, 54% for alpine sphagnum bogs and fens, and 46% for box gum woodlands and grasslands. Providing answers to questions surrounding the methods

for seed collecting is another aspect of Guja's research. Are we collecting equally across target communities? Are collections an adequate size for conservation and use? Do plant traits bias seed collections? Does abundance and distribution bias seed collections?

Equally ambitious is the Australian threatened species strategy. The goal for 2020 is to have 100% of known threatened plant species stored in one or more of Australia's conservation seed banks. It is also hoped that recovery actions will be underway for at least 50 plants and at least 60 threatened ecological community sites.

If the importance of seed banking and associated research could ever be taken lightly, then incidental comments made by Dr. Guja during her lecture would place this research in its proper context. She stated that the Syrian war had caused the first-ever withdrawal from the Domsday seed vault at Svalbard in the permafrost 1300 km beyond the Arctic Circle. She also stated that the oldest seed to germinate had survived from the 1<sup>st</sup> Century CE.

**Anne Wood**

# “The Revolution in Radio Astronomy”

**Professor Elaine Sadler FAA**

The University of Sydney

**1237th Ordinary General Meeting, Wednesday, 7 October 2015**

Australia has been ‘punching above its weight’ in astronomy for many years. Whether it has been providing communications for Moon landings and various space probes, Nobel Laureate Brian Schmidt, or our securing a branch of the Square Kilometre Array (SKA), Australia has contributed innovative technical developments through sustained, long term, government investment.

Professor Sadler told her appreciative audience why wide field, all-sky astrophysics is important and represents our nation’s contribution to the modern understanding of the ‘evolving, dynamic and dark universe’. Bringing together technical, observational and theoretical expertise, Professor Sadler’s team has been the first to detect hydrogen in a distant universe, as well as a new supernova detected with Skymapper. The team effort is stressed – brilliant astronomers and astrophysicists are nurtured, not

plucked from a pool of available fully-trained talent, so time is spent mentoring young scientists in their annual retreat, bringing people together in ‘busy weeks’ as we saw with the Murchison Widefield Array group (<https://www.facebook.com/Murchison.Widefield.Array>).

The secret of success appears to be in picking the projects that even our poor politicians can appreciate as being important and worthwhile, and then spruiking with a single voice. Outreach to schools, community groups and our political masters, is an important aspect of the group’s work. Perhaps other sciences should take note. Good wine might need no bush, but if you want funding it might be a really good idea to make your abilities clear to all.



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## **Big History (continued from page 1)**

David Christian has given numerous talks and lectures on aspects of Russian, Inner Eurasian and world and Big History. In March 2011, he gave a talk on “13.7 billion years of history in 18 minutes” at the TED conference in Long Beach and he has given talks at the World Economic Forum in Davos on Big History. He also appears regularly in the media talking about Big History. His books include *Big History: Between Nothing and Everything*, 2013 (with Cynthia Brown and Craig Benjamin);

“The Return of Universal History”, *History and Theory, Theme Issue*, 49 (December 2010); *This Fleeting World*, 2007. (A history of humanity in under 100 pages); *Big History* a set of 48 lectures for the Teaching Company, 2008; and *Maps of Time: An Introduction to Big History*. Berkeley: University of California Press, 2004, which won the 2005 WHA History Prize for the best book in world history published in 2004.

# Letters to the editor from RSNSW

## **Contributions to the letter pages of newspapers under the auspices of the Royal Society of New South Wales**

As the Royal Society of New South Wales grows and takes its proper place in the conversation of ideas, we have decided to offer rational, evidence-based arguments in the public arena. Letters to newspapers and magazines will be, from time to time, written by members and Fellows, and when approved by Council, offered for publication. Whether or not they appear in print or online, the RSNSW will keep a record of its opinions in the Bulletin.

Here follows two letters sent in recent weeks to the Sydney Morning Herald. The first letter was referred to in the New Scientist online Australian edition.

(1) 24/5/2015

In May 2015, when the University of Western Australia announced it would host a controversial Dane to head a “Consensus Centre”, members of the Society penned the following letter to the Sydney Morning Herald and New Scientist:  
We, the undersigned Fellows of the Royal Society of New South Wales, were among those who expressed

serious concern that major funding has been made available to the University of Western Australia for a “consensus centre” co-directed by Danish political scientist and statistician Bjørn Lomborg, at a time when funding for serious, community-benefiting research in CSIRO and the universities has been cut so drastically.

Now that UWA has refused to accept the centre, we understand that Education Minister Christopher Pyne is seeking to house it in another university, again without review (smh 9/5/15). The RSNSW, as the oldest learned society in the Southern Hemisphere, calls upon all Australian Universities to refuse funding for any institute where academic credentials and autonomy from government influence have not been established by independent, external review. Australian science, with its proud track record, deserves better treatment.

(2) 22/10/2015

In October 2015, the new Prime Minister of Australia announced his support for science and innovation. This is the letter to the Sydney Morning Herald from the RSNSW  
Prime Malcolm Minister Turnbull has promised to “invest in science

and put it right at the centre of our national agenda”.

Does this mean that he will:

- restore the \$75m taken from the Australian Research Council budget;
- reverse the \$111m cuts to CSIRO’s budget over the next four years;
- take steps to ensure career stability and long-term employment prospects for Australia’s young scientists?

Good science offers a great long-term return on investment. Let us hope that the investment matches the promise.

**Contributed by Em. Prof Brynn Hibbert (Vice-President)**