



The Bulletin 420

The Royal Society of New South Wales

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27 April 2018

For Your Diary:

2 May 2018

RSNSW & UNSW

2018 Pollock Lecture

Professor Andrea Morello FRSN

'Engineering for Understanding:

How building quantum devices unveils
the meaning of quantum mechanics'

5.30pm

The Club Bar, UNSW Roundhouse,
Kensington 2052

Register (free): unsw.to/Pollock
before 5pm Tuesday 24 April 2018

17 May 2018

Southern Highlands Branch Lecture

Professor Gordon Parker AO

'An Overview of Depression in Our
Society'

6.30pm start

Mittagong RSL



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

RSNSW Annual Dinner and Awards Friday, 18 May 2018

In the presence of

His Excellency General The Honourable

David Hurley AC DSC (Ret'd),

Governor of New South Wales and

Patron of the Royal Society of New South Wales,
and Mrs Hurley

Distinguished Fellow's Lecture

Thomas Keneally AO DistFRSN

'Mungo Man Imagined:

Writing the ultimate historical novel'



See page 3 for more information

Date: Friday 18th May 2018

Time: 6.30 for 6.45 pm (seating)

Venue: Mitchell Galleries, State Library of NSW
(Entrance: Shakespeare Place, Sydney)

Dress: Black Tie

Open to Fellows, Members, Award Winners and their guests

Cost (including dinner and drinks): \$130 Members and Associate Members;
\$140 for Guests and Non-Members ; \$1,300 for a table of 10

Deadline for Reservations: 10th May 2018; places are limited

Reservations: <https://nsw-royalsoc.currinda.com/register/event/47>

Enquiries: royalsoc@royalsoc.org.au Phone: 9431 8691

From the President



This is my first message as President of the Royal Society of New South Wales. At the time of my election I stressed the honour that I feel to be elected as President – by my rough count, I am the 118th individual to hold this position since the first President, Sir Thomas Brisbane. Brisbane was not only Governor of New South Wales and a distinguished soldier, but also an astronomer of significance, who established an astronomical observatory in Parramatta already in 1825, and was distinguished enough as a scientist to later win the Medal of the Royal Astronomical Society. He was a fine example of all that the Royal Society of New South Wales stands for.

I am taking office at an extraordinarily exciting time for the Royal Society. The membership and fellowship are growing strongly. And perhaps as a reflection of this rejuvenation, the recent Annual General Meeting was revolutionary, in that for the first time in living memory, and perhaps the first time ever, there was a contested election for members of Council. As a result of this election the Society's Council is welcoming four new members. Remarkably enough, all are female, which will dramatically improve the gender balance and other demographic measures within Council.

I take the opportunity to express my gratitude to the retiring Council. And as a relative newcomer, I want to tell you that I was greatly impressed by the dedication and energy of that Council. I am confident that the energy of the new Council will be no less..

Over the past year the still new relationship with the Sydney Mechanics' School of Arts (SMSA) has taken concrete shape, with a very successful 'Enlightenment' series of lectures. It is the intention of Council to build further on this relationship in the coming year.

An even newer relationship for the Royal Society is with the State Library of New South Wales. There will be much more to say about this in the future, but one clear evidence of this relationship is the fact that this year the Annual Dinner will be held at the State Library's Mitchell Galleries, and that for the rest of this year the Annual General Meetings will be held at the State Library. Watch this space for further developments. Comment and suggestions to president@royalsoc.org.au.

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RSNSW Annual Dinner and Awards

At the dinner, the Society will present the following awards for 2017:

Clarke Medal (Botany) - Professor David Keith

The Clarke Medal is awarded each year for distinguished research in the natural sciences conducted in the Australian Commonwealth and its territories. The fields of botany, geology, and zoology are considered in rotation.



Edgeworth David Medal – Associate Professor Angela Nickerson

The Edgeworth David Medal is awarded each year for distinguished research by a young scientist under the age of 35 years for work done mainly in Australia or for contributing to the advancement of Australian science.



History and Philosophy of Science Medal – Professor Peter Godfrey-Smith

This medal is awarded each year to recognise outstanding achievement in the History and Philosophy of Science, with preference being given to the study of ideas, institutions and individuals of significance to the practice of the natural sciences in Australia.



James Cook Medal - Scientia Professor Gordon Parker

The James Cook Medal is awarded from time to time for outstanding contributions to both science and human welfare in and for the Southern Hemisphere.



Poggendorff Lecture – Associate Professor Brent Kaiser

The Poggendorf Lecture is awarded every two to three years for research in plant biology and more broadly agriculture.



Pollock Lecture - Professor Andrea Morello FRSN

The Pollock Memorial Lectureship has been awarded about every four years since 1949, sponsored by the University of Sydney and the Society in memory of Professor J.A. Pollock, Professor of Physics at the University of Sydney (1899-1922) and a member of the Society for 35 years.



RSNSW Medal - Dr Donald Hector AM FRSN

The RSNSW Medal recognises meritorious services to the Society, along with contributions to the advancement of science, including administration and organization of scientific endeavours.



2018 Pollock Memorial Lecture & Cocktail Party Wednesday 2nd May 2018

Professor Andrea Morello FRSN
Professor of Quantum Engineering, UNSW

‘Engineering for Understanding: How building quantum devices unveils the meaning of quantum mechanics’



Over a century after the establishment of quantum mechanics, the popular – and sometimes even the professional – literature is still permeated by the myth that quantum is weird and no one understands it. Yet, the 21st century will probably go into history as the era of quantum engineering, when the peculiar effects allowed by quantum physics are harnessed to create unprecedented functionalities. In this lecture, Professor Morello will illustrate how the ambitious project of building a quantum computer can help us gaining intimacy with the quantum world and, with it, deepen our conceptual and practical understanding of it.

Andrea Morello FRSN is a Professor of Quantum Engineering at UNSW Sydney and Program Manager in the ARC Centre of Excellence for Quantum Computation & Communication Technology. He is a Fellow of the Royal Society of NSW, and the American Physical Society. He grew up near Turin and graduated from the Politecnico di Torino in 1998. He then completed his PhD in the birthplace of low-temperature physics, the Kamerlingh Onnes Laboratorium in Leiden, Netherlands, followed by a postdoc at the UBC in Vancouver. He joined UNSW in late 2006. He and his team were the first in the world to demonstrate the operation of a single electron and a single nucleus quantum bit in silicon. They still hold the record for quantum memory time, and the most accurate demonstration of quantum entanglement in the solid state. For these achievements, Andrea was awarded a Eureka Prize (2011), the Malcolm McIntosh Prize for Physical Scientist of the Year (2013), the David Syme Research Prize (2013), the NSW Science & Engineering Award (2014), and was the inaugural winner of the R. Landauer & C.H. Bennett Award for Quantum Computing (2017).

2018 Events

Royal Society – Southern Highlands Branch

Date*	Event	Speaker	Topic	Location**
17-May-18	Public Lecture	Prof Gordon Parker	An Overview of Depression in Our Society	Mittagong RSL
21-Jun-18	Public Lecture	Dr David Suggett	Future Reefs: How climate change will impact coral reefs	Mittagong RSL
19-Jul-18	Public Lecture	Dr Ken McCracken	t.b.a.	Mittagong RSL
16-Aug-18	Public Lecture	Dr Philip Cam	Philosophy in Schools	Mittagong RSL
20-Sep-18	Public Lecture	Prof Bert Roberts	Aboriginal Art from 65,000 years ago	Mittagong RSL
18-Oct-18	Public Lecture	Hugh Mackay	The State of the Nation Starts in Your Street	Mittagong RSL
15-Nov-18	Public Lecture	t.b.a.		Mittagong RSL

*Lectures are the third Thursday of each month.

**1st Floor, Room Joadja/Nattai.

Professor Gordon Parker AO 'An Overview of Depression in Our Society, and for people to have a more rational model for considering whether antidepressant drugs are likely to be useful or not'



Professor Gordon Parker will consider current rates of prescriptions of antidepressants in Australia compared to previous decades and offer several reasons for the distinctive rate of increase. He will overview a model of the depressive disorders that argues for quite differing biological, psychological (e.g., personality) and social (e.g., loneliness, marital dysfunction) causes – and then the relevance or irrelevance of antidepressants as primary or secondary treatments. He will provide an overview of the debate as to whether antidepressant drugs are more effective or not than placebos, and then open the discussion up to wider debate.

The end objective of his talk is for people to have a more rational model for considering whether antidepressant drugs are likely to be useful or not.

Professor Gordon Parker AO is currently Scientia Professor of Psychiatry, University of New South Wales and was Executive Director of the Black Dog Institute from 2002-2011. He was, for nearly two decades, Head of the School of Psychiatry at UNSW and Director of the Division of Psychiatry at Prince of Wales and Prince Henry Hospitals. He has had a number of responsibilities for the Royal Australian & New Zealand College of Psychiatrists, including being Editor of the Journal and Chair of the Quality Assurance Committee. He has been an active researcher, and has held a number of positions with legal organisations, including the NSW Guardianship Board and the NSW Administrative Appeals Tribunal. In 2004 he received a Citation Laureate as the Australian Scientist most highly cited in the field of 'Psychiatry/Psychology'. In 2018 he received the James Cook Medal from the Royal Society of New South Wales. His research has focussed on modeling psychiatric conditions (depressive, bipolar and personality disorders) and examining causes, mechanisms and treatments for mood disorders. He has published some 20 books and over 1,000 scientific papers and chapters

Anne Wood FRSN

Report of the 1262nd OGM Wednesday 4th April 2018

Professor Paul Fennell

Professor of Clean Energy, Imperial College London
Director of the Centre for Carbon Capture and Storage, Imperial College

'Decarbonation of Industry'



Prof Paul Fennell (left) in conversation prior to the meeting

Professor Paul Fennell talked about the targets that industry faces in view of cutting CO₂ emissions and the potential technologies for doing so. About 8,000 large industrial plants in the world emit half of the global human-generated CO₂. His research focuses on industrial carbon capture and storage (CCS). The main industrial sectors, i.e., iron and steel, cement, petroleum refining, the pulp and paper industry, contribute ~75% of the carbon leakage. For example, the cement industry manufactures about 0.6-1 tonne of CO₂ per tonne of cement, with 60% coming from the calcination reaction and 40% from the kiln. In order to improve the cement process Professor Fennell's research team looked into calcium looping and developed a small cement plant in their lab. Initially, they made the cement quality too pure, as trace elements are important in the settling of cement. In addition, particle size plays an important role in the strength of cement: it needs to be ground fine. His research group is involved in a number of European research projects. For example, in the LEILAC Project (low emissions intensity lime and cement, www.globalccsinstitute.com/projects/leilac) they use Computational Fluid Dynamics (CFD) in reaction modelling, understanding counterflow, looking at the gas temperature distribution, gas velocity and particle temperature distributions. The ASCENT project (www.ascentproject.eu) looks at new types of chemical processes, particularly carbonation conditions. Finishing his talk, Paul expressed thanks to his research group. There were questions about transport and storage being a critical issue, but Paul said that chemical engineering is not that hard, but that insurance and financial issues play a large role. The EU has collaborations with China with technology developments in the EU and demonstration plants in China.

Report of the 12 April 2018 Meeting Royal Society Southern Highlands Branch

Professor Anne Cutler FRS

Research Professor, MARCS Institute for Brain, Behaviour and
Development, Western Sydney University
Emeritus Director, Max Planck Institute for Psycholinguistics
Nijmegen, the Netherlands

‘Language in the first year of life (Babies work harder than we thought)’



Babies are born without predisposition to a particular language; whatever language they hear, that is the language that they acquire. In other words, the processes in the baby brain must be language-universal. Adults listen extremely effectively to speech in their native language, drawing on processes that would work poorly with other languages. We therefore conclude that speech processing in the adult brain is language-specific. Professor Anne Cutler posed the question of how a baby’s language universality becomes the adult’s language specificity, before presenting her research processes and findings to the intrigued 48-person audience.

Several of the experiments that Cutler described related to speech in an infant 6-9 months old. Infants hear mostly continuous speech, only 8.67% of what they hear being isolated words. Speech is continuous, fast, variable and non-unique. Everything in speech recognition follows from that. In the experiments, it was obvious that infants turned their heads longer to hear speech input that they preferred, with 7-month old English-learners preferring passages that contained words that they had just heard in isolation. It is clear that infants can segment running speech, in other words they are easily able to spot the familiar words in continuous speech.

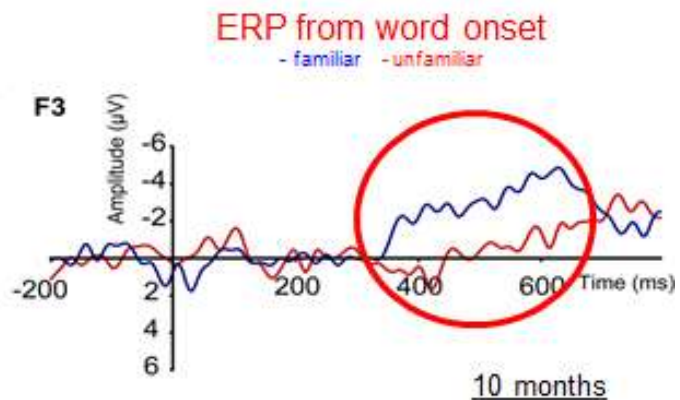
... Continued from previous page

Other results from Cutler's experiments showed that 9-month old English-learners prefer typical words (pliant, rector) where the emphasis is on the first syllable, rather than non-typical words (imply, correct) where the stress lies at the end of the word. An important finding was that two-year-olds who had participated in segmentation studies as infants showed a far greater vocabulary size than those who had not. This was shown to be true in numerous languages in dozens of Head-Turn studies.

One of the techniques used by Cutler's team to test infant speech perception involved the use of Event-Related Potentials (ERP), where the child's head was covered with a cap carrying numerous electrodes. To start a vocabulary, infants have to find words in running speech, in other words to show segmentation ability. With the use of ERPs, the team could look at the age at which segmentation appears, the amplitude of the effect in the brain trace and also the nature of that effect. This data was invaluable in correlating these measures with a child's demonstrated language skills.



Event-Related Potentials show infant brain's response to speech output



ERP demonstrating that the infant brain recognises previously familiarised words significantly more than unfamiliar words

Towards the end of her lecture, Anne Cutler presented her ground-breaking research on the language development of children who had been born to non English-speaking mothers and then adopted by English-speaking parents. The process of acquiring a language starts automatically before birth in the third trimester. The baby is able to separate sounds reaching the womb from various sources such as the mother's voice. This new research has found that the early language in the adoptees can be subconsciously retained even when they can no longer remember the learning experience.

Professor Cutler's conclusion was that, when we look at a baby resting in its cot, we are seeing the human mind at its finest. The tiny child has the ability to generalize across instances, to see the over-arching patterns, and to store this abstraction for constructing future expectations. All in full use, even in the first year of life.

Anne Wood FRSN

Schedule of RSNSW Events 2018

Date	Event	Speakers	Topics and Presentations	Location
2-May-18	Pollock Memorial Lecture	Prof Andrea Morello	Engineering for Understanding	Club Bar, UNSW Roundhouse
18-May-18	Annual Dinner	Tom Keneally AO	Distinguished Fellows Lecture and 2017 Awards Presentation: 'Mungo Man Imagined'	State Library of NSW
6-Jun-18	Ordinary General Meeting	Prof Ben Oldroyd	No sex please, we're Cape bees	State Library of NSW
23-Jun-18	Great Australians Lecture Series 1	Tom Keneally AO	tba	SMSA
4-Jul-18	Ordinary General Meeting	A/Prof Joanna Mendelsohn	Art, Money and Exhibitions in Australia	State Library of NSW
23-Jul-18	Great Australians Lecture Series 2	Em Prof Stephen Leeder	tba	SMSA
1-Aug-18	Poggendorf Lecture	Prof Brent Kaiser	tba	
8-Aug-18	Ordinary General Meeting	Prof Muireann Irish	Neuroscience	State Library of NSW
13-17 Aug-2018	National Science Week	TBA	RSNSW & SMSA Science Talks	SMSA
5-Sep-18	Ordinary General Meeting	Prof Richard Kemp	Eyewitness Evidence	State Library of NSW
6-Sep-18	Great Australians Lecture Series 3	Em Prof Brynn Hibbert	tba	SMSA
3-Oct-18	Ordinary General Meeting	Prof Gordon Wallace	3D Printing of Body Parts	State Library of NSW
7-Nov-18	Ordinary General Meeting	A/Prof Tara Murphy	Gravitational Waves	State Library of NSW
12-Nov-18	Great Australians Lecture Series 4	Prof Alison Bashford	tba	SMSA
23-Nov-18	RSNSW & Four Learned Academies Forum	TBA		NSW Government House
5-Dec-18	Ordinary General Meeting	Jak Kelly Award Winner	2018 Jak Kelly Award Presentation & Christmas Party	State Library of NSW

Contacts for Your Officer Bearers and Council Members

Prof Ian Sloan AO President: president@royalsoc.org.au

Em Prof D. Brynn Hibbert Vice-President (Immediate Past President): b.hibbert@unsw.edu.au

Mr John R. Hardie Vice-President: john.hardie@royalsoc.org.au

Ms Judith Wheeldon AM Vice President: judith.wheeldon@mac.com

Mr John Wilmott Hon Treasurer: rjwilmott@gmail.com

Dr Herma Buttner Hon Secretary: secretary@royalsoc.org.au

Em Prof Robert Marks Hon Sec (Editorial): editor@royalsoc.org.au

Dr Ragbir Bhathal Hon Librarian: R.Bhathal@westernsydney.edu.au

A/Prof Chris Bertram Hon Webmaster: c.bertram@sydney.edu.au

Ms Anne Wood (Southern Highlands Rep): wood.anne@gmail.com

Dr Erik Aslaksen: erik.aslaksen@bigpond.com

Dr Mohammad Chouair: mohammad.chouair@sydney.edu.au

Em Prof Robert Clancy AM: robert.clancy181@gmail.com

Dr Laurel Evelyn Dyson (Bulletin Editor): Laurel.E.Dyson@uts.edu.au

Dr Margaret Gibson: mragebison@optus.com.au

Dr Donald Hector AM: dhector@royalsoc.org.au

Prof Nalini Joshi AO: nalini.joshi@sydney.edu.au

Virginia Judge: vijudge@cmri.org.au

Prof E. James Kehoe: ejameskehoe@gmail.com

Hon Prof Ian Wilkinson: ian.wilkinson@sydney.edu.au

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

Editor: Dr Laurel Evelyn Dyson

Contact: Ms Thalia Child, Phone: +61 2 9431 8691 Fax: +61 2 9431 8677 Email: royalsoc@royalsoc.org.au

Mailing Address: The Royal Society of NSW, PO Box 576, Crows Nest NSW 1585, Australia

For further information: <http://www.royalsoc.org.au/>