



# The Bulletin 423

The Royal Society of New South Wales

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## For Your Diary:

**1 August 2018**

The Poggendorff Lecture

**Professor Brent N. Kaiser**  
**'Establishing a Sustainable Nitrogen Diet to Agricultural Intensive Cropping Industries'**  
See p. 5 for more information

**13, 14 and 17 August 2018**

RSNSW & SMSA

Sydney Science Week Talks

See pp. 6-7 for more information

**16 August 2018**

Southern Highlands Branch Lecture

**Associate Professor Philip Cam**

**'Philosophy For a Thinking Curriculum'**

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

## Open Lecture & OGM

**'The Final Frontier - On the Complexity and Frailty of Human Memory'**

**Wednesday, 8th August 2018**

*Note: In August the OGM will be held on the 2nd Wednesday of the month*

**Associate Professor Muireann Irish**  
University of Sydney



*See page 3 for more information*

**Date:** Wednesday 8th August 2018

**Time:** 6:00 pm for 6:30 pm

**Venue:** Gallery Room, State Library of NSW

(Entrance: Shakespeare Place, Sydney)

**Dress:** Business

**Entry (including a welcome drink):** \$15 for Members and Associate Members of the Society, \$25 for Non-Members.

**Dinner (including drinks):** \$85 for Members and Associate Members, \$95 for Non-Members.

Reservations must be made at least 2 days in advance

**Reservations:** <https://nsw-royalsoc.currinda.com/register/event/50>

**Enquiries:** [royalsoc@royalsoc.org.au](mailto:royalsoc@royalsoc.org.au) Phone: 9431 8691

All are welcome.

# From the President

A few weeks ago I had the privilege of visiting an important chateau in the Loire Valley – important not because it was a residence of kings or princes, but because it was the last residence of my greatest personal hero, the splendid Leonardo da Vinci. He spent the last three years of his life at the Chateau du Clos Lucé under the patronage and protection of King Louis I.

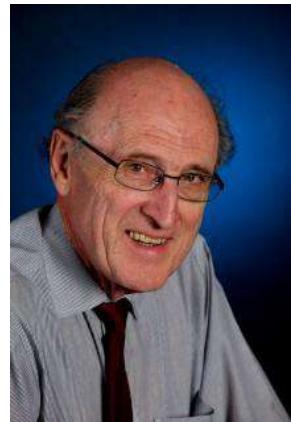
He did not come to the chateau to retire: he was appointed by King Louis as ‘First architect, painter and engineer’ of the king. Leonardo in his years at the chateau continued his painting, engineering and town planning activities. (He sought to devise the ‘ideal city’.) He brought with him to the chateau the work we now know as the ‘Mona Lisa’ in a more or less finished state, but he continued to work on two other celebrated canvases, the ‘Virgin and Child with St Anne’ and ‘St John the Baptist’. He developed plans for civic water projects, and continued developing his remarkable sketches of anatomy and botany, and his revolutionary engineering ideas.

The beautiful garden at the chateau contains a large number of working models developed from Leonardo’s sketches, such as his ‘helicopter’, swing bridge and Archimedes screw, together with floating reproductions of his most famous paintings. A great way to spend a day for a Leonardo enthusiast.

I think you will see already why I speak of Leonardo: within his single person he embraces many of the themes that motivate the Royal Society of New South Wales. His appointment as ‘architect, painter and engineer’ is reminiscent of the ‘Science, art, literature and philosophy’ that are in the remit of the Royal Society. The reality of Science and technology these days is that they encourage, even require, a high degree of specialisation, yet I believe that society will be best served, and we will also be individually happier, if each of us strives to maintain a breadth of intellectual and creative interests – as the Royal Society encourages us to do!

A final note from Leonardo’s chateau: as a believer in the benefits of a balanced life, it pleased me to learn that on June 17, 1518, Leonardo repaid his benefactor with a brilliant banquet, with the courtyard of Chateau du Clos Lucé draped in sky blue, the major planets represented on one side, and the moon on the other. I like to think that Leonardo would have enjoyed the Society’s recent annual dinner, exactly five hundred years later, at the State Library of NSW!

Ian H. Sloan AO FRSN  
President, Royal Society of New South Wales  
[President@royalsoc.org.au](mailto:President@royalsoc.org.au)



**Associate Professor Muireann Irish**  
**The Brain and Mind Centre, University of Sydney**

**'The Final Frontier - On the Complexity and Frailty of Human Memory'**



Human memory remains one of the great scientific enigmas and one which continues to perplex neuroscientists, philosophers, and psychologists alike. Our memories are our most prized possessions, enabling us to revisit defining events from the past and guiding us towards adaptive behaviours in the future. The relative ease with which we mentally navigate back and forth through subjective time, however, belies the incredible complexity of these processes. With the advent of high resolution neuroimaging techniques, it is now possible to map the regions of the brain that activate when we recollect the past, however, it is only when memory begins to fail that we can truly appreciate its intricacies. In this lecture, I will present an overview of work from my group exploring different facets of memory dysfunction across a range of neurodegenerative disorders including Alzheimer's disease, semantic dementia, and frontotemporal dementia. Using a combination of novel experimental tools and advanced neuroimaging techniques, we are moving towards a refined understanding of how progressive atrophy to distributed brain networks impacts the capacity not only to remember the past but also to envisage the future. In doing so, I hope to highlight the neurocognitive mechanisms that must be functional to support a range of memory processes as well as considering the devastating effects of losing these uniquely human functions.

Muireann Irish is an Australian Research Council Future Fellow and Associate Professor of Psychology at the Brain & Mind Centre, University of Sydney. Originally from Ireland, Muireann completed a Bachelor degree in Psychology at Trinity College Dublin (1<sup>st</sup> Class Honours), then a PhD in Cognitive Neuropsychology before relocating to Australia in 2010. Since then, she has produced >80 publications and has received over \$2.5million in competitive funding from such sources as the ARC, NHMRC, Brain Foundation, and Alzheimer's Australia. Muireann's research focus is the cognitive neuroscience of memory and how pathological insult to large-scale brain networks compromises sophisticated expressions of memory. Ultimately, she hopes her research will inform the early and accurate detection of dementia as well as the development of interventions to improve quality of life and wellbeing for those affected.

# 2018 Events

## Royal Society – Southern Highlands Branch

Date*	Event	Speaker	Topic	Location**
16-Aug-18	Public Lecture	A/Prof Philip Cam	Philosophy for a ‘Thinking Curriculum’	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	Dana Cordell	Sydney Food Futures	Mittagong RSL

\*Lectures are the third Thursday of each month.

\*\*1st Floor, Room Joadja/Nattai.

### **Associate Professor Philip Cam**

#### President, Philosophy in Schools Association, NSW

### **‘Philosophy for a “Thinking Curriculum”’**



If we are serious about teaching children to think, then we need to be serious about structuring the curriculum around thinking. This requires us to pay attention to the general thinking strategies and broad conceptual understandings that find a natural home in philosophy. By looking to the concepts and procedures of philosophy, we can help to integrate the curriculum and at the same time make children more effective participants in the process of learning. Philosophy for Children not only helps children to develop habits of good thinking, it provides them with a means of making those broader connections out of which richer and deeper understandings can grow.

Dr Philip Cam is Associate Professor in the School of Humanities and Languages at the University of New South Wales, Australia, and President of the Philosophy in Schools Association of New South Wales. He has a DPhil in Philosophy from the University of Oxford and is an international authority on philosophy in schools. Philip helped to pioneer the introduction of philosophy into schools in Australia and has run workshops for educators around the world. He has published extensively in the field and his work has been widely translated. These include books for teachers such as *Thinking Together*, *Twenty Thinking Tools* and *Teaching Ethics in Schools*, and classroom materials, including the *Thinking Stories* series, a philosophical novella *Sophia’s Question*, and *Philosophy Park*, a history of philosophy in story form. Philip is past-President of the Asia-Pacific Philosophy Education Network for Democracy, for which he edited a series of books on philosophy, democracy, education and human values.

Anne Wood FRSN

## The Poggendorff Lecture Wednesday 1<sup>st</sup> August 2018

Professor Brent N. Kaiser

School of Life and Environmental Sciences, University of Sydney

# 'Establishing a Sustainable Nitrogen Diet to Agricultural Intensive Cropping Industries'

**Date:** Wednesday 1 August 2018, 6 for 6.30 pm

**Location:** New Law Annexe Seminar Room 432, The University of Sydney

**Entry:** Free

**Dress Code:** Business

**Registration:** [www.eventbrite.com.au/e/the-poggendorff-lecture-tickets-48055912528](http://www.eventbrite.com.au/e/the-poggendorff-lecture-tickets-48055912528)

**Enquiries:** royalsoc@royalsoc.org.au

**Phone:** 9431 8691

**All are welcome.**

Across the globe, approximately 120 million tonnes of nitrogen fertilisers are applied each year to grow crops that support the dietary and fibre requirements of humans (FAO 2017). The majority of nitrogen fertiliser expenditure (~60%) is dedicated to the production of common cereals (wheat, rice, barley and maize) of which only 30-40% is retained in the harvested product in the form of either protein or dietary nitrogen. Unused or underutilised nitrogen is often lost to the environment through soil leaching of nitrate into the ground water, atmospheric release of nitrous oxide ( $N_2O$ ) and the volatilisation of ammonia from both the soil and the plant canopy. Nitrogen release into the environment is a global concern due to its devastating impact on water quality and its  $N_2O$  potent capacity as a greenhouse gas.

Agriculturally intensive countries around the world have increasingly invested in technologies to lessen the requirement of nitrogen fertilisers through improved agronomy and the selection of nitrogen-use efficient plants. However, the high dependency of reduced nitrogen to maintain crop growth and achieve sufficient yields remains a challenge to modern farming systems where nitrogen-enhanced yields are now plateauing. Moreover, the rapid increase in global population is driving an independent need to deliver even further increases in productivity and quality that unfortunately is increasingly subject to the detrimental effects of climate change on farm systems.

**Dr. Brent N. Kaiser** is the Professor of Legume Biology and Molecular Genetics in the School of Life and Environmental Sciences at the University of Sydney. He is the current Director of the ARC Industrial Transformation Research Hub (Legumes for Sustainable Agriculture) and Theme Leader in Plant Breeding and Production in the Sydney Institute of Agriculture. Professor Kaiser's research focus is on the management of nitrogen nutrition in plants.





7-19 AUG 2018  
SYDNEY  
SCIENCE  
FESTIVAL



## Royal Society of New South Wales & Sydney Mechanics' School of Arts Sydney Science Week Talks

The Royal Society of NSW and the Sydney Mechanics' School of Arts are combining to offer a series of four talks as part of Science Week  
(<https://sydneyscience.com.au/2018/>)

**Venue:** Mitchell Theatre, Level 1, Sydney Mechanics School of Arts, 280 Pitt St, Sydney  
(near Town Hall Station)

**Registration Essential**

**All are welcome**

**Enquiries: SMSA phone (02) 9262 7300**

### **Talk 1: 'Will Self-Driving Cars Make Us Safer?'**

By Professor Ann Williamson FRSN

Director, Transport and Road Safety Research Centre, UNSW

**Date and Time:** Monday 13 August 2018, 12.30-1.30 pm

**Cost:** Free

*Further details and registration at:*

<https://smsa.org.au/events/event/science-week-autonomous-vehicles-will-in-vehicle-technology-make-us-safer/>



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## **Talk 2: 'Nanotech: What is So Special about Small Stuff?'**

**By Rosie Hicks**

CEO Australian National Fabrication Facility

**Date and Time:** Tuesday 14 August 2018, 12.30–1.30 pm

**Cost:** Free

*Further details and registration at:*

<https://smsa.org.au/events/event/science-week-nanotech-whats-the-big-deal-about-small-stuff/>

## **Talk 3: 'Ethics, Emotions & Elegance in Artificial Intelligence'**

**By Professor Simeon Simoff FRSN**

Dean, School of Computing, Engineering & Mathematics, Western Sydney University

**Date and Time:** Tuesday 14 August, 6-7.30pm

**Cost:** \$15 members of RSNSW or SMSA; \$20 non-members and guests (Light refreshments will be served)

*Further details and registration at:*

<https://smsa.org.au/events/event/ethics-emotions-elegance-artificial-intelligence/>



## **Talk 4: 'Wine and Medicine: An Australian Perspective'**

**By Dr Phillip Norrie FRSN, General Practitioner**

**Date and Time:** Friday 17 August 6-7.30pm

**Cost:** \$15 members of RSNSW or SMSA; \$20 non-members and guests (Light refreshments will be served)

*Further details and registration at:*

<https://smsa.org.au/events/event/science-week-wine-as-medicine-an-australian-perspective/>

# **Report of the 1264<sup>th</sup> OGM**

## **Wednesday 4<sup>th</sup> July 2018**

### **Associate Professor Joanna Mendelsohn**

College of Fine Arts, University of New South Wales

### **'Can Art Really Make a Difference?'**



Picasso's Guernica on display at the 1937 Paris World Fair

The initial topic of Joanna's talk was the relationship between art, mainly pictorial and some films, and war. While classical art would tend to focus on the heroic aspects of war – with death as a sacrifice in a good cause – Francisco Goya depicted the suffering of the Spanish people as a result of the Napoleonic war. The horrors of WW1 and the following rise of fascism, leading to WW2, made some artists depict the gruesome and wasteful side of war as a means of protest, and Joanna showed numerous examples of this, including *Der Krieg* by Otto Dix and *Guernica* by Pablo Picasso.

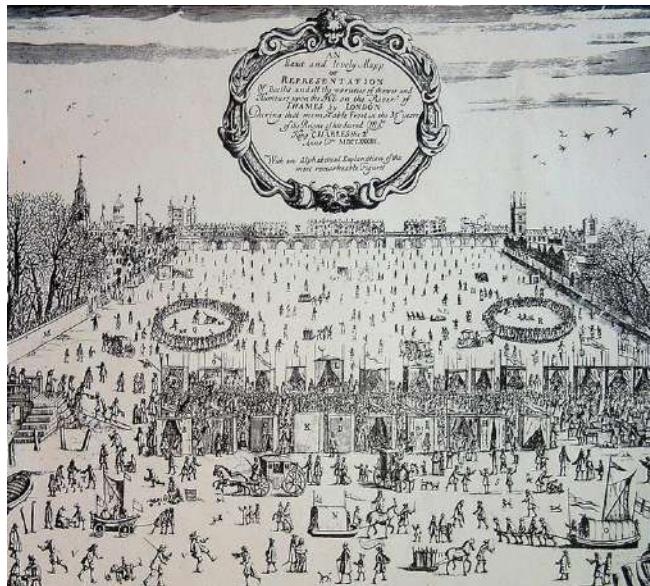
A second topic was art in relation to the current issue of refugees and illegal immigrants, with Ai Weiwei a prominent artist, with both his large installations in Sydney, as part of the Biennale, and in Berlin given as examples. As an instance of a particularly effective use of art, this time in the form of photography, Joanna presented the well-known photo of a Migrant Mother, taken during the Depression in the US and the exodus from what had become a dustbowl in the Mid West. Following publication of this photo, a significant amount of food aid was provided.

Finally, Joanna used MOMA in Hobart as a very successful example of how modern art can be used to tell powerful stories. The talk was followed by numerous questions and associated discussions, which demonstrated how Joanna's message had resonated with the audience.

# Report of the 19<sup>th</sup> July 2018 Meeting Royal Society Southern Highlands Branch

Dr Ken McCracken AO

## ‘The Ice Ages – BIG and little’



The Maunder Minimum  
1645-1715:  
Activity on a frozen River  
Thames, London, 1683

For many millions of years, earth has experienced a series of periods of glaciation. In the big ice ages, temperatures have been 10 degrees cooler over periods of approximately 90,000 years. The little ice ages have seen temperatures 2 degrees cooler over periods of 40-100 years. Five of these have occurred in the last 1,000 years.

During the big ice ages, the northern polar ice sheet extended to about the locations of London and Los Angeles, and the sea level was 100m lower in the rest of the world. In between these ice ages or glacial epochs, there have been warmer periods of duration 10,000 to 15,000 years, the inter-glacials, similar to the climate the earth has experienced for the last 10,000 years. In addition to these big ice ages, there have been 26 little ice ages during the 10,000 year interglacial era we live in. Each has persisted for 40-150 years. The best known are the *Spoerer* and *Maunder* little ice ages of 1428-1540 and 1645-1715 respectively. They caused much starvation and death in Europe.

Ken McCracken then turned his attention to the models and theories that are currently being explored to explain the periods of glaciation that have been observed over eons of time. Much of the data being used to study correlations in observed patterns has come from ice core studies and currently from satellite data, a field in which McCracken continues to be deeply involved. In his latest work, he has revisited the Milankovitch theory which for about 50 years lay largely ignored.

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According to the Milankovitch theory, temperature variation records on earth going back over 400,000 years are closely correlated with changes in the geometry of the earth's orbit. These changes in geometry are due to three main factors, eccentricity, obliquity and precession, which could be loosely regarded as wobbles and deviations of the earth in its orbit around the sun. McCracken believes that these phenomena are instrumental in big ice age occurrence.

As for little ice age occurrence, McCracken believes that they are a consequence of small variations in the amount of heat radiated by the sun, each corresponding to a period when there were very few sunspots. Right now, the sun is not making many sunspots, and McCracken states that we are in a very weak little ice age.



The Dalton Minimum 1790-1820, a little ice age:  
'Napoleon Leaves Russia' 1812.

The conclusion to this lecture was unforgettable when Ken McCracken asked what factors could be causing the correlations between big ice ages with earth's orbital variations, and little ice ages with lesser sunspot numbers. He answered his own question with the statement, "It is the planets that do it".

He proposes that in the case of the big ice ages, the planets manipulate the orbit of the earth depending on the relative positions of their orbits around the sun. In the case of the little ice ages, again due to the relative positions of their orbits, the planets drive a magnetic amplifier deep inside the sun that creates the sunspots, and that in turn results in the observed smaller climatic fluctuations.

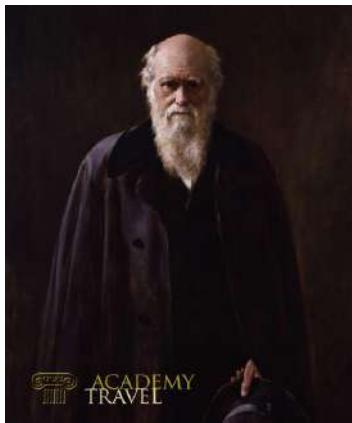
The conclusions reached by Dr Ken McCracken were presented in this Royal Society Southern Highlands lecture for the first time in public. The 90 person audience broke into spontaneous applause.

**Anne Wood FRSN**

# The History of Science: Padua – Florence – Paris – London

## A tour for the Royal Society of NSW in conjunction with the State Library of NSW Foundation

19 September – 4 October 2019



### Overview

Explore the history of science from Vesalius in Padua, to Galileo in Florence and the flourishing of modern science in Paris and London. This 16-day private tour for the Royal Society of NSW in conjunction with The State Library of NSW Foundation includes guided visits to many exceptional museums, rare access to collections, libraries and archival material, and the expert guidance of specialists and curators. It follows the great story of modern science, taking you from Padua, to Florence, Paris and London and includes day trips to Bologna, Siena and Cambridge. A four-night pre-tour extension to Venice is also available.

### Discover

- The birth of modern science, from Galileo's telescopes to Darwin's theory of evolution
- The history of medicine: Vesalius in Padua, Pasteur in Paris and the medical collections of London
- The transmission of knowledge, from rare books and manuscripts to the modern museum
- The history of the university at Padua, Bologna, Paris and Cambridge
- Interaction between the arts and sciences in moments of great change from the Renaissance to the modern world.

### Tour Details

**Dates:** 19 September – 4 October 2019

**Price:** \$9,270 pp. twin share; \$2,280 single supplement

**For more information and to register your interest contact:** Academy Travel, 9235 0023  
[info@academytravel.com.au](mailto:info@academytravel.com.au).

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# The History of Science (contin.)

## Tour Highlights

- Padua: the world's first anatomy theatre, the oldest botanic garden and Giotto's Scrovegni Chapel
- Special access to library collections in Florence, Paris and London
- Private tour of the Pompidou Centre, Paris' modern art museum
- Day trips to Siena, Bologna, Cambridge and Greenwich
- Specialist museums dedicated to Pasteur, Curie, Galileo & Darwin
- London science: from the manuscripts of the Wellcome Library to the National Science Museum.

## Itinerary



**Days 1–3:** Arrive Padua; visit the world's oldest anatomy theatre and oldest botanic garden, visit Scrovegni Chapel, Giotto's masterpiece; day trip to Bologna.

**Days 4–6:** Explore Florence, including the Galileo Museum, Uffizi, and special access to rare collections; day trip to Siena and the wonderful cuisine of Chianti.

**Days 7–10:** Discover a different side of Paris, from special museums dedicated to Pasteur and Curie to a private tour of the Pompidou Centre.

**Days 11–15:** Arrive London. Enjoy visits to Down House, the home of Charles Darwin, the National Observatory and prime meridian at Greenwich, and a range of museums from the Museum of Natural History, to the private collection of the Royal College of Physicians; day trip to Cambridge.

**Day 16:** Departure.

## Tour Leader

Emeritus Prof Robert Clancy AM FRSN has a distinguished career in medical research and has published books on the early mapping of Australia. He has led many similar successful expeditions. Expert guides will meet the group in each destination.

**Maximum Group Size:** 20

# Schedule of RSNSW Events 2018

Date	Event	Speakers	Topics and Presentations	Location
1-Aug-18	Poggendorff Lecture	Prof Brent Kaiser	Establishing a Sustainable Nitrogen Diet to Agricultural Intensive Cropping Industries	New Law Annex, Seminar Rm 432, University of Sydney
8-Aug-18	Ordinary General Meeting	Prof Muireann Irish	The Final Frontier - on the Complexity and Frailty of Human Memory	State Library of NSW
13-Aug-18	Sydney Science Week Talk 1	Prof Ann Williamson	Will Self-Driving Cars Make Us Safer?	SMSA
14-Aug-18	Sydney Science Week Talk 2	Rosie Hicks	Nanotech: What is So Special about Small Stuff?	SMSA
14-Aug-18	Sydney Science Week Talk 3	Prof Simeon Simoff	Ethics, Emotions & Elegance in Artificial Intelligence	SMSA
17-Aug-18	Sydney Science Week Talk 4	Dr Phillip Norrie	Wine and Medicine: An Australian Perspective	SMSA
5-Sep-18	Ordinary General Meeting	Prof Richard Kemp	Eyewitness Evidence	State Library of NSW
6-Sep-18	Great Australians Lecture 3	Em Prof Brynn Hibbert	Great Australians You Have Never Heard Of	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 4	Prof Alison Bashford	Great Australians You Have Never Heard Of	SMSA
29-Nov-18	RSNSW & Four Learned Academies Forum	TBA	Towards a Prosperous yet Sustainable Australia. What now for the Lucky Country?	NSW Government House
5-Dec-18	Ordinary General Meeting	Jak Kelly Award Winner	2018 Jak Kelly Award Presentation & Christmas Party	State Library of NSW

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