



# The Bulletin 431

The Royal Society of New South Wales

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## For Your Diary:

**2 May 2019**

**RSNSW & SMSA**

***Women and Science***

Lecture 2: 'Ada Lovelace and the Analytical Engine'

**Susannah Fullerton OAM FRSN**

*(For more information and how to register, see p. 5)*

**16 May 2019**

**Southern Highlands Branch Lecture**

**Dr Damian Wrigley**

'The Importance of a Seed Bank in Future Preservation of Plant Species'

*(For more information, see p. 4)*



**Patron of The Royal Society of NSW**  
Her Excellency The Honourable Margaret Beazley AO QC  
Governor of New South Wales

## RSNSW Annual Dinner 2019, Awards & Distinguished Fellow's Lecture

In the presence of  
Her Excellency The Honourable Margaret Beazley, AO QC,  
Governor of New South Wales and  
Patron of the Royal Society of New South Wales

## 'The New Field of Atomic Electronics'

Friday, 10th May 2019

**Professor Michelle Simmons FRS FAA  
FTSE DistFRSN**



*See page 3 for more information*

**Time: 6 pm (drinks & music from 6.30, seated by 7 pm)**

**Venue: Swissôtel – Ballroom, level 8, 68 Market Street, Sydney**

**Dress: black tie or evening dress**

**Cost: (including dinner and drinks): \$135 per person**

**Open to Fellows, Members and friends of the RSNSW and their guests**

**Reservations: <https://nsw-royalsoc.currinda.com/register/event/66>**

Final date for reservations is 2 May

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

# From the President



For those who missed it, the Annual General Meeting of the Royal Society on April 3 was an exciting occasion, because for what I think is only the second time in our nearly 200 year history, there was a contested election for the Society's Council. (The first time was last year, in 2018.) To me it is an excellent sign of the present health of the Royal Society that there is competition to serve on its Council.

I welcome all members of the new Council, but especially its new members: Stuart Midgley, Susan Pond, Bruce Milthorpe and Bruce Ramage. Because the Society relies so much on volunteers, I am particularly pleased that all of the new members have already taken up important roles for the Society: Stuart to become Secretary of the Voice and Outreach Committee; Susan to take the leading role on the Forum Planning Committee for the forthcoming Forum of the Royal Society and the Four Academies (on the exciting topic of "Making SPACE for Australia", about the opportunities and challenges of the space age for Australia); Bruce Milthorpe returning to Council to chair the important Awards Committee, and above all, Bruce Ramage who has joined Council to take on the key role of Honorary Secretary. I take the opportunity to thank all members of the retiring Council. Most of all I want to thank the retiring Honorary Secretary Herma Buttner, who has served the Council with great distinction and dedication.

While thanking volunteers, I do particularly want to mention the volunteers who are helping to catalogue the Royal Society's library holdings, now happily located in the State Library of New South Wales.

Can I say also: don't miss the Annual Dinner on May 10. I believe it will be a very special occasion, with a splendid new location; the first opportunity for most of us to see the new Governor, Margaret Beazley; and an address by our own Distinguished Fellow, and 2018 Australian of the Year, Michelle Simmons.

As always, if you have suggestions for how the Royal Society can better serve the community and its members, do please let me know.

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

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## RSNSW Annual Dinner and Awards

At the dinner, the Society will present the following awards for 2018:

### **James Cook Medal - Professor Elizabeth Elliott AM FRSN, University of Sydney**

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.



### **Edgeworth David Medal – Associate Professor Elizabeth J. New FRSN, University of Sydney**

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.



### **Clarke Medal (Zoology) – Professor Emma Johnston AO FRSN, University of New South Wales**

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.



### **History and Philosophy of Science Medal – Professor Paul Griffiths FRSN, University of Sydney**

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.



### **Poggendorff Lecture – Professor Robert F. Park FRSN, University of Sydney**

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



# 2019 Events

## Royal Society – Southern Highlands Branch

Date*	Event	Speaker	Topic	Location**
16-May-19	Public Lecture	Dr Damian Wrigley	The Importance of a Seed Bank in Future Preservation of Plant Species	Mittagong RSL
20-Jun-19	Public Lecture	Prof Ken Baldwin	Nuclear Energy	Mittagong RSL
18-Jul-19	Public Lecture	Dr Christian Heim & Dr Caroline Heim	Understanding the Mental Health Crisis and How Your Relationships can Save You	Mittagong RSL
15-Aug-19	Public Lecture	Prof Rick Shine	Sequencing the Cane Toad Genome (DNA)	Mittagong RSL
19-Sep-19	Public Lecture	Dr Rebecca Carey	Volcanology	Mittagong RSL
17-Oct-19	Public Lecture	Prof Toby Walsh	2062 - The World that Artificial Intelligence Made	Mittagong RSL
21-Nov-19	Public Lecture	Prof Geordie Williamson	t.b.a.	Mittagong RSL

\*Lectures are normally the third Thursday of each month.

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

### Dr Damian Wrigley

National Coordinator, Australian Seed Bank Partnership

### 'The Importance of a Seed Bank in Future Preservation of Plant Species'



Internationally there is a groundswell of individuals, organisations and governments contributing to discourse on the Sustainable Development Goals and many other international conventions and strategies for biodiversity conservation. The Australian Seed Bank Partnership (ASBP) is doing its part by securing Australia's diverse botanical wealth through ex situ seed conservation and research.

The Partnership represents a collaboration of botanic gardens and conservation organisations with a strong focus on delivering against the targets of the Global Strategy for Plant Conservation. We believe viability of long-term seed collections and their availability to the botanic gardens and conservation communities is dependent on the science behind each taxa. In April 2020 the ANBG will host the ASBP's Seed Science Forum which will invite national and international seed scientists across various sectors to share their knowledge and collaborate on future seed science projects.

Dr Damian Wrigley is the ASBP National Coordinator, organising national and international ex-situ seed conservation, capacity building and research collaborations on behalf of the Partnership. He provides support to the Council of Heads of Australian Botanic Gardens to deliver better outcomes for plant conservation throughout Australia. Since 2017 Damian has been Australia's National Focal Point for the Global Strategy for Plant Conservation, liaising with the international botanical and plant conservation communities to support and raise awareness of the importance of plant conservation. Dr Wrigley has over ten years' experience in biodiversity conservation policy and environmental science.

## Women and Science

### Lecture 2: 'Ada Lovelace and the Analytical Engine'

Susannah Fullerton OAM FRSN



Detail of watercolor portrait of Ada, Countess of Lovelace, from the collection of the Science Museum UK. Background is a diagram of an algorithm for the Analytical Engine by Ada Lovelace, from 'Sketch of The Analytical Engine Invented by Charles Babbage' by Luigi Menabrea with notes by Ada Lovelace, 1842.

Only child of the poet Lord Byron and his wife Annabella who adored mathematics, Ada, Countess of Lovelace, worked with Charles Babbage on his 'analytical engine'. It was Ada who first recognised the future possibilities of the machine, and who made notes which can be considered the first computer programme. Babbage focussed on what his machine could do with numbers, but Ada saw its potential beyond numbers and anticipated the implications of the computer a hundred years before anyone else. Her view was that if you had a machine that manipulated numbers, then the numbers could represent other things — letters, music, symbols — and so could move beyond calculation to computation. Susannah Fullerton presents an illustrated lecture on the short life and far-reaching achievements of this remarkable woman.

**Susannah Fullerton** is Sydney's best-known literary lecturer, giving talks on famous authors, their lives and works. She has spoken at literary conferences around the world, and is regularly sought as an entertaining and informative speaker at fund-raising events, conference dinners, schools, libraries, universities, bookshops and clubs. She is a registered speaker for ADFAS (The Australian Decorative and Fine Arts Societies) and travels Australia giving presentations to the groups. She is interviewed regularly on ABC radio and has often been interviewed for TV. Suzannah presents regular series at the Art Gallery of NSW and the State Library of New South Wales.

**Date:** Thursday 2 May 2019, 6pm (for registration and light refreshments) for 6.30 to 7.30pm (talk).

**Cost:** \$15 members of RSNSW and SMSA, \$20 non-members and guests

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

**Registration:** <https://smsa.org.au/events/event/susannah-fullerton-ada-lovelace/>



# Report of the 1272<sup>nd</sup> OGM

Wednesday 3<sup>rd</sup> April 2019

**Em Professor Brynn Hibbert AM FRSN**

**School of Analytical Chemistry, UNSW**

## ‘Measuring What We Can: or How to Lose Weight on May 20th’



Vice-President Judith Wheeldon AM FRSN presenting Professor Hibbert with a medal after the talk

The need to be able to measure observable physical quantities, in order to characterize both the world we live in and the objects we create, goes back a long time, and Professor Brynn Hibbert gave examples of measures of length and weight from various societies, going back thousands of years. However, as the interaction between the individual societies increased, the need for an agreed set of measures became obvious: the earliest proposal for such a set came from John Wilkins (1614-1672), Dean of Ripon, Bishop of Chester, and the first secretary of the Royal Society of London. But it then took more than two hundred years before the first international measure was agreed, in the Treaty of the Metre, signed on 20 May 1875 in Paris. Other measures soon followed suit, and the *Système international d'unités* (SI) or International System of Units - the metric system - developed until seven basic measures (length, mass, time, temperature, electric current, substance, and luminosity) were agreed. Increasingly, as our understanding of Nature and our measuring techniques improved, these standards were defined in terms of physical parameters that we believe are unchanging, or at least changing at an imperceptible rate. Their values, based on the best available measurements, are then *defined* to have a fixed value, e.g., the speed of light in a vacuum, which is defined to have the value 299 792 458 m/s.

One example discussed briefly by the speaker was the relationship between the unit of mass - the kilogram - and the defined physical constant, Planck's constant, and how this is realized in the form of a device called a Kibble balance. Another example, and one of more direct interest to Brynn as a chemist, was the relationship between the unit of substance - the mole - and the related defined physical parameter, Avogadro's constant (or Avogadro's number). This was realized by means of a silicon sphere of extreme roundness, so that its volume could be determined with high accuracy using lasers to measure the diameter. However, the greatest problem was creating a sphere of pure <sup>28</sup>Si, without any admixture of the isotopes <sup>29</sup>Si and <sup>30</sup>Si, and here tetrafluoride gas centrifuges came to the rescue.

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Finally, as to the crucial question of whether it would be possible to lose some weight when the new mass standard comes into effect on May 20<sup>th</sup>, the answer is, regrettably, no. But from Brynn's point of view, the most regrettable effect of this change is that there will be no more paid trips to Paris to recalibrate our national copy of the kilogram.

This excellent presentation was followed by a lively and well-informed discussion, including on the influence of the oxide layer on the surface of the silicon sphere, and the fact that with modern technology, we do not have to measure Avogadro's constant; we can just count. An interesting philosophical issue, but of no practical importance as long as the value is defined.

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## RSNSW Council 2019-2020

At the 152<sup>nd</sup> Annual General Meeting on 3<sup>rd</sup> April 2019 the Office Bearers and Council Members were announced following the Council election. The Council comprises the following, in addition to the new Honorary Secretary (General) Mr Bruce Ramage (not pictured):

President: Em. Professor Ian Sloan AO FRSN



Vice-President: Mr John Hardie FRSN



Vice-President: Em. Professor Brynn Hibbert  
AM FRSN (immediate past President)



Vice-President: Ms Judith Wheeldon AM  
FRSN



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Hon. Treasurer: Mr Richard Wilmott



Southern Highlands Branch Chair: Ms Anne Wood FRSN



Hon. Secretary (Editorial): Em. Professor Robert Marks FRSN



Bulletin Editor: Dr Laurel Evelyn Dyson



Hon. Librarian: Dr Ragbir Bhathal FRSN



Dr Mohammad Choucair FRSN



Hon. Webmaster: Ass. Professor Christopher Bertram FRSN



Em. Professor Robert Clancy AM FRSN



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Dr Donald Hector AM FRSN



Mr Stuart Midgley



Professor Nalini Joshi AO FRSN



Em. Professor Bruce Milthorpe FRSN



The Hon. Virginia Judge FRSN



Dr Susan Pond AM FRSN



Hon. Professor Ian Wilkinson FRSN



**Report of 18 April 2019**  
**Royal Society, Southern Highlands Branch**

**Professor Kenneth McCracken AO**

**‘Tales of an Itinerant Scientist:  
Highlights of a 65-year career in Space Research, Astronomy and  
the Mineral Industry’**

A few days before the April lecture, the Southern Highlands Branch received the sad news that the scheduled speaker was to fly to England immediately to be by the bedside of his dying mother. We sent our condolences and expressions of comfort, and to allay his concerns, assured him that an interesting lecture could still be given to our enthusiastic residents. All on our mailing list were immediately notified by late email of a change of speaker and lecture topic. On the evening, an audience of 55 warmly applauded Professor Ken McCracken as he stepped in with his usual strong and enthusiastic support for the Royal Society.

McCracken presented a wonderful lecture of a life devoted to science. Essentially his long and successful career can be described in five main stages: Cosmic Ray research (1954-70), X-ray astronomy (1964-1989), mineral exploration geophysics (1970-1989), Jellore Technologies (1989-date) and Paleo-Cosmic rays (1997-date). Just a few of the research positions he has held include Consultant, Goddard Space Flight Centre NASA, Assistant Professor MIT, Professor University of Texas, Professor University of Adelaide, Chief CSIRO division of Mineral Physics, Chief CSIRO Division of Applied Geomechanics, and Director CSIRO Office of Space Science and Applications.



Kenneth McCracken in  
his Tasmanian  
Laboratory, Mt  
Wellington 1956

In his early research at the Cosmic Ray stage, McCracken recalled how he had built and operated a 23-litre ionization chamber in Tasmania similar to the Carnegie Type C instruments used by Scott Forbush. Then in 1955, he became responsible for building and operating the five Australian neutron monitors installed for the International Geophysical Year 1957-58. He operated his own laboratory on the slopes of Mt Wellington, building most of the state of the art electronics himself.

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He established a cosmic ray observatory in New Guinea and managed, by telex messages, neutron monitors in the Antarctic. During this period of his young life, he published a remarkable number of papers in top journals, and became very well known in the literature.

Of his time at MIT (1961-62), Ken recalled his first ‘break through’. He developed a mathematical model for the motion of relativistic charged particles in a high order simulation of the Earth’s magnetic field. This mathematical model solved a long-standing problem regarding the distribution of cosmic rays on the surface of the earth. Again he received very wide exposure among his peers. His computer program written in 1959 is still in use today.

When Ken was professor at the University of Adelaide, X-ray detectors were flown on Skylark rockets from Woomera, South Australia, leading to the discovery that X-ray objects are highly time variable. Later when he began his CSIRO career in mineral exploration, he recalled thinking that changing from cosmic ray detectors on the ground, to building satellites and to X-ray astronomy was never difficult for him. However, changing to leading a research laboratory in mineral exploration, about which he knew nothing at the time, was a leap of faith.



Skylark Launch, Woomera, 1967

McCracken established four extremely successful programs in his new role. Over time he was elected as a Fellow of the Australian Academy of Science and of ATSE. He received his first CSIRO medal, the Ian Wark Medal, then the Haddon King medal, and was named joint recipient of the Australia Prize, all the while publishing prolifically.

Kenneth McCracken is now technically ‘in retirement’, but his research still goes on. From 1997-date, he has worked with colleagues in USA, Switzerland and South Africa using ice cores from the polar regions to study, among other things, modulation of the galactic cosmic radiation over the past 10 000 years, the cause of the solar cycle and the strength of the interplanetary magnetic field for the last 10 000 years. A truly inspiring lecture from an eminent scientist who is still giving so much to society.

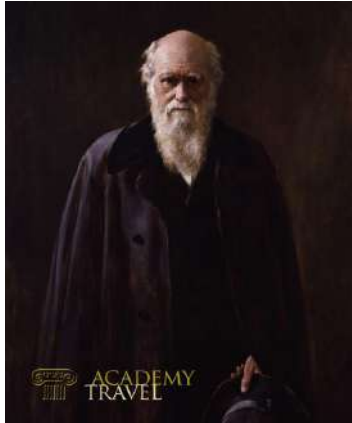
**Anne Wood FRSN**

# 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





# Memorial Service for Professor Noel Hush AO DistFRSN Change of Date

Emeritus Professor Noel Sydney Hush AO DistFRSN DSc FRS FAA FNAS FRACI died on Wednesday, 20 March 2019 at the age of 94. In order to avoid a clash with an Academy of Science conference, and in the expectation that many Academy fellows would want to attend Noel's memorial service, both the date and time have been changed. Note the new arrangements:

Date and Time: Monday 27 May, 9:45 am for 10 o'clock  
Place: The Great Hall of the University of Sydney.

## Contacts for Your Officer Bearers and Council Members

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# Schedule of RSNSW Events 2019

Date	Event	Speakers	Topics and Presentations	Location
2-May-19	Women and Science	Susannah Fullerton OAM FRSN	Ada Lovelace and the Analytical Engine	SMSA
10-May-19	Annual Dinner RSNSW	Prof Michelle Simmons FRS FAA DistFRSN FTSE	Distinguished Fellow's Address: The New Field of Atomic Electronics	State Library of NSW
tba	Clarke Lecture	Prof Emma Johnston AO FRSN	tba	
5-Jun-19	Ordinary General Meeting	Dr Kate Faasse	Psychology	State Library of NSW
20-Jun-19	Women and Science	tba	tba	SMSA
3-Jul-19	Ordinary General Meeting	Prof Robert Burford FRSN	History of Polymers	State Library of NSW
18-Jul-19	Women and Science	tba	tba	SMSA
7-Aug-19	Ordinary General Meeting	Prof Peter Shergold AC FRSN	Science and Politics	State Library of NSW
August	Poggendorf Lecture	tba	tba	
August	Science Week Talks	tba	tba	SMSA
4-Sep-19	Ordinary General Meeting	A/Prof Hans Pols	History and Sociology of Medicine in South-East Asia	State Library of NSW
19-Sep-19	Women and Science	tba	tba	SMSA
2-Oct-19	Ordinary General Meeting	Prof Peter Godfrey-Smith	Other Minds	State Library of NSW
17-Oct-19	Women and Science	Anne Harbers	Electricity, Astronomy and Natural History	SMSA
6-Nov-19	Ordinary General Meeting	Prof Barbara Gillam FASSA FRSN	Visual Perception and Aboriginal Art	State Library of NSW
November	Dirac Lecture	tba	Physics	
7-Nov-19	RSNSW & Four Learned Academies Forum	tba	Making Space for Australia	NSW Government House
21-Nov-19	Women and Science	Em Prof Anne Green	An Accidental Radio Astronomer	SMSA
4-Dec-19	Ordinary General Meeting	Jak Kelly Award Winner	2019 Jak Kelly Award Presentation & Christmas Party	State Library of NSW