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31 January 2019

21 February 2019

Southern Highlands Branch Lecture

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25 February 2019

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26 February 2019

RSNSW & SMSA

Speaking of Music ...

Lecture 1: Jazz & Democracy

Dr. Wesley J. Watkins, IV,

(For more information and how to register, see p. 6)



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

RSNSW Scholarship Awards

Wednesday, 6th February 2019

This special event celebrates the work of three outstanding young researchers. They are each a candidate for an advanced degree in a science-related field within New South Wales.

Fiona McDougall

Department of Biological Sciences
Macquarie University

Evelyn Todd

School of Life and Environmental Sciences
University of Sydney

&

3-minute thesis (3MT) talk

Chuhao Liu

University of Wollongong

See page 3 for more information

Date: Wednesday 6th February 2019

Time: 6:00 pm for 6:30 pm

Venue: Gallery Room, State Library of NSW
(Entrance: Shakespeare Place, Sydney)

Dress: Business

Entry: \$15 for Members, Fellows and Associate Members of the Society, \$5 for full-time Students, \$25 for Non-Members (including a welcome drink)

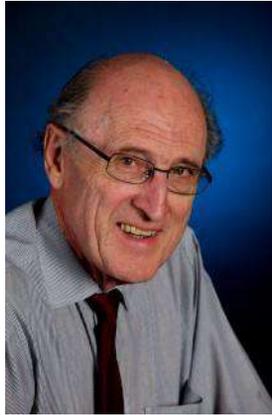
Dinner (including drinks): \$85 for Members and Associate Members, \$95 for Non-Members.

Reservations: <https://nsw-royalsoc.currinda.com/register/event/55>

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

All are welcome.

From the President



The time is approaching for a new Council to be formed – the Annual General meeting on April 3 will see the completion of the process. The rules specify that at each election all office bearers and all councillors face re-election. If you believe you can contribute towards making the Society do better in furthering its mission and serving its members, please consider standing for Council.

One election of special importance this year is that of Secretary, because our admirable Secretary Herma Buttner has decided not to stand again. The Secretary is involved in all aspects of the Council's work, and is automatically a member of the Executive of the Council. If you have any interest in the position, or know of others who might be suitable, feel free to discuss the position with me, or with any other member of the present Council.

The present Council takes very seriously questions of gender balance, and is careful to ensure that there is no improper discrimination in any of the Society's activities. It is therefore a special pleasure to report that, of the five of the Society's Awards and Medal announced in December 2018, three were won by females: Elizabeth Elliott was awarded the James Cook Medal, the Society's senior award; Emma Johnston was awarded the Clarke Medal; and Elizabeth New the Edgeworth David Medal; while Paul Griffiths was awarded the History and Philosophy Medal, and Robert Park the Poggendorf Lectureship. To top off the female dominance, both of the 2018 Scholarship winners, Evelyn Todd and Fiona McDougall, were female, as was the winner of the Jak Kelly award, Anita Petzler. A great result.

Ian H. Sloan AO FAA FRSN
President
Royal Society of New South Wales
President@royalsoc.org.au

... Continued from page 1

Fiona McDougall

Department of Biological Sciences

Macquarie University

'Human-Associated Bacteria and Antibiotic Resistance in Grey-Headed Flying Foxes'



Over recent decades, the number of endangered grey-headed flying foxes (or fruit bats) roosting in urban environments has increased dramatically. Each year, several thousand sick, injured and orphaned flying foxes enter wildlife rehabilitation facilities. In both urban areas and rehabilitation establishments, they encounter human-associated bacteria which may be pathogenic. At present, the transmission of bacteria, including antibiotic-resistant strains, between humans and flying foxes is poorly understood.

Fiona's research examining the spread of human-associated bacteria (*Escherichia coli* and *Klebsiella pneumoniae*) to the grey-headed flying fox (*Pteropus poliocephalus*) is providing insight into the unique diversity and ecology of these bacteria in their new host. Flying foxes have also acquired antibiotic-resistant bacteria, including multidrug-resistant *Escherichia coli*. The prevalence of genetic determinants of antibiotic resistance is higher in flying foxes in rehabilitation facilities than in wild urban flying foxes. We are yet to understand the implications of these findings on the management and conservation of these wonderful animals.

Evelyn Todd

School of Life and Environmental Sciences

University of Sydney

'Using Genetics to Improve Athletic Performance in Thoroughbred Horses'



Thoroughbred horse racing holds both historical and economic significance in Australian society, dating back to the early colonial years of settlement. The thoroughbred racing and breeding industry is also a major contributor to the Australian economy due to the internationally recognised quality of the horses it produces. The thoroughbred horse breed was founded in the 18th century, making it the oldest closed animal population in the world. Uniquely, all modern thoroughbred horses throughout the world trace their pedigree back to this time (an average of 24 generations). Although thoroughbreds are the product of many generations of inbreeding for the selection of racing performance, the population is still viable and thriving. Evelyn's research examines how these many generations of selective breeding has influenced the genetic characteristics of modern thoroughbred horses. These findings assist in understanding the effects of long-term selection on the health and viability of animal populations.

2019 Events

Royal Society – Southern Highlands Branch

Date*	Event	Speaker	Topic	Location**
21-Feb-19	Public Lecture	Prof Rodney Croft	Electromagnetic Fields and Health	Mittagong RSL
21-Mar-19	Public Lecture	Susannah Fullerton	The Life and Diary of Samuel Pepys	Mittagong RSL
11-Apr-19	Public Lecture	Prof Richard Kemp	Psychology of Eyewitness Memory	Mittagong RSL
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.

Professor Rodney Croft School of Psychology University of Wollongong ‘Electromagnetic Fields and Health’



Non-ionising electromagnetic fields are generated both naturally and by man-made technologies such as mains power transmission, FM radio, TV broadcasts, and mobile phones and associated base stations. Related to this there has been substantial concern within the community regarding the possibility that exposure to such fields may be hazardous to health. Indeed the International Association for Research into Cancer classified exposure due to fields from both mains power transmission and mobile phone handsets as ‘2B’, or ‘Possibly carcinogenic to humans’.

This presentation will focus primarily on radiofrequency fields, such as those emitted by mobile phones and base stations, and provide some background to these issues, a summary of the research findings to date, and conclusions regarding whether such electromagnetic fields are hazardous to health.



ANNUAL MEETING OF THE FOUR SOCIETIES

*Australian Nuclear Association
The Royal Society of New South Wales
Australian Institute of Energy
Nuclear Engineering Panel of Sydney Division of Engineers Australia*

Helen Cook
GNE ADVISORY

‘Legal Considerations pertaining to Nuclear Energy as an Option for Australia’

Date: Monday 25 February 2019 – BREAKFAST EVENT
Time: Networking and registration 7:15am, light breakfast, 7:35am start. Finish by 9:00am.
Venue: Allens, Level 28, Deutsche Bank Place, 126 Phillip Street, Sydney, NSW 2000
Entry: Free
Registration: <https://tas.currinda.com/register/event/1891>
Register by Thursday 21 February 2019 (register early as places are limited)

This presentation by Helen Cook will overview international approaches to the development of nuclear power programmes in emerging nuclear countries and discuss legal considerations for Australia should Australia wish to develop a domestic nuclear power program.

She will draw on her experience advising on nuclear projects and transactions in the United Kingdom, the United States, Egypt, Turkey, the United Arab Emirates, Argentina, India, Bahrain, Saudi Arabia and South Africa, as well as her co-operation with the International Atomic Energy Agency.

Helen Cook, from GNE ADVISORY, is an independent nuclear energy lawyer dedicated to all aspects of the civil nuclear sector. She is the author of the comprehensive legal text book, *The Law of Nuclear Energy* published by Sweet & Maxwell, (Second Edition, March 2018), and is the former chairperson of the Law Working Group of the World Nuclear Association.



Speaking of Music...

Lecture 1: Jazz & Democracy

Dr Wesley J. Watkins, IV



In the Speaking of Music... lecture series, co-hosted by the Royal Society of NSW and the Sydney Mechanics' School of Arts, our presenters will examine music, its relationship to the world and its profound power to affect us – sometimes in surprising ways.

The first speaker in February will be **Dr Wesley J. Watkins, IV**, the founder of The Jazz & Democracy Project, an innovative integrated music curriculum that utilizes jazz as a metaphor to cultivate a profound understanding of American democratic ideals. Enriching the study and teaching of US history, government, civics and culture, it inspires youth to become active, positive contributors to their communities.

Dr Wesley J. Watkins, IV, first proposed such a curriculum as part of the Stanford University School of Education Undergraduate Honours Program. Now living in Sydney, Dr Wes (as he is known to his students) is speculating on how these principles might apply to Australian democracy and Australian education. Join 'Dr Wes' as he explains how the jazz masters are practitioners of American democratic ideals, as he advocates for live jazz and jazz education in the classroom, and as he ponders how these ideas translate to the Australian experience.

- Date:** Tuesday 26 February 2019, 6pm for 6.30 to 7.30pm.
Light refreshments will be served.
- Cost:** \$15 members of RSNSW and SMSA, \$20 non-members and guests
- Location:** Tom Keneally Centre, Level 3, Sydney Mechanics School of Arts, 280 Pitt St, Sydney (near Town Hall Station)
- Registration:** <https://smsa.org.au/events/event/speaking-of-music-jazz-democracy/>

Report of the 1269th OGM
Wednesday 5th December 2018

Anita Petzler

Department of Physics and Astronomy, Macquarie University

‘Hydroxyl as a Probe of the Galaxy’s Molecular Gas’



Anita Petzler, winner of the Jak Kelly Award 2018, presenting at the OGM

Anita Petzler studies the interstellar medium to gain a better understanding of star formation. The interstellar medium is the collection of gas and dust between the stars of a galaxy and is the raw material from which new stars are formed. Recognising the limitations of carbon monoxide as a tracer of more diffuse molecular gas she employs an alternate tracer: hydroxyl. Hydroxyl is expected to coexist with molecular hydrogen in all environments. The ground state of hydroxyl is split into four levels with allowable transitions between those levels at 1612, 1665, 1667 and 1720 MHz. The relative population of hydroxyl molecules in each level is determined by the local gas conditions which in turn determines the relative intensity of absorption or emission. Key parameters in star formation are temperature, density and column density (total amount per unit area of a material suspended in a cloud in space, similar to a straw of 1 cm² taken through a cloud). By studying the transitions of the hydroxyl, the local conditions of the intervening hydroxyl gas can be measured, i.e., the emission and absorption spectra of hydroxyl. As modern observation techniques, including large-scale surveys using telescopes, will give us an overwhelming wealth of data it is vital to develop an automated analysis pipeline for a rapid extraction of target parameters from these observations in a physically and statistically rigorous way. A poor signal-to-noise ratio makes it a difficult problem to solve.

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Showing a number of data sets, Anita then explained that a set of possible models has to be constructed to analyse the data in order to identify reliably the ‘best model’, essentially matching the optical depths (a property of the cloud) to simulations. In question time, Anita explained that radio astronomy is a very reliable tool for the study of star formation and there is a lot of expertise in Australia. The construction of the SKA (square kilometre array) will further Australia’s position in this field. The interstellar medium consists of various molecules and ions, but hydroxyl is easy to observe from the ground. In order to understand how a star is formed it is important to know how much gas there is, accounting for all parts of the composition of the interstellar medium.



Vice-President Judith Wheeldon AM FRSN presenting the speaker with a medal and her associate membership certificate after the talk

In a short speech after Anita Petzler’s presentation, Irene Kelly said that her husband Jak, after whom the award is named, would have been so proud of the winner. Irene evoked memories of Ruby Payne-Scott (1912–81), a pioneer radio physicist, who became one of the first women physicists (together with Joan Freeman) to be employed by the Radiophysics Laboratory of the then Council for Scientific and Industrial Research (CSIR) at the University of Sydney. She was part of the Australian team that developed a means of measuring radio emissions from the Sun and stars, a breakthrough which would in turn lead to the construction of sophisticated radio telescopes. Subsequently, their groundbreaking work was named: ‘radio astronomy’. Irene noted that Ruby was also an outspoken advocate for women’s rights.

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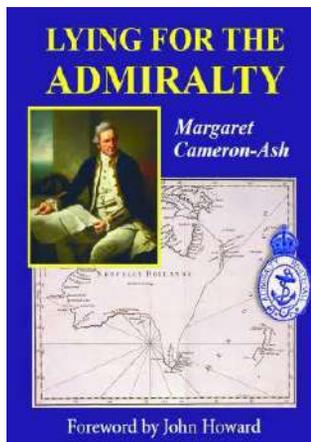
Chuhao Liu

Winner of the University of Wollongong 2018 3MT Competition ‘Finding the Best-Fitting Jeans for Railway Foundations’

Train is a very popular choice for travelling and freight transport in Australia. However, track foundation particles (ballast) are almost free to move laterally and are subjected to significant breakage upon repeated train passage. To solve this problem, industry currently installs a plastic grid, named Geogrid, inside the railway foundations. But the best design of geogrid remains an open question. This research aims to find out the optimum design of geogrid, especially the size of the hole (aperture) on the grid, and develop a standard for rail manufacturing.

‘Captain Cook and Port Jackson: Why Didn't the Dog Bark?’

Margaret Cameron-Ash Hon FRSN



Margaret Cameron-Ash Hon FRSN is author of *Lying for the Admiralty: Captain Cook's Endeavour Voyage*, Rosenberg Publishing, Sydney, 2018

When a guard-dog failed to bark as expected, Sherlock Holmes deduced that it already knew the visitor. Mystery solved. When Captain Cook failed to investigate as expected, can we deduce that he had already found what he was looking for?

A naval officer on an unknown coast had a duty to identify ports of shelter and refreshment. Sailing ships need service stations where they can trade for food and wood, rest their sick and make repairs. They want a deep, natural harbour, protected from the gales and swells of the open ocean, with a deep anchorage close to shore, situated near elevated, well-drained land with reliable fresh water.

When the *Endeavour* sailed into Botany Bay on 29 April 1770, Cook saw few of these features. The bay was very shallow and dangerously exposed to the strong winds and storm waves rolling in from the Tasman Sea. It lacked an adequate source of drinking water and its low sandy foreshores offered little more than salt marshes and mangroves. Clearly, it was useless for military operations and little better for commerce.

Yet when Cook left Botany Bay to resume his coastal survey, he made no attempt to find a more navy-friendly inlet on Australia's temperate coast — the climate zone generally favoured by Europeans because of its mild temperatures, free from the heat and diseases of the tropics. But Cook travelled non-stop to the Tropic of Capricorn. He sailed past Port Jackson (Sydney Harbour) with all its hidden promise; Broken Bay with its three generous arms of Pittwater, Brisbane Water and the Hawkesbury River; Newcastle Harbour at the mouth of the Hunter River; Port Stephens; Port Macquarie; Coffs Harbour; and the entrances to the Clarence and Richmond Rivers. Many of these are fine natural harbours with features far superior to Botany Bay in terms of depth, shelter, fresh water, vegetation, food, and soils. They surely required investigation after the shortcomings of Botany Bay. But Cook didn't take his ship into any of them; nor did he sound their entrances.

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Evidently, the brilliant and diligent Captain Cook had already found what he was looking for and there was no need for his crew to see anything more. Of course, Cook doesn't reveal how he did this, but the most likely scenario is that he walked overland from Botany Bay and found the 'naval heaven' of Sydney Harbour.



'Looking out to sea through Sydney Heads at a passing northbound ship' by Augustus Earle, 1825

Cook's failure to 'bark' is not the only clue to Cook's secret discovery of the vast interior waterway of Port Jackson. There is also a remarkable piece of documentary evidence.

In the Home Office archives at Kew in the United Kingdom, there is a memorandum written by Captain Arthur Phillip in 1787, before he left England with the First Fleet. The memo indicates that Phillip already knew that there were islands in Port Jackson. But how could he know this? No-one on the Endeavour could have seen the islands when she sailed past Sydney Heads. Their line of sight was blocked by the dog-leg entrance formed by Bradley's Head and South Head.

Cook was under orders to hide his important discoveries by omitting from his charts and journal those places that could become security risks. The Admiralty had no wish to advertise Britain's hard-won prizes to the French or other rivals. Already during this Pacific voyage, Cook had concealed the insularity of Tasmania. He knew from his experience in Canada that off-shore islands could be used by a hostile power for mounting operations. So, when he saw the magnificence of Sydney Harbour, he knew that it, too, had to remain secret until Britain could afford to garrison the place and keep out the French. As soon as the Endeavour arrived back in England, Cook would rush to Whitehall and report all his discoveries to the Secretary of the Admiralty, Philip Stephens. Meanwhile, he would hide the Harbour from his crew by not sailing into it, and from his readers by not mentioning it in his journal.

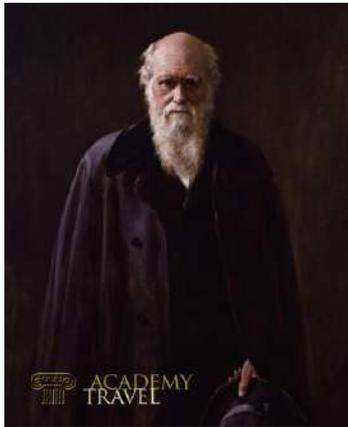
The Endeavour voyage should be seen in its geopolitical context. James Cook was the eighteenth century's James Bond when the Second Hundred Years War was underway. France and Britain were vying for commercial supremacy and the control of shipping lanes around the world. Unfortunately, Cook didn't survive to see which flag won. He was killed in Hawaii eight years before Arthur Phillip sailed from Portsmouth.

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.

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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 2019

Date	Event	Speakers	Topics and Presentations	Location
6-Feb-19	Ordinary General Meeting	Scholarship Winners 2018	Royal Society Scholarship Presentations	State Library of NSW
25-Feb-19	Annual Meeting of the Four Societies	Helen Cook	Legal Considerations pertaining to Nuclear Energy as an Option for Australia	Allens, Lvl 28, 126 Phillip St
26-Feb-19	Speaking of Music	Dr. Wesley J. Watkins IV	Jazz and Democracy	SMSA
6-Mar-19	Ordinary General Meeting	Prof Katherine Belov FRSN	Genomics	State Library of NSW
21-Mar-19	Women and Science	Suzanne Burdon	Mary Shelley, Scientist, and Frankenstein	SMSA
3-Apr-19	AGM & Ordinary General Meeting	Em Prof Brynn Hibbert AM FRSN	Address by the Ex-President	State Library of NSW
17-May-19	Annual Dinner RSNSW	Prof Michelle Simmons FRS FAA DistFRSN FTSE	Distinguished Fellow's Address	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
3-Jul-19	Ordinary General Meeting	Prof Robert Burford FRSN	History of Polymers	State Library of NSW
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
2-Oct-19	Ordinary General Meeting	Prof Peter Godfrey-Smith	Other Minds	State Library of NSW
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	
November	RSNSW & Four Learned Academies Forum	tba	tba	NSW Government House
4-Dec-19	Ordinary General Meeting	Jak Kelly Award Winner	2019 Jak Kelly Award Presentation & Christmas Party	State Library of NSW

Latest Issue of the Royal Society of NSW Journal

Who is the only NSW-born Nobel Laureate? (Patrick White doesn't count: he was born in London of Australian parents.)



Find out in the latest Journal (December 2018), now online at:

<https://royalsoc.org.au/society-publications/current-issue>

It contains a previously unpublished address by the late chemist, John Cornforth, entitled, 'Adventures with Sugars,' presented in 1999 in England. With the 200th anniversary of the founding of the Philosophical Society of Australia in 2021, the Journal includes a piece on one of the founders, Judge Barron Field. It also contains papers on erosion in the Royal National Park, on the mines and minerals of Malaya, an obituary of the Sydney-born mathematician and radio-astronomer Ronald Bracewell, and an interview with him by Ragbir Bhathal FRSN, an invited paper by David Hush FRSN on Mozart's music, and a reflection on the Stockholm 'New Shape' Competition of 2018 by competitor Len Fisher FRSN.

Contacts for Your Officer Bearers and Council Members

Prof Ian Sloan AO President: president@royalsoc.org.au
Em Prof D. Brynn Hibbert AM 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 Richard 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 Choucair: mohammad.choucair@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: mragibson@optus.com.au
Dr Donald Hector AM: dchector@royalsoc.org.au
Prof Nalini Joshi AO: nalini.joshi@sydney.edu.au
The Hon Virginia Judge: diannejudge@hotmail.com
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 Rachel Greenwood, 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/>