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The Royal Society of New South Wales

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28 September 2018

Open Lecture & OGM

For Your Diary:

18 October 2018

Southern Highlands Branch Lecture

Hugh Mackay AO

**'The State of the Nation Starts
in Your Street'**

6.30pm start

Mittagong RSL

**'3D Printing of Body Parts:
Practical Applications and Fundamental
Explorations'**

Wednesday, 3rd October 2018

Professor Gordon Wallace AO

University of Wollongong



Patron of The Royal Society of NSW

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



See page 3 for more information

Date: Wednesday 3rd October 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, \$5 for Students, \$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/52>

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

All are welcome.

From the President – Moving the Powerhouse Museum



I want to share with you the fact that the Council of your Society has resolved to oppose the relocation of the Powerhouse Museum from Ultimo to Parramatta, believing that its historical links to Ultimo are of great importance, not to mention that it would be a colossal waste of money. Rather, it wants to see the Powerhouse Museum properly refurbished, and an outstanding new museum established in Parramatta. As a result of this decision, and with the help of former President Don Hector and modern technology, I wrote 134 individual letters to every member of the NSW Parliament, in both the Lower and Upper Houses. Here is a sample:

‘Dear Ms,

The Council of the Royal Society of New South Wales, Australia’s oldest scientific and cultural institution, wishes to express its strong opposition to the decision to move the Powerhouse Museum to Parramatta. At the same time, it wants to emphasise that it strongly supports the vision of an outstanding new museum in Western Sydney – it is the moving of the existing Museum of Applied Arts and Sciences that is opposed. The Powerhouse’s links to the Ultimo precinct are of fundamental historical importance to the development of the Australian economy and the Museum is, and should be, a major drawcard for overseas visitors. If the Museum has been allowed to run down then the solution is not removal, but rather a Government commitment to renewal of the present Museum. And moving the Museum’s many heavy exhibits is surely a great waste of public money.

While the nature of a major new museum in Western Sydney should be very much in the hands of the region, the Council of the RSNSW is interested to contribute to the discussion. An exciting possibility is a new museum of science and technology at Parramatta with a special focus – a museum that differs from that of the Powerhouse at Ultimo but is not of lower status, just as the various Smithsonian Museums in Washington DC are not of different standing.

But the immediate need is to stop the tragic, irreversible destruction of the Powerhouse Museum at Ultimo. Etc.’

Another kind of museum for the Western Suburbs that would find strong support in Council is an Australian Museum of the First Peoples, if that should be the wish of Indigenous groups.

Council has been following up in various ways, including interacting with individual parliamentarians. I hope that our Members and Fellows agree with Council on the decision and the actions taken. I welcome your feedback.

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

Professor Gordon Wallace AO
Director, Intelligent Polymer Research Institute
University of Wollongong

**‘3D Printing of Body Parts:
Practical Applications and Fundamental Explorations’**



In recent times we have witnessed medical breakthroughs enabled by advances in cell therapies, biomaterials science and 3D printing. The convergence of these three areas has enabled rapid progress. We have seen this impact on customised wearable prosthetics as well as implantable components (such as 3D metal printed jaw or heel implants) that provide structural support. The ability to replicate not just 3D shapes but also the distribution of mechanical properties from medical imaging data is being used to create models to understand airway collapse and to develop innovative intervention strategies in sleep apnoea. Polymer-based 3D printed structures have been used to provide scaffolds that facilitate tissue regeneration through strategic distribution of bioactive molecules including drugs and growth factors.

Perhaps the ultimate regenerative platform is a 3D printed structure that contains stem cells configured in an appropriate chemical and mechanical environment to induce appropriate tissue regeneration. This ability to create 3D structures containing living cells is impacting on diverse clinical challenges. These include cartilage regeneration using adipose stem cells and corneal regeneration using limbal stem cells. Professor Wallace’s research team is developing 3D printing protocols to allow for more effective transplantation of islet cells to treat Type 1 Diabetes. These new approaches to the assembly of cells within 3D structures are also enabling unprecedented fundamental explanations of the development of stem cells.

Professor Wallace’s research team is particularly interested in the development into neural lineages. Their quest to create ‘brain on a bench’ is expected to enable us to better understand the development of illnesses such as epilepsy and schizophrenia and to devise more innovative interventions.

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In this talk he will report on his most recent studies on printing stem cells and the impact of the printed environment on stem cell development. He will also touch on some non-technical challenges arising in this rapidly developing area of medical research: ethical and regulatory issues.

Professor Wallace is involved in the design and discovery of new materials for use in energy and health. In the health area this involves using new materials to develop biocommunications from the molecular to skeletal domains in order to improve human performance. In the energy area he investigates the use of new materials to transform and store energy, including novel wearable and implantable energy systems for use in medical technologies. He recently co-authored an eBook on 3D BioPrinting

Hemalatha Urban Presents her 3-Minute Thesis on ‘Fat Knees’



Hema receiving her Associate Membership of the Society from President Ian Sloan

At the September OGM members of the society enjoyed a talk on ‘Fat Knees’ by the 2017 winner of the University of Sydney 3-Minute Thesis Competition Hemalatha Urban. Her research investigates the relationship between the infrapatellar fat pad and clinical outcomes and pain levels in patients undergoing knee replacements for obesity-linked osteoarthritis. The fat pad is a local adipose deposit in the knee associated with osteo. She is interviewing patients before surgery to assess pain and function, and then taking all the material removed from the knee during knee replacement: from the fat pad and a piece of subcutaneous-fat in the knee she will make a ‘soup’ for inflammation analysis.

Hema’s was the first of a series of presentations from winners of 3-Minute Thesis Competitions at our major universities. The prize for each presenter will be an Associate Membership for 2018. In order to encourage more students to attend the OGM, the Council at its September meeting voted to reduce the cost of attendance to \$5.

2018 Events

Royal Society – Southern Highlands Branch

Date*	Event	Speaker	Topic	Location**
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.

Hugh Mackay AO

‘The State of the Nation Starts in Your Street’



Hugh Mackay AO is a social researcher and bestselling author of 19 books, including *The Good Life*, *The Art of Belonging* and his latest: *Australia Reimagined: Towards a more compassionate, less anxious society*. His talk will be loosely based on this, his most recent book. In it, he asks why Australia’s unprecedented run of economic growth has failed to deliver a more harmonious society and offers some compelling proposals for a more caring and socially cohesive Australia.

Hugh has had a 60-year career in social research, and was also a weekly newspaper columnist for over 25 years. He is currently a patron of the Asylum Seekers Centre and an honorary professor of social science in the University of Wollongong. Among many other honorary appointments, he has been deputy chairman of the Australia Council for the Arts, chairman of trustees of Sydney Grammar School, and the inaugural chairman of the ACT government’s Community Inclusion Board.

In recognition of his pioneering work in social research, Hugh has been elected a Fellow of the Australian Psychological Society and awarded honorary doctorates by Charles Sturt, Macquarie, NSW, Western Sydney and Wollongong universities. He was appointed an Officer of the Order of Australia in 2015.

Anne Wood FRSN

**Report of the 1266th OGM
Wednesday 5th September 2018**

Professor Richard Kemp

School of Psychology
University of NSW

‘The Psychology of Eyewitness Memory’



Professor Richard Kemp receiving a medal from Judith Wheeldon AM FRSN

Professor Jim Kehoe introduced his colleague Richard Kemp, who is a cognitive scientist and forensic psychologist. He obtained his PhD from London University and moved to UNSW, Sydney, in 2001. Richard’s current research interests include identity verification and face perception, eyewitness memory, police interviewing and forensic science evidence. He has undertaken his research in collaboration with a variety of partner organisations, including State and Federal government agencies, police and emergency services, banks and financial service providers.

Richard started his presentation by demonstrating the flaws of visual identification. After a short video showing a staged theft he presented photos of 9 potential suspects and asked the audience to identify the culprit: the answers differed considerably, but actually the person in the video was not amongst the photos shown. Although identification is considered the strongest evidence in courts of law it is most unreliable, and DNA sampling is therefore becoming more important. In order to understand what can go wrong with identifications, Richard explained the memory process, including encoding, storage and retrieval of information. We construct the world we live in from our experiences as they arrive through our sense organs. This can lead to incomplete and ambiguous data, as he illustrated with a number of images of graphic illusions.

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In another short video he showed a crime scene twice, with changes occurring in the scene the second time. The audience only found about 3 changes when actually 21 had occurred, thus demonstrating the deficits of perception and memory.

In addition, our memories change over time: the Ebbinghaus Forgetting curve shows that retention goes down to 60% after only 19 minutes and about 30% after a day. The implications of this are that we need to get information from eye-witnesses as soon as possible after the event. Memory in traumatic events can be even more vulnerable to a coherent account: a study of the survivors of Flight AT236 over the Atlantic in August 2001 showed that people with post-traumatic stress disorder (PTSD) were more likely to include irrelevant details. We just don't know enough about the effects of trauma on memory, some studies showing that traumatic events are better remembered and other studies showing the opposite. Memory of repeated events also requires more research: these memories tend to become more generic over time, with lost of detail of the specifics of each event. The use of language to describe events is relevant too: e.g., recounting a car accident with words like 'smash', 'collide' or 'contact' evokes a different estimate of the speed of the vehicles involved. Moreover, co-witness discussion after an event can lead to misremembering and subsequent misinformation as memories are shared and subject to 'social contagion'.

Therefore, the use of technology is being explored. Photos, might be useful, although reviewing video material impacts on people's memories of an event. In addition, Richard has been collaborating on the development of an app iWitnessed that can be downloaded for free and provides prompts for eyewitnesses to complete a structured incident report for sending to the police, preferably soon after an incident.



Wearable cameras are being introduced into police forces around the world, including in New South Wales

The science of memory and its application in law raises some serious issues, especially when old memories are recalled. For example, in the Royal Commission into Institutional Responses to Child Sexual Abuse, how can we evaluate 30-year old evidence?

After the talk, there was some discussion about how certain events trigger memory: this could be words, but also sounds or smells. The emotional state of a person will contribute to aspects of the memorisation as well.

Report of 20 September 2018

Royal Society Southern Highlands Branch

Professor Richard ‘Bert’ Roberts
Director, Centre for Archaeological Science
University of Wollongong

‘When did Australia’s Human History Begin?’

Australian has been shaped as a nation by its natural, historic and Indigenous heritage. Professor Roberts believes that in order for future generations to adapt successfully to new challenges, it is imperative that we dramatically improve our understanding of Australia’s past. Recent exciting discoveries and key projects led by the Centre for Archaeological Science (CAS) have addressed the emergence of modern human behaviour in Africa, the worldwide dispersal of our species, the human colonisation of Australia and resulting impact on the native fauna, and the evolution and extinction of the so-called ‘Hobbit’ (*Homo floresiensis*) in Indonesia.

Roberts opened his address with his involvement in the finding and interpretation of remarkable new evidence from Madjedbebe in northern Australia. This research raises fascinating points about how long ago the first humans arrived in Australia, how long these people existed with megafauna, and the overlap between modern humans and Neanderthals. Madjedbebe is the oldest known place of human occupation in Australia. It is profound to think that Indigenous Australians have been coming to this rock shelter for over 2,600 generations. In comparison, Europeans have been in Australia for just nine generations.



Site of the Madjedbebe excavation in the Kakadu region, where the oldest traces of human occupation in Australia have been found.

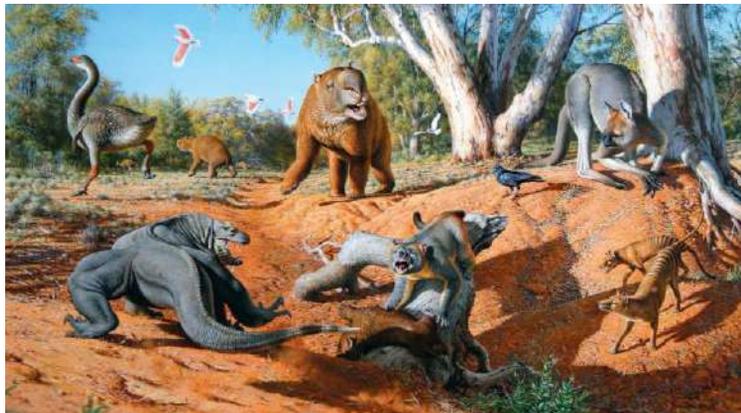
(AFP Photo: Dominic O’Brien)

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The time of arrival of the first humans in Australia has been robustly debated for decades. Until very recently, it was speculated that Australia wasn't occupied until 47,000 years ago. However, due to the latest sophisticated research techniques at hand, it is clear that Madjebebe has set a new line in the sand for the dating of human arrival. Artefacts at Madjedbebe were found in three bands. The lowest, at 2.6-2.15m under present day ground levels, is the area of oldest occupation. Researchers now have evidence to push back the age of human occupation by about 18,000 years to 65,000 years ago, a time predating the first Egyptian pyramids by at least 60,000 years. Roberts presented much detail of the latest scientific methods such as Optically Stimulated Luminescence (OSL) as well as the more limited Radiocarbon dating that led to this conclusion.

The finding of a new date for the arrival of the first Australians at least 65,000 years ago raises the probability that Aboriginal people and megafauna co-existed for 20,000 years or more. Perhaps more profoundly, it re-sets the clock for the time when modern humans first left Africa, raising questions about who they mixed with along the way.



Australian megafauna (image by Peter Trusler, courtesy *Science Magazine*)

Roberts has recently returned from fieldwork in Siberia, where in 2010 the astonishing discovery was made of unusual hominin DNA in the Denisova cave in Siberia's Altai Mountains. The hominins, which are now extinct and are believed to be cousins of the Neanderthal, were called Denisovans after this discovery. Researchers have long suspected that these two groups of ancient human relatives interbred, but it was only this year that a 90,000 year old flake of bone from a teenager born to a Neanderthal mother and a Denisovan father provided proof of the long held hypothesis.

Professor Richard Roberts concluded his excellent lecture to the 51-person audience with the statement that the only humans in the world today to carry Neanderthal, Denisovan and modern human genomes are the Australian Aborigines. Clearly his research is opening the door to a deeper understanding and appreciation of Australia's human history about which so many questions remain.

Anne Wood FRSN

New Issue of the Royal Society of NSW Journal

The latest issue of the Journal is now available online:

<https://royalsoc.org.au/images/pdf/journal/151-1-June2018.pdf>.

For those who were not able to attend last November's Four Academies Forum on 'The Future of Reason in a Post-Truth World', or would like to revisit some of the excellent talks, eleven contributions to the Forum are included in the Journal, including the Governor's Introduction and Ross Gittins' contentious Summary of Proceedings. Other contributors include: Mary O'Kane, Don Hector, Simon Chapman, James Wilsdon, Emma Johnston, Lisa Bero, Andrew Jakubowicz, N J Enfield, and Peter Gluckman. In addition, the issue begins with the after-dinner speech from the Society's 2018 Annual Dinner by Tom Keneally about his work in progress, an historical novel linking two Australians – a contemporary scientist and Mungo Man, who died 42,000 years ago. There is also a speech by Australian of the Year, Michelle Simmons, and five abstracts from recent PhD dissertations.

Royal Society of NSW Fellows Win Honours

One of Australia's most eminent economists, Emeritus Professor Geoffrey Harcourt FASSA FRSN, has been awarded the highest honour in the 2018 Queen's Birthday Honours List. Professor Harcourt was made a Companion of the Order of Australia (AC) 'for his eminent service to higher education as an academic economist and author, particularly in the fields of Post-Keynesian economics, capital theory and economic thought'.

Also in the Queen's Birthday Honours, Past President of the Royal Society of NSW Emeritus Professor Brynn Hibbert FRSN was appointed as a Member of the Order of Australia (AM) for 'significant service to science in the discipline of chemistry, to professional societies, and to sport through illicit drug profiling'.



Geoffrey Harcourt receiving his honour

New Member and Fellows



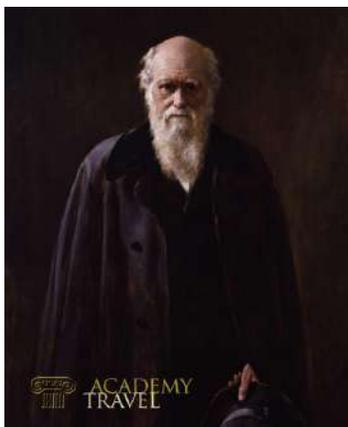
At the September OGM the Society welcomed a new member Christine Yeats (pictured) and four new fellows: Katherine Belov, Ragbir Bhathal, Inaam Tabbaa and Robert Thomas. Congratulations to all!

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 RSNWS Events 2018

Date	Event	Speakers	Topics and Presentations	Location
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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