



The Bulletin 416

The Royal Society of New South Wales

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29 November 2017

For Your Diary:

*Happy
Holidays
&
Safe Travels*

Watch this space
for more announcements
of Society events
in the next *Bulletin*,
which will be distributed
late January 2018

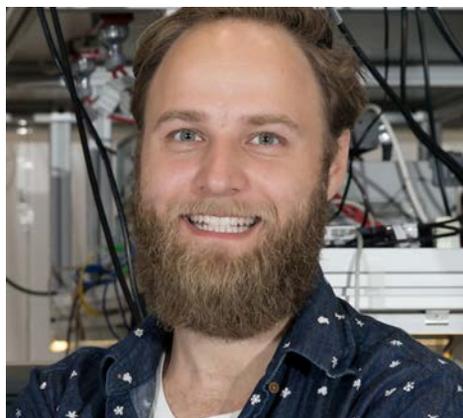


Patron of The Royal Society of NSW
His Excellency General The Honourable
David Hurley AC DSC (Ret'd)
Governor of New South Wales

Open Lecture, Jak Kelly Award,
and Christmas Party
Wednesday, 6 December 2017

**“How to Store Light: an Optical
Memory Based on Sound Waves”
Moritz Merklein**

Jak Kelly Award Winner for 2017
Department of Physics, University of Sydney



See Page 8 for more information

Date: Wednesday, 6 December 2017; 6:00 pm for 6:30 pm
Venue: Union, University and Schools Club, 25 Bent Street, Sydney
Entry: \$10 for Members and Associate Members of the Society,
\$20 for Non-Members, which includes a welcome drink.
Dress: Business
Party (including drinks): \$40 for Members and Associate Members,
\$50 for Non-Members.

Reservations must be made at least 2 days in advance
Reservations: <https://nsw-royalsoc.currinda.com/register/event/39>
Enquiries: royalsoc@royalsoc.org.au Phone: 9431 8691
All are welcome.

From the President



There is much to talk about this month, even though the much-heralded 4 Academies and RSNSW Forum is yet to happen. As we might expect with our swelling ranks of members and fellows, FRSN is cropping up more and more in the titles of prize winners and recipients of State and National honours.

This month I had occasion to write congratulations to three Fellows who appear in the list of Premiers Prizes for Science & Engineering and to Distinguished Fellow Michelle Simmons for being named NSW Australian of the Year 2018 (<https://www.australianoftheyear.org.au/honour-roll/?view=fullView&recipientID=1956>). Scientia Professor Simmons is Director of the Australian Research Council Centre of Excellence for Quantum Computation and Communication Technology, CQC2T <<https://royalsoc.org.au/about-us/distinguished-fellows>>, and we all remember her Pollock Lecture in 2013, which was the first time that many of us had heard of quantum computing. Professor Simmons is now in the running for Australian of the Year and we wish her every success!

A new Fellow, Professor Gordon Wallace AO FAA FTSE FIOP FRACI FRSN was named NSW Scientist of the Year 2017 <<http://www.chiefscientist.nsw.gov.au/premiersprizes/2017-nsw-scientist-of-the-year>>. Professor Wallace is a chemist and materials scientist based at the University of Wollongong. We look forward to hearing him at an OGM, perhaps to reprise his talk to the Southern Highlands Branch “3-D Printing of Body Parts”.

Two Fellows Professor Trevor McDougall FAA FRS FRSN and Professor Edward Holmes FAA FRS FRSN won Prizes in the categories of

Excellence in Mathematics, Earth Sciences, Chemistry and Physics, and Excellence in Biological Sciences (Ecology, environmental, agricultural and organismal) respectively. (<http://www.chiefscientist.nsw.gov.au/premiersprizes>).

This month I represented the Society at the Australian Institute of Physics (AIP) New South Wales Postgraduate Awards at which students from NSW universities present their work. At this meeting, the winner of the Jak Kelly Scholarship was chosen by Erik Aslaksen. The scholarship was awarded to Moritz Merklein from the University of Sydney, School of Physics who presented “A chip integrated optical buffer based on hyper-sound waves”. We look forward to hearing from him at next month’s OGM on Wednesday 6 December. Trust me, student talks are the highlight of the year’s activities.

In the media, Fellow Len Fisher has appeared on the wireless again, with his mate Robyn Williams <http://www.abc.net.au/radionational/programs/scienceshow/challenging-our-thought-processes,-biases-and-assumptions/9162084>. And did I see our Fellow and very best supporter Professor Mary O’Kane FRSN on the TV ABC News supporting the new Australian Museum’s FrogID App for identifying frogs?

The Society wrote a letter of support for the bid of Professor Claude Roux FRSN for Sydney to host the 22nd World Meeting of the International Association of Forensic Sciences (IAFS) in 2020. He was successful, and so we look forward to participating in this important event. That is if we have any time to spare with our own programme of activities to mark the 250th anniversary of Captain Cook’s arrival.

Continued on page 7

RSNSW and Sydney Mechanics' School of Arts Sign Memorandum of Understanding for a Strategic Partnership



Signing ceremony: L-R Front Row: Thomas Keneally AO FRSN; Winsome Allen, President, SMSA; Emeritus Professor Bryn Hibbert FRSN, President, Royal Society of NSW; L-R Back Row: Emeritus Professor Robert Clancy AM FRSN; Denis Mockler, Board member, SMSA; John Hardie FRSN, Councillor, Royal Society of NSW.

The Royal Society of NSW and the Sydney Mechanics School of Arts (SMSA) signed a memorandum of understanding to establish a strategic partnership on 30 October 2017. The two organisations will collaborate to gain synergies from their similar objectives and activities. This partnership reflects the similar heritage of the two organisations and their commitment to advancing knowledge and engaging with the broadest possible audience in NSW. Key elements of this agreement include:

- Development of a joint program of events that will be broadly attractive to members of both organisations and the general public;
- Display of important selections of material from the Society's library at the premises of the SMSA, 280 Pitt Street, Sydney;
- Reciprocal membership benefits between the two organisations when engaged in joint activities.

In addition, the Society will hold some of its own functions at the SMSA auditorium and meeting rooms, particularly when they are expected to attract larger audiences. The location near Town Hall station and one of the new Metro line stations is particularly convenient.

Report of Open Lecture
Wednesday, 1 November 2017

Pamela Griffiths FRSN
“Women Artists: Barriers and Frustrations”

Pamela Griffiths FRSN is an artist, designer, master printer, and author. In her presentation, she shared with us her joys, frustrations, and challenges she has encountered as a female artist. She also shed light on the gender disparity in art. Today, while 51% of visual artists are women, they earn on average 81¢ for every dollar made by male artists. Likewise, there are very few female directors of large museums. (For more details, see the website for the US National Museum of Women in the Arts listed at the end of this article.)

Pamela came from an artistic family. She also acknowledged her encouraging high-school teachers who provided a European training in art. After school, when she trained as an art teacher, she slowly realised there were no women who taught art, and the textbooks (Helen Gardner ‘Art through the Ages’; Gombrich ‘The Story of Art’) did not mention any female artists. But particularly the romanticising of male artists (e.g., Picasso, Miro, Modigliani) whose behaviour unthinkable for women made it difficult for women to find interesting motifs.

Pamela enjoyed teaching in the 1970s and motivated many young artists. At that time, young people also started to travel to see the art in other continents, and commercial galleries commenced in Australia. Under Gough Whitlam, the arts considerably developed, cultivating talent and ability at all levels. In 1978, a council was established to foster art, and funding became available for art projects. Germaine Greer’s books opened Pamela’s eyes to the female situation and encouraged her to get help not only in the studio, but also in the household. Consequently, she set up her own studio in 1978 with an etching press, the



first in the country. Passing on her techniques to others, the Griffiths studio has produced over 700 editions from some 50 artists. For the 2007 Asia-Pacific Economic Cooperation Conference, the Government commissioned an etching of rural Australia that was given to all the visiting heads of the nations.

Pamela showed images of her work, etchings and paintings. Some of her paintings were commissions that were used as a repeat pattern for printing the patterned fabric known as toile, e.g.. in 1988 for the Royal Australian History Society ‘The Bicentennial Toile’ and in 1994 a decorative commemorative fabric depicting the life of Sister Mary Mackillop for the Sisters of St. Joseph. Pamela had examples of toiles with her, giving the audience a great opportunity to see all the details.

In her talk, Pamela also introduced works of some women artists from the 16th, 17th, and 18th centuries, and in the 19th century Rose Bonheur, Berthe Morisot, Mary Cassatt; the latter two being impressionists. Well known women artists of the 20th century are Frida Kahlo and Georgia O’Keeffe.

For more information about gender disparities in the arts and the National Museum of Women in the Arts, see: https://nmwa.org/sites/default/files/shared/getthefacts_master-statistics_5womenartists.pdf.



Prof Sven Rogge (Head, School of Physics, UNSW), Dr Herma Buttner, Prof. Nicholas Fisk (DVC Research, UNSW), A/Prof Matthew Arnold (Chair, AIP -NSW branch), Prof Boris Altshuler, Prof. Emma Johnston (Dean of Science, UNSW), Dr. Donald Hector

Dirac Lecture 2017

Professor Boris Altshuler

“Is It Possible to Predict the Behaviour of Closed Physical Systems? From the Solar Systems to a Quantum Computer”

On 6 November 2017, the University of New South Wales presented the Dirac Medal to Professor Boris Altshuler from the Columbia University in New York. Professor Boris Altshuler then delivered the Dirac Lecture, entitled “Is it possible to predict the behaviour of closed physical systems? From the solar systems to a quantum computer.”

The historical background goes back to the mechanics of Lagrange following Newton with the integrable systems of equations of motion as deterministic mathematics in contrast to the ergodic systems describing chaotic motion known as Brownian motion of particles. (An “ergodic system” is one where the position of the points in the system averages out over time, so that if the system runs for a very long time its initial state cannot be determined.) This phenomenon was first observed under a microscope by the 19th-century scientist, Robert Brown and was referred to as the thermo-statistical motion of molecules. This research was further developed by von Oswald, Boltzmann, and last not least in Einstein’s PhD thesis in Zürich 1905, where he demonstrated that he could arrive at Avogadro’s number. The distance between two molecules increases defining the Lyapunov constant.

Altshuler traced the development of Bose-Einstein statistics leading to the Anderson Localization – leading to the award of a Nobel Prize – and entangled quantum states. These are non-ergodic systems and may be an important to the development of quantum computing algorithms.

Since 1979, the Dirac Lectures have been presented by UNSW’s School of Physics and are supported by the Royal Society of NSW in conjunction with the Australian Institute of Physics. Thanks for this most outstanding presentation were expressed by Dr Donald Hector FRSN for the RSNSW.

Heinrich Hora

Dr Lik Yung (Jeremy) Chan



“Effects of Maternal Cigarette Smoke Exposure on Brain Health in Offspring”

Dr. Jeremy Chan opened his lecture with some interesting comments on smoking by pregnant women. Of special note was that the number of publications relating to the impact of smoking and nicotine on brain health has risen steadily year on year from one publication in 1961 to 35 in 2015. The total over that period was 624 papers. Since the introduction of plain packaging of cigarettes in 2012, the number of women smoking has fallen to 13%, yet 25% of pregnant women still smoke, and in the aboriginal community, the number is as high as 50%.

Cigarette smoking is the leading cause of death and morbidity worldwide. Despite increased public education and government policies to ban smoking in public places, there are low success rates of smoking cessation during pregnancy. The adverse impact of maternal smoking on health outcomes in the next generation has been well studied, including increased risk of type 2 diabetes mellitus, impaired renal function and structure, and sudden infant death. Dr. Chan and his team have now identified additional adverse outcomes in the next generation, using female Balb/c mice. The additional adverse outcomes shown by the team include increased inflammation in the brains of offspring from smoke exposed mothers (SE) as well as abnormal mitochondrial metabolic markers and oxidative stress-related cell injury.

Furthermore, the team was able to demonstrate that SE offspring have reduced brain antioxidants. This led to further studies where the antioxidant capacity during early life of the offspring was boosted. The antioxidant chosen was L-Carnitine. In recent years, this antioxidant

has been shown to improve white matter lesion after chronic hypoperfusion in rats, and has also been shown to provide neuroprotection by elevating brain antioxidant capacity in aging rats. Chan and his team had previously demonstrated that maternal L-Carnitine supplementation during pregnancy and lactation can alleviate oxidative stress as well as mitochondrial and renal dysfunction in offspring from SE mothers. These findings then prompted further research on the impact of maternal L-Carnitine supplementation during gestation and lactation on brain markers of mitophagy, autophagy, mitochondrial antioxidants and other complexes in both genders of the SE offspring.

In the developing brain, substantially high energy demand increases the need for glucose, oxygen, and cerebral flow. Mitochondria can be regarded as the cellular power house and thus play important roles during brain development which is a highly energy-dependent process. The effects of maternal smoking on intrauterine environmental stress causing adverse birth outcomes have been well documented. This present study now opens the door to further investigations, in particular, confirmation of the benefits of L-Carnitine use in high-risk pregnancies to improve potential health outcomes in offspring by replenishing mitophagy function in the brains of offspring. Much work has already been done on this subject, but as Dr. Chan pointed out, much more needs to be done.

Anne Wood FRSN

President's Column

At the Forum, books recently published by Fellows and speakers will be presented to His Excellency, and these will be duly reported. In particular, I draw your attention to a book just out by Erik W. Aslaksen FRSN, member of Council and Executive Committee: "The Social Bond". It has recently been published by Springer, and is available for free download from <http://www.springer.com/gp/book/9783319687407>. Taking his title by analogy of Linus Pauling's "The Chemical Bond," which was the first comprehensive description of how atoms come together to create the ensembles called molecules which have quite different properties than their constituent elements, Erik has constructed a theory of society. The opening sentence reads: "This book is the culmination of a long and very personal process a quest for understanding the world around me and my existence in it." This seems to be the epitome of our Enlightenment charter. I recommend it to you. As usual, please write with comment and suggestions to president@royalsoc.org.au



Erik W. Aslaksen FRSN

Brynn Hibbert FRSN

Award for the Advancement and Promotion of Physics to Ragbir Bhathal FRSN

Dr Ragbir Bhathal has recently been awarded the prestigious Award for the Advancement and Promotion of Physics by the Australian Institute of Physics for his dedicated advocacy of the study of physics in schools, universities, and the community, including Aboriginal people. He has previously won teaching awards from the Australian Government's Office of Learning & Teaching (OLT) in 2014 Citation and from Western Sydney University's in 2016.

Dr. Bhathal has built the only privately funded observatory in any Australian university: the Campbelltown Rotary Observatory. Its programs include running talks by physicists and astrophysicists, including Nobel Laureate Professor Brian Schmidt, workshops for teachers, hands-on physics activities, and astronomy nights for the public and schools.



Since its opening in 2000, over 80,000 visitors have attended these programs.

Among his other activities, Dr. Bhathal runs the very successful Engineering Frontiers program aimed at Year 10 students. Over the last ten years over 2,000 students have participated in the program. On behalf of the National Library of Australia, he conducts the National Oral History Project on Eminent Australian Astrophysicists and Physicists. He published the first book on women in science in Australia and the first book on the history and development of astronomy and astrophysics in Australia for which he won the prestigious C J Dennis award for excellence in natural history writing.

Mortitz Merklein

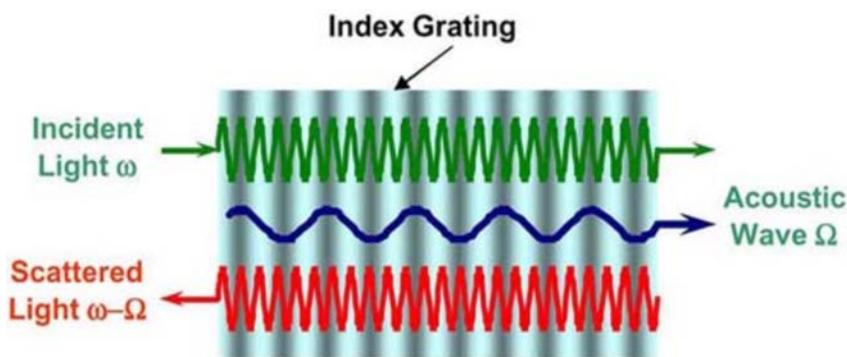
“How To Store Light: An Optical Memory Based On Sound Waves”

Winner of the Jak Kelly Award 2017, Moritz Merklein will describe a memory for optical data that is based on sound waves. This development has the potential to revolutionize next-generation computer chips.

Today, reducing heat is one of the most significant challenges in computing in large data centres. Photonic interconnections can solve this challenge, connecting different processing units without generating heat, while offering a broad bandwidth and data throughput. However, the vast speed of light is imposing new challenges on harnessing light as an information carrier, requiring an optical memory to slow down information for buffering, synchronization, re-routing, and further processing of the data. So far no method for controlling light has been developed that reaches the required bandwidth, the fractional delay, and is compatible with complex optical data encoding schemes, and least of all can be integrated into a photonic circuit.

Transferring the optical data to sound waves can provide a powerful solution to this challenge, enabling at reduction in the flow of information on the chip. It is like storing a flash of lightning inside thunder.

Moritz Merklein received his Physics Diplom from the University of Konstanz, Germany in 2012. His thesis dealt with the fabrication of Silicon nitride nanostructures and the characterisation of their mechanical modes using ultrafast pump-probe spectroscopy. Moritz joined the stimulated Brillouin scattering group in the Department of Physics at The University of Sydney under the supervision of Professor Benjamin Eggleton and Dr. Birgit Stiller. During his PhD studies., he made significant contributions to the field of stimulated Brillouin scattering, which describes the interaction between sound and light waves.



<https://image.slidesharecdn.com/bfrlinbandosnricton12poster-130218073357-phpapp02/95/inband-osnr-monitoring-technique-based-on-brillouin-fiber-ring-laser-4-638.jpg?cb=1361173305>

The Jak Kelly Award was created in honour of Professor Jak Kelly, who was Professor of Physics and The University of Sydney and UNSW and also President of the Royal Society of NSW. Its purpose is to encourage excellence in postgraduate research in Physics. The winner was selected from a short list of candidates who made presentations at a recent joint meeting of the Australian Institute of Physics NSW Branch, the Royal Australian Chemical Institute and the Royal Society of NSW, which was held at UNSW.

New Fellows

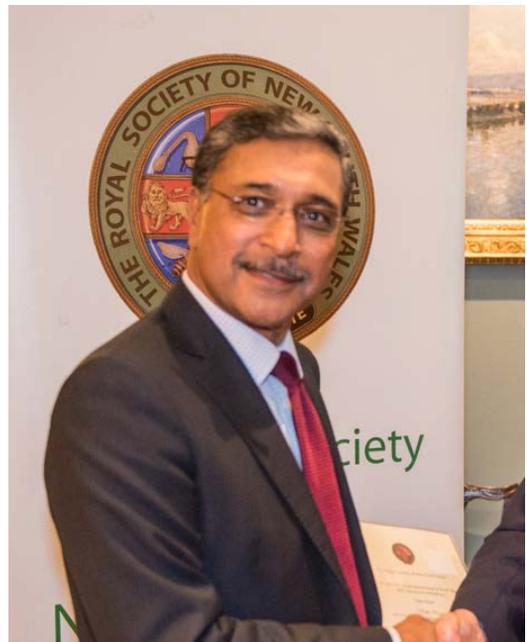
At the November OGM, Fellowships were awarded to Mr Rod Stowe (former NSW Fair Trading Commissioner), Prof. Lyndon Anderson (Dean Faculty of Arts and Design, University of Canberra), and Prof. Hargurdeep Saini (Vice-Chancellor and President of the University of Canberra). Thank you to Dr. Don Hector for the photos.



Pro, Lyndon Anderson FRSN with the Society's President Em. Prof. Brynn Hibbert



Mr. Rod Stowe FRSN



Prof Hargurdeep Saini FRSN



Schedule of RSNSW Meetings

Date	Event	Speaker	Topics and Presentations	Location
6-Dec-17	Ordinary General Meeting	Jak Kelly Award Winner	2017 Jak Kelly Award Presentation & Christmas Party	Union, University & Schools Club

RSNSW - Southern Highlands Branch

Date*	Event	Speaker	Topic	Location
16-Nov-17	Public Lecture	Dr Yik Lung (Jeremy) Chan	Effects of Maternal Cigarette Smoke Exposure	Mittagong RSL

*Lectures are usually the third Thursday of each month, except September.

RSNSW & The Sydney Mechanics School of Arts

Date*	Event	Speaker	Topic	Location**
1-Feb-18	Public Lecture	Kim Mckay	Learning, Adaptation and the Enlightenment: The Museum	Sydney Mechanics School of Arts***
1-Mar-18	Public Lecture	Paul Brunton	Learning, Adaptation and the Enlightenment: The Library.	Sydney Mechanics School of Arts***
5-Apr-18	Public Lecture	George Paxinos	Sophistry: "Global Deflation: The Enlightenment has Failed!"	Sydney Mechanics School of Arts***

**Mitchell Theatre, Level 1, Sydney Mechanics School of Arts, 280 Pitt St, Sydney

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