2021 PREMIER'S PRIZES FOR SCIENCE & ENGINEERING

GOVERNMENT HOUSE
SYDNEY
1 December 2021

NSW GOVERNMENT

The Honour Roll

NSW Scientists of the Year

2020	**Professor Edward Holmes** The University of Sydney
2019	**Scientia Professor Rose Amal AC** UNSW Sydney
2018	**Laureate Professor Nick Talley AC** The University of Newcastle
2017	**Professor Gordon Wallace AO** University of Wollongong
2016	**Professor Rick Shine AM** The University of Sydney
2015	**Laureate Professor Scott Sloan** The University of Newcastle
2014	**Professor Mark Westoby** Macquarie University
2013	**Laureate Professor Graeme Jameson** The University of Newcastle
2012	**Laureate Professor John Aitken** The University of Newcastle
2011	**Scientia Professor Michelle Simmons** University of New South Wales
2010	**Professor Hugh Durrant-Whyte** The University of Sydney
2009	**Professor Stephen Simpson** The University of Sydney
2008	**Professor Martin Green** University of New South Wales

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The 2021 Premier's Prizes for Science & Engineering are an initiative of the NSW Government, led by the Office of the Chief Scientist & Engineer, to recognise excellence in research and education, and to reward those whose cutting-edge work has generated economic, environmental, health, social and technological benefits for New South Wales.

Order of Proceedings

Welcome to the 2021 NSW Premier's Prizes for Science & Engineering, hosted at Government House, Sydney, on Wednesday 1 December.

Introduction

Master of Ceremonies:
Professor Hugh Durrant-Whyte
NSW Chief Scientist & Engineer

Keynote Address

Her Excellency
The Honourable Margaret Beazley AC QC
Governor of New South Wales
Patron of the NSW Premier's Prizes for Science & Engineering

Premier's Address

The Honourable Dominic Perrottet MP
Premier of New South Wales

2021 Premier's Prizes Presentation

The Honourable Stuart Ayres MP
Minister for Jobs, Investment, Tourism and Western Sydney, and Minister for Industry and Trade

Address by the 2021 NSW Scientist of the Year

The Governor at the launch of the Asbestos Diseases Research Institute as a World Health Organization Collaborating Centre for the Elimination of Asbestos Related Diseases, with Emeritus Professor Ken Takahashi, Institute Director, 23 February 2021.

GOVERNMENT HOUSE
SYDNEY

Message from Her Excellency The Honourable Margaret Beazley AC QC Governor of New South Wales

The year 2021 has highlighted the fundamental role that research and development plays in medical and scientific innovation and implementation. Science diplomacy has also been especially critical as nations have collaborated to address the common global threat of COVID-19.

Indeed, a perhaps unexpected legacy of these last two very difficult years has been the collaborative networks that have formed in New South Wales' world-class universities, research institutes and innovation centres. The newly formed NSW RNA Bioscience Alliance and the new RNA Production and Research Network will further support these initiatives, extending into 'medical technologies and therapeutics to combat everything from pandemics to cancer and genetic diseases'.

While the year has been difficult - and demanding - the response of our medical researchers, engineers and health professionals has been nothing short of superlative as they have led us through the pandemic. We all thank and honour them.

There have been many other things to celebrate:

- The excellence of STEM teachers and Indigenous educators, who inspire the next generation of innovators, throughout extended periods of remote learning
- The recognition in the Eureka Prizes for 2021 of NSW research, innovation, technologies and partnerships, including the NSW Bushfire Hub
- Environmental and conservation programs, undertaken to ensure the preservation of our precious biodiversity, including the genome programme to save the koala, and the rat-eradication programme which has resulted in a biodiversity boom on Lord Howe Island
- New green energy and frontier initiatives, including the NSW Space Research Network
- The wider community's deepening interest in science, evidenced this year as NSW Science Week communicators took science online, reaching more than 162,000 people.

Given the challenges of COVID-19, the collaborations, the scientific developments and the huge interest in and around science, it is fitting that in 2021 we also celebrate the 200th anniversary of The Royal Society of New South Wales, our State's oldest formal 'learned society' established "to enquire into the various branches of physical science of this vast continent and its adjacent regions".

As Patron, I applaud the achievements of each of our NSW scientists, researchers, engineers and educators. Congratulations!

Margaret Beazley

Her Excellency the Honourable Margaret Beazley AC QC
Governor of New South Wales

NSW Premier Dominic Perrottet at UNSW Sydney's Kensington campus announcing a $96 RNA pilot manufacturing facility, 21 October 2021.

Message from the Premier of New South Wales

We turn to our science and engineering community to bring new horizons within our reach. Whether building the cities of the future, researching medical cures or responding to the challenge of climate change, their work benefits us all in a multitude of ways. Their efforts during the COVID-19 pandemic have been truly life-saving, helping us to learn more about how the virus works and innovating the vaccines that keep us safe.

The NSW Premier's Prizes for Science & Engineering give us the opportunity to recognise these pioneers and their cutting-edge work. The prizes remind us how much we rely on this community for our quality of life, particularly as we rebuild our economy and society in the wake of the pandemic. The NSW Government is drawing on this expertise once again as we look to create a new medical manufacturing and research industry in NSW capable of producing mRNA vaccines.

Our broader COVID-19 recovery plan draws heavily on our science, technology, engineering and mathematics skills base to build the industries and jobs of the future and a more self-sufficient economy.

This year, we released the NSW Government's R&D action plan to encourage collaboration and innovation and turn ideas into jobs. We also continue to develop dedicated precincts where research and development and new enterprises can thrive.

Our June 2021 Budget committed more than $1 billion to start work on the Bradfield City Centre, which will become Australia's first 22nd century city. Adjacent to the new Western Sydney Airport, it will be a hub for advanced manufacturing, aerospace and defence, and other high-tech growth industries.

Sydney's Tech Central will become the biggest technology hub of its kind in Australia. With Atlassian as an anchor tenant, the precinct will create 25,000 innovation jobs and host start-ups, scale-ups and innovation partners. These are the kind of ambitions that can be realised with a vibrant scientific sector. We must therefore continue to champion the scientists who shape our lives and future.

I congratulate the 2021 NSW Scientist of the Year, our nine category winners and all the researchers and educators nominated for this year's Premier's Prizes.

The Honourable Dominic Perrottet MP
Premier of New South Wales

The NSW Chief Scientist & Engineer with Quasar Satellite Technologies, a funding recipient at the 2020 Physical Sciences Fund Announcement Event, Sydney Startup Hub, 9 February 2021.

Message from the NSW Chief Scientist & Engineer

Welcome to the NSW Premier's Prizes for Science & Engineering. A sincere thank you once again to our Patron, the Governor of NSW, Her Excellency the Honourable Margaret Beazley AC QC and Mr Dennis Wilson for allowing us to hold tonight's ceremony at Government House.

We welcome the Premier, the Honourable Dominic Perrottet MP, who in his first weeks in office has already signalled his strong support for science and research through the announcement of the NSW Hydrogen Strategy and the establishment of a pilot manufacturing facility to develop mRNA and RNA drugs and medicines to combat disease and save lives.

Presenting the Prizes tonight is the Honourable Stuart Ayres MP, NSW Minister for Jobs, Investment, Tourism and Western Sydney, and Minister for Trade and Industry. My Office is fortunate indeed to have a Minister committed to the translation of research and development into prosperous outcomes for the people, environment and economy of NSW.

In January 2021, the NSW Government released the Accelerating Research and Development in NSW Action Plan, strongly driven by the Honourable Gabrielle Upton MP, Parliamentary Secretary to the Premier. This important document has kept my Office very busy this year, launching the Small Business Innovation Research program, the Emerging Industry Infrastructure Fund and the Bushfire Response R&D Mission, with much more to come.

This year has seen other important R&D initiatives announced, including the NSW Space Research Network, the commencement of work to establish both a sovereign semiconductor production capability and Decarbonisation Innovation Hub, the release of world-first open-source genome data to protect the NSW koala population and the publication of an important roadmap to enable our state to become a renewable energy superpower.

None of this is possible without research and educational excellence, which is why we gather here tonight. It is my great pleasure to welcome you to the 2021 NSW Premier's Prizes for Science & Engineering. Join me in celebrating the achievements of this year's winners.

Professor Hugh Durrant-Whyte
NSW Chief Scientist & Engineer

NSW Premier's Prizes for Science & Engineering

The Premier's Prizes for Science & Engineering reflect the NSW Government's strong commitment to the local research and development community.

The Prizes seek to raise community awareness and appreciation of the important contribution scientists, engineers and teachers make to our daily lives, as well as to encourage careers in these fields.

The top award, the prestigious Premier's Prize for the NSW Scientist of the Year, will be presented to an outstanding individual who has made a significant contribution to the advancement of science, engineering or teaching which has benefited or has the potential to benefit the people of New South Wales.

The 2020 NSW Scientist of the Year, Professor Edward Holmes, receives his trophy from the Hon. Rob Stokes MP, Minister for Planning and Public Spaces, 27 October 2020.

2021 Categories

1. **Excellence in Mathematics, Earth Sciences, Chemistry or Physics**
2. **Excellence in Biological Sciences (Ecological, environmental, agricultural and organismal)**
3. **Excellence in Medical Biological Sciences (Cell and molecular, medical, veterinary and genetics)**
4. **Excellence in Engineering or Information and Communications Technology**
5. **NSW Early Career Researcher of the Year (Biological Sciences)**
6. **NSW Early Career Researcher of the Year (Physical Sciences)**
7. **Leadership in Innovation in NSW**
8. **Innovation in NSW Public Sector Science and Engineering**
9. **Innovation in Science, Technology, Engineering or Mathematics Teaching in NSW**

CATEGORY 1

Excellence in Mathematics, Earth Sciences, Chemistry or Physics

Professor Shujun Zhang

University of Wollongong

Professor Shujun Zhang is a material scientist focusing on electronic ceramic materials and the development of new materials to improve medical technology and the storage and harvesting of green energy.

Shujun's research is producing high performance ferroelectric materials for use in next generation ultrasonic medical imaging and diagnostics. These materials will greatly benefit the health sector and improve outcomes in NSW, as well as for the broader market.

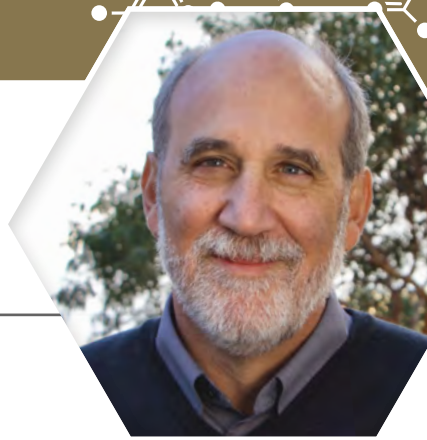
The ferroelectric materials developed by Shujun can also be used in thermal imaging detection to monitor bushfires on a large scale – technology that has become increasingly important in the wake of the 2019/20 bushfires and future climate projections.

Shujun is developing high performance, low cost ferroelectric materials for energy harvesting and high power energy storage, with enormous potential for use in future green energy systems. His work takes us one step closer to a renewable and sustainable future, with reduced dependence on fossil fuels.

Shujun's global influence is reflected in being named an IEEE Fellow of the Ultrasonics, Ferroelectrics and Frequency Control Society (UFFC-S) and Fellow of the American Ceramic Society, as well as Vice President for Ferroelectrics for the IEEE UFFC-S in 2021. He was also named the Australian Leader in Ceramic Engineering in 2019.

Shujun has authored more than 500 papers, with over 27,000 citations and an h-index of 78. His publications have appeared in high profile peer-reviewed journals, including *Science*, *Nature* and *Nature Materials*.

CATEGORY 2



Excellence in Biological Sciences
(Ecological, environmental, agricultural and organismal)

Professor Peter Steinberg
UNSW Sydney

Professor Peter Steinberg is one of the founders of the field of marine chemical ecology and a leader in the integration of macroecology and environmental microbiology. In recent years, he has become increasingly focused on building resilience into coastal systems faced with rapid environmental change, through habitat restoration and rehabilitation, and 'eco-engineering' of the built marine environment.

Peter's work has had major lasting impacts on NSW, national and global marine environments. He developed a model for disease in seaweeds that has been adopted internationally and led the establishment in Sydney of Australia's most successful kelp forest restoration project, bringing crayweed back to reefs to provide essential habitat and food resources.

As the inaugural Director and CEO of the Sydney Institute of Marine Science (SIMS), Peter led the growth of the Institute from a single lab to one of Australia's most significant marine science institutes.

Peter initiated and directs the World Harbour project, now a global network of 35 coastal cities focused on the science and management of urban marine environments, which has led to the 'Living Seawalls' project, transforming seawalls across Sydney Harbour and elsewhere into species-rich havens.

Further, Peter has strongly influenced marine policy as a NSW Marine Estate Expert Knowledge Panel member and as a lead author of Australia's *National Marine Science Plan 2015-2025*.

In 2017, Peter received the Australian Marine Science Association's pre-eminent Silver Jubilee Award for Outstanding Contributions to Marine Science and in 2020 was a Web of Science Highly Cited Researcher.

Peter has published over 225 papers, including in *Science*, *Nature* and *PNAS* and is an inventor on 10 patents on novel antifouling and antibacterial technologies. Doubling his citation rate in the last five years, he has over 25,000 citations and an h-index of 81.

CATEGORY 3

Excellence in Medical Biological Sciences
(Cell and molecular, medical, veterinary and genetics)

Scientia Professor Gregory Dore
UNSW Sydney

Scientia Professor Gregory Dore is head of the Viral Hepatitis Clinical Research Program at UNSW Sydney's Kirby Institute and an infectious diseases physician at Sydney's St Vincent's Hospital.

Greg has been involved in viral hepatitis and HIV epidemiological and clinical research, clinical care and public health policy for 20 years. He has developed extensive national and international collaborations, and is internationally recognised in the areas of Hepatitis C virus (HCV) natural history and epidemiology, therapeutic strategies for acute and chronic HCV infection, particularly among people who inject drugs, and HCV elimination strategies.

Greg established the St Vincent's Hospital viral hepatitis service in 1999 and has led its development into one of the leading national and international HCV treatment services, with a focus on marginalised populations including the homeless and people who inject drugs. He has been involved in the COVID-19 response, including as a chief investigator of the post-COVID ADAPT study.

Greg has been President of the Australasian Society for HIV Viral Hepatitis and Sexual Health Medicine (ASHM), a member of the National Health and Medical Research Council (NHMRC) and is an NHMRC Practitioner Fellow. He is a member of the Australian Academy of Health and Medical Sciences. In 2020, Greg received the Australian Museum Eureka Prize for Infectious Diseases Research.

In the same year, Greg was named as a Clarivate highly cited researcher (top 1%). He has published 450 papers, with over 22,000 citations and has an h-index of 82.

CATEGORY 4

Excellence in Engineering or Information and Communications Technology

Distinguished Professor Fang Chen

University of Technology Sydney

Distinguished Professor Fang Chen creates innovative solutions that use machine learning algorithms to extract knowledge from data. This knowledge can then be used to solve real-life problems in large-scale complicated systems and networks.

Some of Fang's most impactful work focuses on urban water supply networks, where water main failures can cause service interruption, temporary flooding, water loss and traffic disruptions. Growing populations and ageing infrastructure require more efficient strategies to manage risks from system failures.

Fang has applied pioneering machine learning methods to predict pipe failures across over 30 utilities worldwide. Applied to over 10 million pipes and one million failure records, Fang's novel approach has been found to be five to ten times more accurate than current industry standard tools.

In NSW, since December 2019 the Water Pipe Failure Prediction Tool developed by Fang and her colleagues has detected water pipe leaks and breaks which have saved 3,000 megalitres of water – equivalent to 1,200 Olympic-size swimming pools – and $8 million in lost water. If applied across Australia, Global Water Intelligence estimates her solutions could enable Australian water utilities to save $700 million per year on reactive repairs and maintenance.

Fang won the 2021 Australia-New Zealand Women in AI Infrastructure Award, the 2018 Eureka Prize for Excellence in Data Science and the 2016 Australian Water Association's Water Professional of the Year. In 2017, Fang received the Brian Shackle Award for "the most outstanding contribution with international impact in the field of human interaction with computers and information technology".

Fang has more than 300 refereed publications and has filed 30 patents in eight countries. Her h-index is 40.

CATEGORY 5

NSW Early Career Researcher of the Year (Biological Sciences)

Dr Louise Causer

UNSW Sydney

Dr Louise Causer is a National Health and Medical Research Council Early Career Fellow at the Kirby Institute. Throughout her career as a clinician, medical epidemiologist and academic, Louise has demonstrated a strong commitment to international public health and infectious disease control. As a researcher, she has been pivotal in introducing point-of-care testing for sexually transmitted infections (STIs) in remote health care services.

Women living in remote Australia have unacceptably high rates of adverse reproductive health outcomes from untreated STIs. These infections are easily cured with antibiotics but diagnosis and treatment in remote areas is often delayed.

In 2013, new molecular-based diagnostic technology was developed that allowed same-day diagnosis and treatment of STIs. Louise's research was the first to demonstrate that this technology could be successfully operated by Aboriginal health workers in remote areas.

In another world first, Louise coordinated the evaluation of a cluster randomised trial which showed the technology substantially improved clinical practice and patient outcomes. Louise has also led the scale-up of this technology into clinical practice, which has been sustained for over four years.

For her research, Louise has partnered with Aboriginal health organisations and point-of-care testing is now recommended in the *National Aboriginal and Torres Strait Islander STI Strategy 2018-2022*.

The testing network and critical support systems infrastructure Louise helped to establish were leveraged for Australia's COVID-19 response, improving access to testing for 150 remote communities in six jurisdictions, including NSW.

Louise's work to date has resulted in 43 peer-reviewed articles in top journals, including *Lancet ID* and *Clinical Infectious Diseases*. She has an h-index of 20.

CATEGORY 6

NSW Early Career Researcher of the Year (Physical Sciences)

Associate Professor Rona Chandrawati

UNSW Sydney

Associate Professor Rona Chandrawati is an emerging global leader in nanosensors and nanoparticle-based drug delivery, and Australia's leading researcher in colourimetric polymer sensor technology. In the last five years, Rona has achieved world-class – often first-in-world – results with applications in the food industry, agriculture and medicine.

The sensors Rona has developed have many applications. Her unique colourimetric nanosensors allow for food spoilage and contamination to be detected without specialised equipment, on-site or at home. They provide quantitative and qualitative results using colour changes visible to the naked eye. These sensors have helped reduce food waste – a problem costing Australia $10 billion each year.

In agriculture, Rona's sensors allow rapid detection of α-hemolysin (a key indicator of bovine mastitis) in milk. Currently one of the most difficult veterinary diseases to control, these sensors enable detection in 30 minutes, instead of days under previous testing. This has significant economic, animal welfare and human health benefits to the NSW and Australian dairy industry.

In medicine, Rona's synthesis of nanoparticles and nanozymes for nitric oxide delivery have significant therapeutic implications, particularly in treating glaucoma, which affects one in 10 Australians.

Rona has received prestigious fellowships from the Australian Research Council and the National Health and Medical Research Council. In 2020, she was named by Engineers Australia as one of Australia's Most Innovative Engineers and as 'Emerging Investigator' by the journal *Polymer Chemistry*.

To date, Rona has authored 77 peer-reviewed publications in top journals, including *Science*, *Advanced Materials* and *Advanced Science*. She has over 3,400 citations and an h-index of 28.

CATEGORY 7

Leadership in Innovation in NSW

Scientia Professor Richard Bryant AC

FAA FASSA FAPS FAHMS

UNSW Sydney

Scientia Professor Richard Bryant is the world's leading authority in early psychological responses to traumatic events. In light of the significant mental health impacts of the Black Summer bushfires and ongoing COVID-19 pandemic, Richard's research is more critical than ever. His work managing the early mental health impacts of these events has had enormous benefits for the people of NSW.

Richard has identified the core biological and psychological factors that occur after trauma and that influence long-term trajectories of mental health, as well as developing early interventions to manage anxiety, depression and post-traumatic stress disorder (PTSD).

Richard's Traumatic Stress Clinic is the largest treatment centre in Australia. In the last five years, the Clinic has helped NSW become the first jurisdiction in the world to reduce PTSD in first responders, generating a mental health strategy for survivors of bushfire.

In a world first, Richard adapted his early treatment protocol to develop a brief program delivered via video conferencing to meet social-distancing needs and include regional workers in NSW. Multiple trials have found that the program effectively reduced anxiety, depression, and pandemic worries. This is the first program of its type in the world to address the mental health effects of the pandemic and is shaping programs in Europe and India.

Richard has been widely recognised for the innovation and impact of his work, receiving an Australian Research Council Laureate Fellowship, as well as the James Cook Medal – the most prestigious award offered by the Royal Society of NSW.

Richard is Australia's most published and cited psychologist, having authored six books, 75 book chapters and over 700 publications, with more than 66,500 citations and an h-index of 132. He was an ISI Highly Cited Researcher in 2019 and 2020.

CATEGORY 8
JOINT WINNER

Innovation in Public Sector Science and Engineering

Mr Nicholas Carlile MSc

NSW Department of Planning, Industry and Environment (DPIE)

Nicholas Carlile has researched island ecology in NSW for 30 years and is recognised as an expert on Lord Howe Island's seabird assemblages. Since 2005, his work has provided insights into the island's ecology to meet the challenge of its protection. Together with Dr Terence (Terry) O'Dwyer, he has provided scientific leadership and expertise for the major environmental program to remove rodents, a Key Threatening Process under the Environment Protection and Biodiversity Conservation Act 1999.

Prior to the commencement of the eradication program, Nicholas worked with a team of researchers to determine the impacts of rodents on seabirds, land birds and invertebrates. With Terry, he showed the efficacy of the proposed bait, demonstrating that it was sufficient to kill all island rodents, despite concerns of bait resistance.

In the winter of 2019, Nicholas provided expert direction on seabird management as part of a Technical Advisory Group. Together with Terry and the Rodent Eradication Program team, he brought over 50 per cent of the Lord Howe Currawongs into captivity and coordinated the capture of 85 per cent of Lord Howe Woodhens for safekeeping during baiting.

The DPIE team provided extensive monitoring during the active baiting to safeguard the complex faunal assemblages of this World Heritage environment. No declines in any species have since been detected and several species have had remarkable recoveries.

Nicholas has worked in conservation science since 1986, was awarded a Churchill Fellowship in 1999 and achieved his MSc in 2001. He has published 98 papers (30 on Lord Howe Island fauna) with 1200 citations (h-index: 20) on over 35 species and was responsible for the down-listing of two Australian endangered species.

Nicholas (left) and Terry releasing threatened currawongs after being held for five months during rodent eradication on Lord Howe Island.

CATEGORY 8
JOINT WINNER

Innovation in Public Sector Science and Engineering

Dr Terence O'Dwyer

NSW Department of Planning, Industry and Environment

Dr Terry O'Dwyer's passion for conservation biology began in 2000 with his PhD research on Australia's rarest endemic seabird, Gould's petrel. This passion continues in his current role as Senior Scientist with DPIE, where his research plays a crucial role in the ecological restoration of islands in NSW.

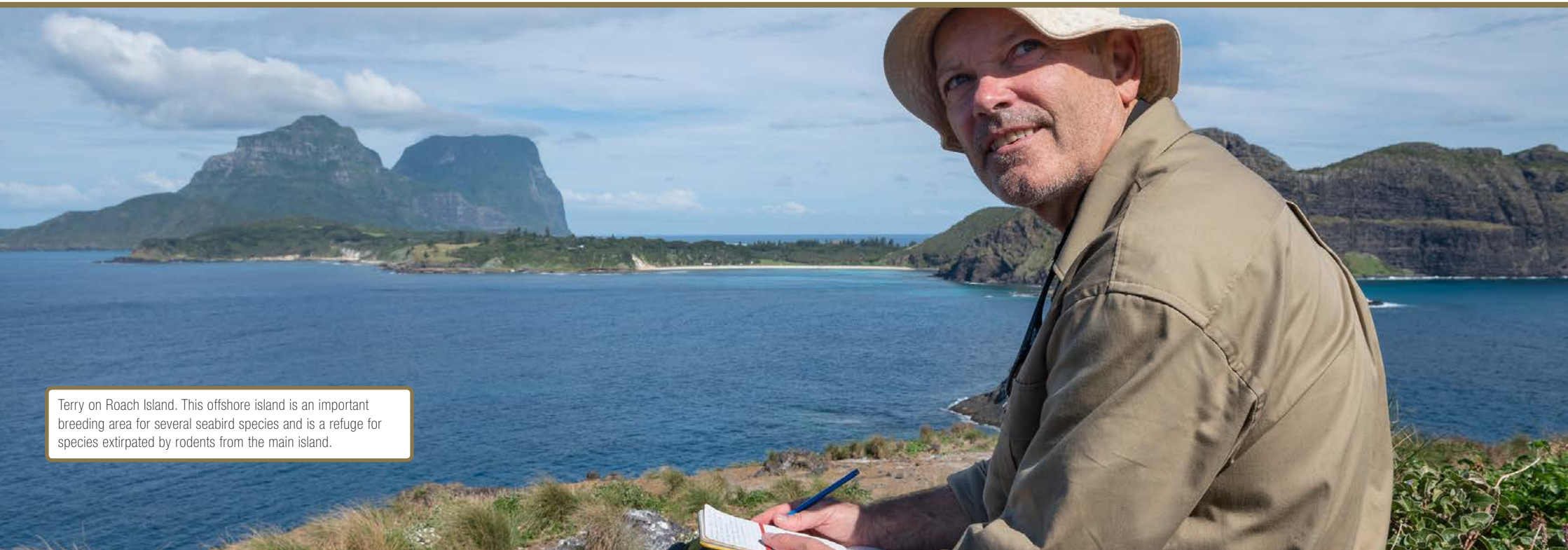
As part of a team of scientists, Terry performed critical research in preparation for the Lord Howe Island rodent eradication project. Together with Nicholas Carlile, he developed a comprehensive plan to protect the unique fauna of Lord Howe Island during the baiting phase of this globally seminal conservation program.

Terry managed the non-target mitigation and monitoring plan, which was successfully implemented to ensure that there were no significant impacts on any native fauna, many of which are now flourishing since the completion of the program.

The value of the plan in safeguarding endemic species has been recognised in Australia and internationally. Both Terry and Nicholas have been consulted for other eradication projects, such as a proposed rodent eradication on Warul Kawa in Torres Strait and the current multi-million-pound mouse eradication project on Gough Island in the South Atlantic. Their leadership in this area should result in greater conservation outcomes on islands across the globe.

Terry has been an ARC International Fellow, collaborating with world-class researchers at the University of California and at Harvard University on the role of scent in mate-choice in petrels.

Terry has published extensively on petrel biology including papers on their physiology, behaviour and genetics. He has published 14 articles in international journals and has a Web of Science h-index of 9.



Terry on Roach Island. This offshore island is an important breeding area for several seabird species and is a refuge for species extirpated by rodents from the main island.

CATEGORY 9

Innovation in Science, Technology, Engineering or Mathematics Teaching in NSW

Cassandra Portelli

Hunter School of the Performing Arts

Cassandra Portelli goes above and beyond to engage students in learning real world mathematics skills. Outside of school, Cassandra commits her time to support the professional development of other mathematics teachers and has driven policy change across Australia.

Cassandra leads 'Maths and Milo', a daily program supporting school students with homework and study, as well as focusing on the latest practices in mathematics teaching. Her work on the latter has been recognised by the Faculty of Education and Arts at The University of Newcastle and both programs have become integral parts of university pre-service teacher education.

Cassandra leads the Newcastle Mathematics Educators Community and Mathematical Association of New South Wales Newcastle Cluster, ensuring maths teachers have access to quality professional learning and mentoring. She has contributed to dozens of regional, state and national professional learning events, and published in several education journals including *Reflections* and *Connect*.

Cassandra was an inaugural winner of a CHOOSEMATHS award. In further recognition of her work, Cassandra received the Premier's Financial Literacy Scholarship, touring countries participating in Global Money Week and making recommendations for change at local, state and federal levels. Subsequently, Cassandra has worked with ASIC on MoneySmart Teaching resources and implemented a nation-wide Global Money Week Financial Literacy Challenge. Recently her recommendation to host a Treasurer's Financial Literacy Challenge was adopted.

Also in the policy space, Cassandra contributed to the 2019 Parliamentary Inquiry into teacher workload and analysed research for the 2019 NSW Curriculum Review as a member of the Mathematical Association of NSW. In 2021 she was invited to participate in the Quality Initial Teacher Education Review.

2021 NSW SCIENTIST OF THE YEAR

James Finlay Patrick AO

BSc MSc DEng DSc FIEAust CPEng (Ret) FTSE

Chief Scientist - Emeritus, Cochlear Limited

Adjunct Professor, Macquarie University

James (Jim) Patrick is recognised as a world authority on cochlear implants. Together with Professor Graeme Clark, he is one of the original engineers who pioneered the development of the multi-channel cochlear implant.

Jim joined Professor Clark's research team at Melbourne University in 1975. With training in physics and communications engineering, and an interest in how electrical stimulation might be used to help people hear, he led the successful development of 'UMDOLEE', the 10-channel cochlear implant developed by the university's Departments of Otolaryngology and Electrical Engineering.

When the UMDOLEE proof of concept generated Commonwealth Government support for commercial development in 1981, Jim moved to Sydney as a member of the Cochlear 'Tiger Team' established by Paul Trainor inside the Nucleus group, to develop a 'clinically applicable' cochlear implant. Jim was responsible for systems engineering and the digital aspects of the implantable stimulator, playing a key leadership role in the development of the commercial medical implant.

From 1981 to 2016 Jim was a member of Cochlear's senior management team, holding a number of technology management roles, including responsibility for R&D, Quality and Manufacturing. He was recently responsible for Cochlear's global research programme, exploring how novel forms of signal processing can improve the performance of the cochlear implant and how advances in biology and electro-neural interfaces can be applied to future implant designs.

Jim has also been involved in several projects that seek to use Cochlear technology in other medical bionics fields. These include the treatment of spinal cord injuries, the use of an implanted stimulator to provide sensory feedback for people using artificial hands and the use of an implanted stimulator to provide 'pacing' vestibular stimulation to relieve Ménière's disease symptoms.

2021 NSW SCIENTIST OF THE YEAR

Jim has been a member of the Advisory Boards to many Institutions, with current appointments to The Shepherd Centre Research Advisory Committee, the Mirage 3.4D Board and the Carbon Cybernetics Board.

Jim retired from Cochlear in December 2016 but continues to contribute in an Emeritus role.

Jim has received significant recognition and awards during his career:

- Named in the 2007 'Australia's Most Influential Engineers' for *Engineering Expertise*
- Honoured by the Royal Institute for Deaf and Blind Children by their naming of the 'Jim Patrick Audiology Centre' and by the Australian Hearing Hub by their naming of 'The Patrick Meeting Room'
- Named 'Engineering Icon for the Cochlear Implant' by The Warren Centre for Advanced Engineering
- Won the 2014 David Dewhurst Award for Biomedical Engineering
- In 2015, received the ATSE Clunies Ross Lifetime Achievement Award for the application of science and technology for the benefit of Australia
- In 2015, received the Order of Australia for distinguished service to science through the development of Cochlear implant technology, to biomedical research and engineering innovation, and to education and professional associations
- In 2017, received the Samuel F. Lybarger Award for Achievements in Industry by the American Academy of Audiology
- In 2020, was awarded the Officers Cross of the Order of Merit by the Republic of Poland

Jim is named as an inventor on 37 families of patents. He has been invited to present at numerous conferences on topics associated with cochlear implants and has contributed to 11 book chapters and 44 peer-reviewed papers.

The 2020 Premier's Prizes for Science & Engineering (L to R):

2020 NSW Scientist of the Year, Professor Edward Holmes, Professor Ewa Goldys, Dr Rachael Gallagher, Distinguished Professor Ian Wright, Ms Sophie Poisel, Professor Merlin Crossley, Dr David Hopkins, Distinguished Professor Sue O'Reilly, Her Excellency the Hon. Margaret Beazley AC QC, Governor of NSW, Mr Dennis Wilson, Distinguished Professor Antoine van Oijen, Distinguished Professor Zaiping Guo, Dr Jelena Rnjak-Kovacina, Professor Hugh Durrant-Whyte, NSW Chief Scientist & Engineer, the Hon. Rob Stokes MP, Minister for Planning and Public Spaces.

NSW
GOVERNMENT