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## AROTAKENGA OUR YEAR IN REVIEW

TĒNA KOUTOU KATOA. HE MIHI TĒNEI KI TE WHĀNAU WHĀNUI. OUR ROLE IS TO SUPPORT NEW ZEALANDERS TO TŪHURA EXPLORE, TOROHĒ DISCOVER AND TOHATOHA SHARE KNOWLEDGE.

T Ū H U R A E X P L O R E We support New Zealanders to follow their curiosity and explore the world through the many rangahau research funds and development opportunities we offer. Best known is the Marsden Fund but we also administer a number of other funding opportunities, including some for talented taiohi young people.

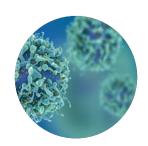
TOROHĒ DISCOVER We recognise the discoveries that New Zealanders make through their rangahau research, from school children through to researchers at the top of their field whom we elect as Fellows of our academy. We celebrate excellence in rangahau research by presenting medals and awards and synthesise expert knowledge on topics of importance to Aotearoa.

TOHATOHA SHARE Knowledge is for sharing. We need it to make decisions on important issues and to enjoy life to its fullest. We share information on key topics and facilitate the sharing of the latest rangahau research discoveries through our public events and expert advice programme, journals and the Science Media Centre.

This publication shares what we were up to in 2018.

READ ON TO DISCOVER MORE ABOUT OUR MAHI ACTIVITIES DURING THE SEASONS OF TE TAU 2018.









RAUMATI | SUMMER



**NGAHURU** | AUTUMN

MŌHIOTANGA — KNOWLEDGE MĀRAMATANGA —— UNDERSTANDING

#### HIGHLIGHTS 2018



**HŌTOKE** | WINTER



KŌANGA | SPRING

MATAWHĀNUI — VISION MAHINGĀTAHI — WORKING TOGETHER



#### TOHATOHA

SHARE



# A 'BIONIC LEAF' FOR HARVESTING ENERGY FROM THE SUN

MAY HOLD THE ANSWER TO POVERTY AND SUSTAINABILITY

Professor Daniel Nocera, Harvard University, came to New Zealand in February as a guest of the MacDiarmid Institute and gave a kōrero lecture at Royal Society Te Apārangi. A pioneer in energy conversion, particularly on the generation of solar fuels, Daniel talked about developing his inventions: the Artificial Leaf, which harnesses solar power to split water molecules into hydrogen fuel, and the Bionic Leaf, which makes liquid biofuel from hydrogen, carbon dioxide and genetically engineered microbes. The Bionic Leaf technology has been modified recently to produce nitrogen fertiliser from hydrogen, nitrogen and an enzyme. Daniel is driven by his desire to give the emerging world access to energy and fertiliser without them needing to build large and expensive distribution systems. With his technology, he hopes they can show the developed world how to live sustainably.

"The beauty of the sun to replace fossil fuels is firstly, in one hour the amount of sun that hits the face of the planet is what we use in an entire year globally. Secondly, if you're a poor kid in India, you have the same access to energy supply as the richest person in the world does."

PROFESSOR DANIEL NOCERA



# WHAT'S REALLY INSIDE YOUR MEDICINE CABINET?

Professor of Chemistry at the University of Oxford (UK), Dame Carol Robinson was in Aotearoa in March 2018 for two public korero lectures sponsored by the Universities of Canterbury and Auckland, presented by Royal Society Te Apārangi. Carol pioneered the application of mass spectrometry techniques to problems in chemical biology. Her groundbreaking rangahau research on the three-dimensional structure of proteins in particular has demonstrated the power of such techniques in studying large molecular compounds. In this talk, Carol illustrated the novel approaches being developed to try to win the battle against disease, while also understanding the problems of addiction in the treatment of pain. Her career started at the age of 16 when she got a job for a drug company working on what was then a new instrument, the mass spectrometer.



"When I got there I became fascinated with the technique. I was pitting myself against the instrument, which would break all the time, and it was a lot of fun to be fixing it and trying to outwit it. Most of the time it didn't work but when it did work it was really exciting and we could see the molecules that people were synthesising for drugs. We could see how they broke up and we'd get a so-called mass spectrum which is the atomic mass of all the things that were in the molecule and from that we could piece it together to get the structure. It's a bit like a jigsaw puzzle, you get all the little fragments and then you build it back up again."

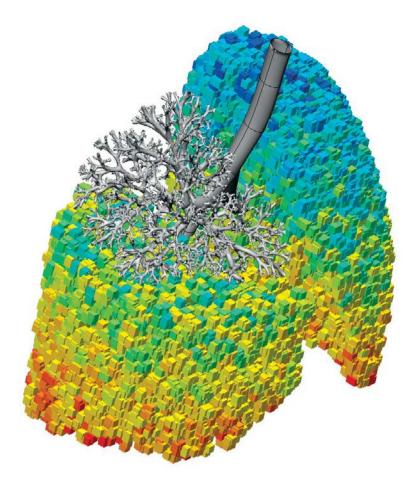
DAME CAROL BORINGON



VIEW VIDEO OF 'WHAT'S REALLY INSIDE YOUR MEDICINE CABINET



#### RAUMATI | SUMMER



# DIGITAL BREATHS:

THE BENEFITS
OF BIOENGINEERING

For our New Zealand Research Series in 2018, Professor Merryn Tawhai FRSNZ, University of Auckland, Deputy Director of the Auckland Bioengineering Institute and Director of the MedTech CoRE, gave public korero talks in 10 centres around Aotearoa. She posed the question: Is New Zealand becoming a world leader in the bioengineering industry? She examined our capabilities in this field and also showed the progress of her own rangahau research to digitally model the human lung and the implications of this for healthcare.



"Bioengineering research allows me to combine modern imaging, instrumentation, and computational methods to explore lung physiology in an unconventional way, and by doing this, to come up with novel technologies that will have clinical and commercial impact."

PROFESSOR MERRYN TAWHAI





Photo: Dave Allen/NIWA

# CLIMATE CHANGE:

Professor Jim Skea, Imperial College London and Co-chair of the Intergovernmental Panel on Climate Change (IPCC) Working Group III, presented a korero lecture for Royal Society Te Aparangi in Wellington before he headed to Christchurch for a meeting on the IPCC's Special Report on Climate Change and Land. In his talk, Jim discussed the role of the IPCC, what we know about climate change, how the Paris Agreement is upping ambition, new questions being posed for the IPCC 6th Assessment cycle, carbon targets and budgets in the UK, plus his own thoughts on New Zealand's Zero Carbon Bill.



"The IPCC's role is to assess the scientific, technical and socioeconomic information relevant to understanding human induced climate change, impacts and options for adaptation and mitigation, mitigation essentially being reducing emissions or, increasingly, the idea of increasing sinks of carbon that would take carbon out of the atmosphere. Because we're intergovernmental, we're supposed to be neutral with respect to policy and deal objectively with all the scientific, technical and socioeconomic factors. So we are intended to be – and the slogan is carved on all our hearts – policy relevant not policy prescriptive."

PROFESSOR JIM SKEA





# 10-YEAR PLAN FOR OUR UNDISCOVERED, UNDOCUMENTED AND UNNAMED BIODIVERSITY

"Australia and New Zealand together have some of the most extraordinary organisms anywhere on Earth. However, the world is experiencing mass extinctions, and Australia and New Zealand are not immune... This Decadal Plan provides an important vision, and outlines what taxonomists and biosystematists working in Australia and New Zealand could achieve if properly supported."

SIR DAVID ATTENBOROUGH

**TOROHĒ**DISCOVER

In April an ambitious plan was launched for New Zealand and Australia to describe our biodiversity before it becomes extinct. Best estimates put this undiscovered proportion of our biodiversity at 70%. The 10-year plan was a joint project of Royal Society Te Apārangi and the Australian Academy of Science. It followed on from our comprehensive review of taxonomic collections in Aotearoa in 2015 that called for more resources and a coordinated approach to safeguard and grow New Zealand's taxonomic collections. The Decadal Plan recommends the establishment of a funded body that will support the discovery of new species in New Zealand and disseminate this new knowledge. This would reverse the erosion of taxonomic knowledge in New Zealand and provide career pathways for young taxonomists. It also calls for New Zealand to develop key missing infrastructure and encourages the use of new and emerging technologies so that taxonomic science can serve the needs of society, government and our unique biodiversity. Naturalist and broadcaster Sir David Attenborough supported the plan.



READ REPORT: DISCOVERING BIODIVERSITY



#### NGAHURU | AUTUMN



# ORNAMENTAL TO DETRIMENTAL: NON-NATIVE PLANTS INVADE



Professor Philip Hulme FRSNZ, Chair in Plant Biosecurity at Lincoln University, was the 2018 recipient of the Leonard Cockayne Lecture Award from Royal Society Te Apārangi. This award recognised his scholarship and scientific achievements that have significantly progressed global understanding of the causes and consequences of biological invasions. In his popular korero talk series, he explained that Leonard Cockayne, while a great botanist, was mistaken in his view that non-native plants couldn't colonise native habitats. He says many ornamental garden plants have now escaped into wild areas and the scale of the problem will only increase. He would like to see plants that are sold with a likelihood of becoming a weed given a 'star' rating and better national regulation around plant sales and importation. This lecture series was presented in partnership with the Bio-Protection Research Centre in conjunction with our Branches based in the Manawatū, Hawkes Bay, Canterbury, Wellington and Nelson.

"New Zealand is one of the weediest places on Earth. We've got about 1,800 species of weed that have spread out into our natural environment but in our gardens, we're growing around 25,000 to 30,000 plant species and varieties that could easily escape from our gardens. Imagine it like an iceberg. What we see at the moment is just the tip of the iceberg and underneath the water is what we are growing in our gardens."

PROFESSOR PHILIP HULME



WATCH VIDEO: ORNAMENTAL TO DETRIMENTAL

**TOHATOHA**SHARE



#### TOHATOHA

SHARE

ALERT NEWSLETTER REACHES 1,000TH ISSUE ALERT – THE SOCIETY'S WEEKLY NEWSLETTER TO SHARE EVENTS, NEWS AND OPPORTUNITIES FOR THOSE INTERESTED IN EXPLORING AND DISCOVERING KNOWLEDGE – REACHED THE MILESTONE OF 1,000 ISSUES IN MAY.

The first issue of Alert was published as Science Digest  $\vartheta$  Technology Alert in September 1997, replacing the Science Digest series. Interestingly, this first issue included topics relevant to the mahi work the Society continues to focus on today such as gene technology, climate change and animal ethics. The Society was one of the first organisations in New Zealand to use email to send out its newsletter and to have a website. In June 1998, issue 34, the name changed to Science  $\vartheta$  Technology Alert and in November 1999, issue 105, the name was shortened to Alert.

"Welcome! Members will be pleased to know that Science Digest has been reinstated as the main vehicle of communication between the Society and its many constituents. To cut down on paper, postage and reading time, most of the articles here refer to fuller information on our webserver, The Gateway to NZ Science: http://www.rsnz.govt.nz/"

EXCERPT FROM FIRST ISSUE, SEPTEMBER 1997





# NGĀ KETE: ANNUAL COLLECTION OF REVIEWS LAUNCHED

Last year the Journal of the Royal Society of New Zealand launched a new initiative to give Ngā Ahurei a Te Apārangi Fellows of the Society a stronger voice in our longstanding journal that dates back to 1867. Called Ngā Kete, it is an annual collection of review articles published in a diverse range of subject disciplines from New Zealand's most prominent scholars, including Fellows, medal winners and awardees. The name, Ngā Kete, pays homage to the three baskets of knowledge – Ngā Kete o te Wānanga – for which Tāne ascended to the twelfth heaven, Te Toi-o-ngā-rangi, and brought down for mankind. Te kete-tuatea is the basket of light and present knowledge, te kete-tuauri is the basket of darkness for things that remain unknown to us and te kete-aronui is for the pursuit of knowledge that humans seek. The three baskets of knowledge are depicted in a lapel pin that Fellows, Members and staff of Royal Society Te Apārangi wear.



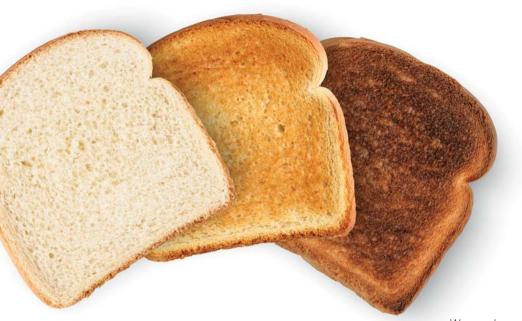
"Here on our remote continent, Aotearoa New Zealand, Royal Society of New Zealand Te Apārangi has a roll of people recognised for special achievements. These are the Fellows, medallists and awardees of Royal Society Te Apārangi. It is a pleasure to offer this special issue of the Journal of the Royal Society of New Zealand, the first annual compilation of review articles on the research fields and contributions of recently elected Fellows."

EWAN FORDYCE FRSNZ, SENIOR EDITOR, JOURNAL OF THE ROYAL SOCIETY OF NEW ZEALAND



VIEW NGĀ KETE: THE 2018 ANNUAL COLLECTION
OF REVIEWS

#### NGAHURU | AUTUMN



# **TOHATOHA**SHARE

# ADDING FOLATE TO PACKAGED BREAD RECOMMENDED

We produced a joint report with Sir Peter Gluckman FRS FRSNZ as the Prime Minister's Chief Science Advisor that reviewed the hauora health benefits and potential risks of adding folate (folic acid) to bread to reduce the rate of neural tube birth defects in Aotearoa. Unlike other countries where adding folate is mandated, New Zealand relies on industry-led voluntary fortification of bread and there is continuing evidence of low levels of folate in women of childbearing age in New Zealand. The conclusions of the review support mandatory fortification. The report was provided to the Ministry of Health in June.

"There is compelling evidence that mandatory folic acid fortification is associated with lower rates of neural tube defects, and that taking folic acid supplements at the recommended doses in pregnancy has no adverse effects on pregnancy outcome or the child's health. No evidence was found to link the use of folic acid supplements or fortification to increased risks of neurological/cognitive decline, diabetes, or cardiovascular disease, nor was there evidence that unmetabolised folic acid is harmful."

PROFESSOR SIR PETER GLUCKMAN FRS FRSNZ



READ REPORT: THE HEALTH BENEFITS AND RISKS OF FOLIC ACID FORTIFICATION OF FOOD

# MĀORI SCHOLARSHIP WINNER SHINES AT LONDON SCIENCE EVENT



IRITANA BENNETT-FAKAHAU FROM ŌTAKI COLLEGE WAS SELECTED BY ROYAL SOCIETY TE APĀRANGI TO ATTEND THE LONDON INTERNATIONAL YOUTH SCIENCE FORUM IN JULY 2018.

Iritana was one of a number of tauira students selected to represent New Zealand at international science and technology events, supported by the Talented School Students Travel Award. These awards are managed by the Society with funding from the Ministry of Business, Innovation and Employment. Iritana found attending the forum to be a life-changing experience and she also made a big impression on the organisers of the forum who have asked Iritana back in 2019 to be a mentor for the younger students. This is an honour as only a few students from over 600 participants are given this opportunity.

"This trip has changed many things about me. I have considered changing my entire career path and I now actually like physics! It has also made me realise how lucky and fortunate I am to not only live in New Zealand, but to be proud of my culture. Going over to London, I wore my Māoritanga with pride."

IRITANA BENNET-FAKAHAU

VIEW MORE TALENTED SCHOOL STUDENTS TRAVEL AWARD

TŪHURA

EXPLORE



# LATEST SCIENCE AND TECHNOLOGY INFORMATION FOR MPs

IN COLLABORATION WITH THE SPEAKER OF THE NEW ZEALAND PARLIAMENT, SCIENCE NEW ZEALAND, UNIVERSITIES NEW ZEALAND AND THE INDEPENDENT RESEARCH ASSOCIATION OF NEW ZEALAND, WE RAN OUR ANNUAL SPEAKER'S SCIENCE FORUM FROM MARCH TO OCTOBER SO THAT MEMBERS OF PARLIAMENT HAD THE OPPORTUNITY TO HEAR KÖRERO PRESENTATIONS ON TOPICAL RESEARCH AREAS. 111 MEMBERS OF PARLIAMENT REGISTERED FOR THE SPEAKER SERIES EVENTS.

In 2018, the topics presented were:

- Lake and river recovery and resilience: Negative impacts on freshwater quality may take decades to be visible what can recent research tell us about predicting the future resilience of freshwater systems and rates of recovery when remedial actions are taken?
- Transport disruption: Technology changes to vehicles are likely to lead to major disruptions in the way we own vehicles, tackle road safety, and invest in transport systems what is already foreseeable that we can plan for?
- Climate change impacts: What does recent research tell us about the stress on, and potential for, irreversible change in the Antarctic and other vulnerable natural systems of importance to New Zealand?
- Changing our urban form: New Zealanders predominantly live in urban spaces which have changed little in form over many decades what are emerging forms of urban environments, how could they change the way New Zealanders choose to live, and how could they alter the demand for public services?
- New genetic technologies: What are the benefits and uncertainties of new gene technologies in areas such as human health and pest management?
- Transformative science in agriculture: The cupboard of new plants, animal breeding and on-farm technologies is not bare

   what are recent transformational science advances that are likely to further develop our rural sector?
- How high tech science leads to new industries: New Zealand's technology sector exports over \$10m of products annually

   how might new high technology companies be spawned through development of intellectual capital in our research sector?
- A mine of information: Science and information technology has vastly increased the amount of information that is known about an individual. There is the potential to use such information in a positive way, but there are also risks of misuse. How can these important ethical issues be managed when the artificial intelligence to interrogate such data is growing rapidly?

"The genetically modified ryegrass we have been testing in field trials in the Midwest United States has high metabolisable energy so it can grow 50% more quickly than conventional ryegrass, is more drought-resistant and cows that eat it produce up to 23% less methane."

DR RICHARD SCOTT, AGRESEARCH WHO PRESENTED AT THE SESSION ON TRANSFORMATIVE SCIENCE FOR AGRICULTURE.



LEARN MORE ABOUT SPEAKER'S SCIENCE FORUM



#### TOHATOHA

SHARE



FOOD INNOVATION CHALLENGE

IN 2018 64 SECONDARY STUDENTS
AND THEIR TEACHERS FROM
CANTERBURY TO AUCKLAND
PARTICIPATED IN THE NZIFST/
CREST STUDENT PRODUCT
DEVELOPMENT CHALLENGE

The Challenge requires teams of Year 11-13 students to develop a new food product for an industry client, following the process defined in the Team Silver CREST awards, which is similar to the product development process used by the food industry. Participating teachers also receive professional development from staff of the Massey Institute of Food Science and Technology at Massey University.

The Challenge continues to be an invaluable way of implementing food science and technology, as practised by the food industry, into secondary schools. This has led to many students choosing food science and technology as a career to pursue.

"The Challenge gave me a good idea about what the industry would be like and has given me an upper hand with the product development projects at university, as I have more experience than the others.

What I like about food technology is that you get to look at all that goes behind the making of everyday food products and it makes you realise how much work and effort is required for this industry. It also allows you to let out your creative side. People think that food technology is all about just making food and being a chef, but it's not. Food technology is about all the technological aspects that go into making food products, whether it be the chemical composition of a new flavour, or calculating the energy flow of a production system. In food technology there is a lot of chemistry, physics and calculus, so you will need to have these requirements before you start, and the work load isn't easy, but it is worthwhile."

EAMONN JACK, WHO IS STUDYING FOOD TECHNOLOGY AT MASSEY UNIVERSITY. HE DID THE CHALLENGE IN 2016 WHILE A STUDENT AT WESTLAKE BOYS HIGH SCHOOL.



### OUR FINANCIALS



IN THE YEAR TO 30 JUNE 2018 THE ROYAL SOCIETY OF NEW ZEALAND GROUP, COMBINING ROYAL SOCIETY TE APĀRANGI AND ITS ASSOCIATED ENDOWMENT TRUST FUND, GENERATED A SURPLUS OF \$0.364M (EXCLUDING NET GAINS ON LAND AND BUILDINGS). TOTAL REVENUE GREW BY 3.3% TO \$7.997M AND \$2.5M WAS TRANSFERRED FROM THE SOCIETY TO ITS ENDOWMENT TRUST FUND.

The total assets of the group increased by around \$1.0m during the year to a value of \$19.810m at year end. Our appointed auditors changed to Grant Thornton during 2018.

We remain reliant on our professional services provision to government for about three quarters of our income. Royal Society Te Apārangi managed seven contestable funds on behalf of the Government during the year, with around \$86m being paid out in the twelve months to 30 June 2018. The physical land and buildings on our Turnbull Street site were revalued at year-end and increased in value by \$0.679m to a net value of \$11.7m at 30 June 2018.

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### NEW PRESIDENT OF THE SOCIETY

ON 1 JULY 2018, PROFESSOR WENDY LARNER FRSNZ FACSS FNZGS BEGAN HER TERM AS PRESIDENT OF THE SOCIETY, ONLY THE SECOND WOMAN AND THIRD SOCIAL SCIENTIST TO DO SO. Professor Larner is an internationally respected social scientist whose rangahau research sits in the interdisciplinary fields of globalisation, governance and gender. In June she was awarded the prestigious Victoria Medal from the UK's Royal Geographical Society for her internationally leading research on globalisation and political economy.

She joined Victoria University of Wellington as Provost in 2015 from the University of Bristol. She is continuing in her role as Provost while serving as Royal Society Te Apārangi President.

"The issues I want to focus on during my term at the Society are among the same issues I am grappling with in my day job at the university, so the two roles are complementary. These issues include supporting mātauranga Māori and Māori researchers, and how to better support equity and diversity in all its forms.

I am interested in the opportunities offered by the disciplinary span of Royal Society Te Apārangi, and how we might build on work already underway to ensure that the organisation is more welcoming of all researchers.

I am also particularly interested in how we better support early and mid-career researchers, because they're our future – if we don't get things right for them, our research landscape won't be the research landscape we need in the future."

PROFESSOR WENDY LARNER FRSNZ FACSS FNZGS, ROYAL SOCIETY TE APĀRANGI PRESIDENT



# **TOHATOHA**SHARE

# SIX WOMEN ELECTED COMPANIONS

SIX WOMEN WHO HAVE WORKED
TIRELESSLY IN THE AREAS OF
DEMENTIA RESEARCH, NUTRITION,
NEW ZEALAND HISTORY, SOCIAL
SCIENCE, SCIENCE EDUCATION AND
SCIENCE COMMUNICATION WERE
ELECTED COMPANIONS BY ROYAL
SOCIETY TE APĀRANGI IN JULY 2018.

The Society's Council is pleased to be able to recognise the significant impact and the sustained efforts each has made in their respective areas. While it is coincidental that we have elected all females in the year that New Zealand celebrates 125 years of women's suffrage, it's a fitting opportunity to reflect on the important contributions women have made and continue to make in many areas of our lives."

PROFESSOR WENDY LARNER FRSNZ FACSS FNZGS, ROYAL SOCIETY TE APĀRANGI PRESIDENT



Election as a Companion is an honour recognising outstanding leadership or sustained contributions to promoting and advancing pūtaiao science, hangarau technology and aronui humanities in Aotearoa. The honour is reserved for those who have made a contribution to society far above and beyond what might be expected of them from the roles they have held. Companions can use the postnominal 'CRSNZ' after their name to indicate this honour.

**Wendy Fleming** is recognised for her outstanding contributions to the promotion of dementia research in New Zealand, which is now giving hope to people with dementia.



Dame Claudia Orange, Te Papa Tongarewa, is recognised for her work to improve public awareness, knowledge and understanding of the Treaty of Waitangi, of New Zealand biography, and of the role of museums in telling 'our nation's story'.

**Associate Professor Robin Peace**, Massey University Wellington Campus, is recognised for building a strong network for social science and evaluating social policy.

Jennifer Pollock is recognised for her exceptional leadership, both locally and nationally, in science education. Through her work, New Zealand's science curriculum was broadened to include ocean and atmospheric learning, allowing important issues such as climate change to be included.

Associate Professor Rebecca Priestley, Victoria University of Wellington, is recognised for her work over more than 25 years to promote and communicate science issues to the New Zealand public through her writing and work as a teacher and academic of science communication and the history of science.















# STRONG UPTAKE OF NZ ORCID HUB



ORCID is a global organisation that provides researchers with a unique digital identifier, which they link with their chosen professional activities. They can also permit other organisations, such as their employer, funders or publishers, to write information to their record. The Society is the lead agency of the New Zealand ORCID Consortium, which has the role of supporting the adoption of ORCID by research organisations and funders in New Zealand. The Society and technology partner University of Auckland, launched the NZ ORCID hub in mid 2017. The hub is an easy-to-use web application that allows all New Zealand research organisations to request permission from their researchers to read from and write to their ORCID records without technical knowledge.

Many New Zealand research organisations have started using the NZ ORCID Hub, and this has meant that the number of researchers having information written to their ORCID records by their employing organisation or funder has risen dramatically over the past year. Having third party sources of information in ORCID records implies a higher level of trust in the record, allowing reuse by other systems. Instead of entering the same information multiple times into different systems, a researcher can simply provide their ORCID iD, saving them administration time.

"Using ORCID will allow people to spend more time researching and contributing, rather than filling in forms."

NEW ZEALAND ORCID ADVISORY COMMITTEE



# STUDENT CREATES DOLL WITH PROSTHETIC HAND

T Ū H U R A E X P L O R E Selwyn House Girls' School Year 7 student Evelyn King from Christchurch was awarded a First CREST in July for her project to create a robotic prosthetic hand for a doll. The project was part of the school's CREST innovation programme in which students are asked to come up with an invention and create a prototype. CREST is a Royal Society Te Apārangi programme designed to encourage students to be innovative, creative, and to problem solve in science, technology and environmental studies. Evelyn's doll hand makes use of 3D printing and coding so that the prosthetic hand can move.

"There was a lack of diversity among modern dolls in shops. You don't really see a doll with a disability. I decided there were unmet needs for the wellbeing of children amputees, as they don't have the opportunity to have dolls that look like them."

**EVELYN KINC** 



WATCH VIDEO ON EVELYN'S KING'S PROSTHETIC DOLL HAND.

# WHIZZ BANG SCIENCE FOR THE JULY SCHOOL HOLIDAYS

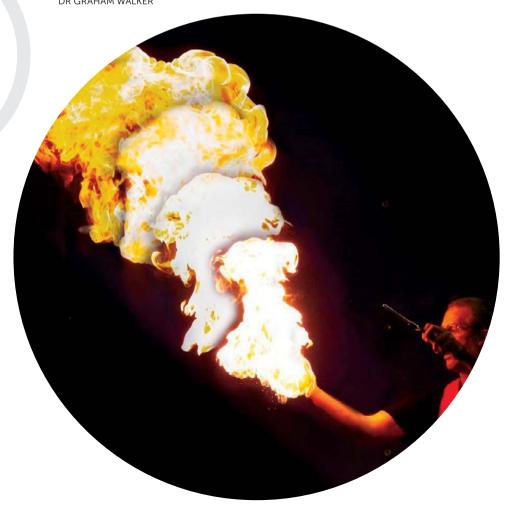
Dr Graham Walker once again travelled over from Australia during the July school holidays to perform an entertaining and informative science show aimed at primary-aged students and their whānau families. Based at the Australian National Centre for the Public Awareness of Science at Australian National University (ANU) in Canberra, Graham is a veteran of making science engaging for younger audiences. In 2018 shows were held in Ruatoria, Gisborne, Wairoa and Lower Hutt, organised by Royal Society Te Apārangi in partnership with the Raye Freedman Trust. The Lower Hutt show sold out so quickly that a further two shows were organised. In total nearly 3,000 students and family members attended. The korero talk lived up to its 'Whizz Bang Science' billing, with some pretty 'big bangs' using liquid nitrogen. It was both fun and educational with one parent commenting in the feedback survey that "it was fantastic learning about forces and kinetic energy".

"Science shows can make people more excited about science, encourage them to keep studying it, or even behave in ways that science argues are good choices, like with tackling climate change."

DR GRAHAM WALKER

**TOHATOHA**SHARE

Photo: Eyre's Eyes







# FAREWELL EVENT AND PORTRAIT UNVEILING FOR PAST PRESIDENT

TOROHĒ DISCOVER A hui gathering was held at Te Whare Apārangi in Wellington in late July to celebrate Emeritus Professor Richard Bedford's (FRSNZ) achievements and contributions during his three-year term as President of the Society and to unveil his presidential portrait, painted by Marianne Muggeridge. Speakers commented on his clear and far-sighted leadership as the Society turned 150 years old, using the milestone as an opportunity to set a new agenda of change and diversity.

"Just our second social scientist – a population geographer – Dick has put a strong platform in place for the revitalisation that I will have the privilege of helping realise. In addition to leading the changes that will help make Te Apārangi more relevant for Māori and women, he has created space for engagement with the wider research community including the CRIs, independent research communities, the three wānanga, and the innovation communities. In short, his was a tenure of ambitious transformational change."

PROFESSOR WENDY LARNER FRSNZ FACSS FNZGS, ROYAL SOCIETY TE APĀRANGI PRESIDENT



# SUPERVOLCANOES - A SUPER TOUR

"Volcanic systems are difficult to predict. The term 'prediction' implies that volcanoes have a pattern of behaviour that is uniform. Contrary to this, many volcanoes show behaviour that is better described as chaotic, and not amenable to prediction. There are good reasons for supposing, however, that volcano forecasting may become feasible for many more volcanoes in the future but, as with the weather, forecasts can only be made on good information and even then can be wrong. Volcanoes have so many factors that control their behaviour that simple prediction is not likely for most future eruptions."

PROFESSOR COLIN WILSON FRS FRSNZ

2017 Rutherford Medallist Professor Colin Wilson FRS FRSNZ began a 22-location 'super tour' in July 2018, speaking in centres from Invercargill to Kaitaia, on his area of expertise: supervolcanoes. He explained that it's the amount of material a volcano emits that makes it a supervolcano and Colin has worked on many of the world's supervolcanoes, including Taupō in Aotearoa, and Long Valley and Yellowstone in the USA. He has developed and applied field and laboratory analysis techniques to map out the volcanic processes from slumber to massive eruption. His rangahau research has helped us understand how, where and when molten rock gathers below volcanoes and the processes that operate during explosive eruptions. His mahi work links events that happen over many thousands of years with those operating during some of the largest and most destructive eruptions known in New Zealand and globally.



WATCH VIDEO:
THE LIFE AND TIMES OF SUPERVOLCANOES

#### HŌTOKE | WINTER



# SCIENCE MEDIA CENTRE CELEBRATES 10 YEARS

IN 2008 A MISSION TO IMPROVE
THE DEPTH, BREADTH AND QUALITY
OF SCIENCE COVERAGE IN THE
NEW ZEALAND MEDIA WAS LAUNCHED
WITH A SMALL TEAM IN A BACK ROOM
OF ROYAL SOCIETY TE APĀRANGI.
TEN YEARS ON, IT WAS TIME TO
CELEBRATE WHAT HAD BEEN ACHIEVED
WITH A SPECIAL FUNCTION FOR
JOURNALISTS, SCIENTISTS, SCIENCE
COMMUNICATORS, SMC ADVISORY
BOARD MEMBERS AND FORMER STAFF.

As well as connecting journalists with experts, the centre has run 'Science Media SAVVY' courses for scientists to give them the confidence to talk with the media. There have been some important topics tackled over the decade including climate change, Christchurch and Kaikōura earthquakes, Pike River mine disaster, swine flu pandemic, Zika virus, antibiotic resistance, gene editing, Havelock North campylobacter outbreak and much more.



#### **MEDIA PERSPECTIVES**

"When there's been a complete information vacuum over a controversial subject, they've been the ones who have been going around finding someone to front the media."

JAMIE MORTON, NZ HERALD

"I use them all the time. If I'm working on a big story, could be abortion, vaccination, I get in touch with them and say 'what's the buzz, what's the latest research, who should I talk to?""

JOANNA WANE, NORTH & SOUTH

"I think we are seeing more science stories published and we are talking, more often, to more scientists and getting a better range of perspectives."

PATRICK CREWDSON, STUFF

"So rather than just googling the last person that was quoted on a topic, they'll send you the four or five top people in that field and you can really drill down with them."

ELOISE GIBSON, NEWSROOM

#### SCIENTIST PERSPECTIVES

"I love working with the Science Media Centre. I feel part of a collective of scientists who want to be generous with the truth and get the message out there."

DR MICHAEL BAKER, UNIVERSITY OF OTAGO

"We used to see a lot of articles where you'd pit one person against another and where it would be very difficult to find experts to talk on the subject and now it's been made really super easy."

DR HELEN PETOUSIS-HARRIS, UNIVERSITY OF AUCKLAND

"I learned everything I know about working with journalists and talking to the media from the Science Media Centre."

DR SHAUN HENDY FRSNZ, UNIVERSITY OF AUCKLAND

"I think the landscape is vastly different. There were very few scientists who had a really good ability to communicate and with all the SAVVY courses they have been running it has changed."

DR SIOUXSIE WILES, UNIVERSITY OF AUCKLAND





# COMMUNITY INITIATIVE TO CONTROL CATFISH

#### TŪHURA

EXPLORE

David Bach, a primary school teacher from St Mary's School in Rotorua, joined the Science Teaching Leadership Programme in 2018 and is now contributing to a large community initiative to manage pest catfish in the Rotorua lakes. Catfish are swiftly becoming a scourge within Aotearoa's freshwater systems as they threaten to overwhelm native species such as koura (freshwater crayfish) and are preying on fish eggs, small fish and juvenile trout. For the first phase of the programme, David was hosted by Te Arawa Lakes Trust, which manages 14 Rotorua lake beds on behalf of the iwi. The Trust is working closely with the Bay of Plenty Regional Council on trapping and tracking fish, while researchers at the University of Waikato and NIWA are seeking to develop improved methods.

The Science Teaching Leadership Programme's leadership course and the mātauranga Māori and science experience he gained while at the Trust have given David the tools to begin planning citizen science projects with his students at St Mary's that will help them contribute to the community initiative to control catfish. Furthermore, local teacher Andrew Doyle from Rotorua's Lynmore Primary has joined the Science Teaching Leadership Programme. He will also be hosted by Te Arawa Lakes Trust and plans to build on David's work to mitigate the catfish pest problem through engaging his wider school community with the issue. Working with the Trust highlights the programme's continuing commitment to work alongside indigenous community organisations to ensure teachers and schools experience science from the perspective of tangata whenua.

"A culture change is required from everyday lake users to help stop the spread of catfish to other areas."

DAVID BACH



READ ARTICLE: CATFISH: A DECEPTIVELY SERIOUS THREAT TO NZ WATERWAYS.

# NATIONAL RESEARCH CHARTER FOR AOTEAROA BEING DEVELOPED



In mid 2018 the major research funding agencies, bodies representing different types of research organisations and Royal Society Te Apārangi agreed to co-sponsor the development of a National Research Charter. The charter will set out the principles underpinning sound rangahau research practice in the context of Aotearoa New Zealand and then interpret those principles into non-prescriptive statements of expectation on individual researchers, research organisations and public research funding agencies. The charter would be benchmarked to contemporary international good practice and include elements specific to the context of Aotearoa New Zealand.

"The aim of the charter is to provide clarity to all researchers and research organisations on expectations for sound research practice. It also seeks to foster a culture of collective responsibility for maintaining good research practice, to set out what sufficient compliance looks like and also to support cohesive research teams working across many research organisations. The charter will also provide clarity for international collaborators on the expectations on them when they are working on New Zealand-based research. It will help provide the public with confidence in the research community by setting out the wider communities' expectations for competence, balance and soundness from researchers."

DR JOHN HAY, INDEPENDENT CHAIR OF NATIONAL RESEARCH CHARTER WORKING GROUP



# THE FUTURE NEEDS SCIENTISTS

IN JULY WE HELD A SPECIAL PANEL
KÕRERO DISCUSSION WITH LEADING
SCIENCE EDUCATORS IN PARTNERSHIP
WITH THE AUSTRALIAN HIGH
COMMISSION AND NEW ZEALAND'S
PRIME MINISTER'S SCIENCE PRIZES.



TŪHURA EXPLORE Joining Jenn Corbitt from Te Apārangi's Science Teaching Leadership Programme were three teachers: Sarah Johns from Nelson College for Girls, Terry Fenn from Onslow College, both of whom have won New Zealand's Prime Minister's Science Educator Award, and Dr Ken Silburn from Casula High in Sydney, who has won the Australian Prime Minister's Prize for Excellence in Science Teaching in Secondary Schools. They offered their insights and approaches on teaching science in a time when technological advances are at pace. They also discussed how teaching practice can enthuse students and ready them with scientific skills and knowledge.

"When I first started as a teacher, I was focused on how I could get students to pick science as they moved into the senior school, and that was the measure of how successful I was as an educator. But now my focus is very much on how can I create conditions or experiences where students connect to their learning emotionally, academically and cognitively so they are actually relishing their role in it. Then from there, regardless of where their pathway takes them, they come out as very capable thinkers and learners. That's how science education has evolved for me."

SARAH JOHNS



WATCH VIDEO: THE FUTURE NEEDS SCIENTISTS



# DRAWING DINOSAURS

Dr Julius Csotonyi is a Canadian full time freelance scientific illustrator who specialises in paleoart on prehistoric species and ecosystems. His reconstruction illustrations are based on paleontological evidence and inference. He works closely with scientific researchers, book publishing companies, museum exhibit design teams and curators to prepare scientific illustrations. The resulting illustrations are then available for educational outreach to the public in museum exhibits, books, and even postal stamps and coins.

He gave a talk for Royal Society Te Apārangi in August 2018.

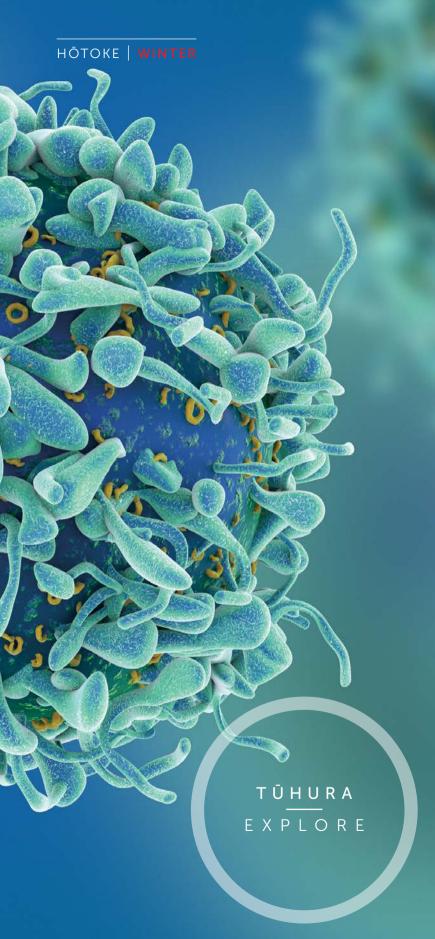
"I would like to paint you a picture of what excites me about how paleoart relates to science. It seems straightforward that paleoartists would require the work of scientists to guide their work, to make it as scientifically accurate as possible, but it's also increasingly true these days that palaeontologists benefit from the use of paleoart, carefully done paleoart, to help to promote their science to the public."

DR JULIUS CSOTONYI



WATCH VIDEO: PALEOART – WHEN ART AND SCIENCE BENEFIT EACH OTHER





# DEVELOPING NOVEL CANCER IMMUNOTHERAPIES

Immunotherapy is a type of cancer treatment that boosts the body's natural defences to fight cancer. On behalf of the government, the Society awarded a Catalyst: Leaders grant to facilitate researchers at the Malaghan Institute of Medical Research to work with China's Professor Peng Li and his team from Guangzhou Institutes of Biomedicine and Health on cutting-edge cancer immunotherapy. Professor Li's team has developed CAR-T treatments that re-engineer a patient's own immune cells to fight cancer. This therapy requires the CAR-T treatment to be manufactured for each patient and Professor Li has been assisting staff at the Malaghan Institute to optimise the New Zealand production methods in their custom manufacturing facility so that clinical trials can be carried out in New Zealand.

"In the short term this collaboration will provide access to a cutting-edge treatment for New Zealand patients which they would not otherwise be able to access. We hope this will be the first of a series of clinical trials of new CAR T-cell therapies."

PROFESSOR IAN HERMANS, NZ PRINCIPAL INVESTIGATOR, MALAGHAN INSTITUTE OF MEDICAL RESEARCH



VIEW MORE ON CATALYST: LEADERS



# SPECIAL JOURNAL ISSUE ON OUR ALPINE FAULT

IN SEPTEMBER 2018 WE PUBLISHED A SPECIAL ISSUE OF THE NEW ZEALAND JOURNAL OF GEOLOGY AND GEOPHYSICS TO MARK THE 300TH ANNIVERSARY OF THE 1717 GREAT ALPINE FAULT EARTHQUAKE.

TOROHĒ DISCOVER The magnitude of the earthquake is estimated as  $8.1\pm0.1\,\mathrm{Mw}$  from evidence of the ground breaking along 380 kilometres of the South Island of New Zealand. The special issue was planned to be published in 2017 but the November 2016 7.8 Mw Kaikōura earthquake at a different place on the same boundary caused a delay to its publication. The volume has the broader theme of the advances in science and understanding hazards of the Alpine Fault, which is of global importance for the study of active plate boundary faults. It contains many novel and high impact research papers and has received considerable national and international attention from the research community and the media.

"There are not many centuries-old earthquakes that stimulate publication of a special issue but the great Alpine Fault earthquake of 1717 AD is one of them. It is an earthquake with might, intrigue, insights, and a certain motivational effect... The intrigue of this earthquake arises from the gradual unveiling of multiple lines of research that have come together to consolidate our understanding of what took place in 1717 AD. Although Aotearoa New Zealand had been settled by Māori for about half a millennium when the earthquake occurred, oral histories of the event are rare. The story is told instead by trees, sediments, and the landscape of the South Island's West Coast."

GUEST EDITORS: PHAEDRA UPTON, URSULA COCHRAN, CAROLINE ORCHISTON, JAMIE HOWARTH. JARG PETTINGA AND JOHN TOWNEND.



# 125 YEARS: ARE WE THERE YET?



To commemorate 125 years of women's suffrage, alongside the National Library of New Zealand, we supported WORD Christchurch to present a panel discussion of how far we have come since women were granted the vote, and how far we still have to go in the fight for gender equality.

The participants were pioneering human rights activist Georgina Beyer, historian Dame Anne Salmond FRSNZ, musician and writer Lizzie Marvelly, head of Aotahi, the School of Māori and Indigenous Studies at the University of Canterbury, Sacha McMeeking, and Paula Penfold, consulting journalist on Stuff's #metooNZ investigation.

This discussion was chaired by Kim Hill CRSNZ.

"Feminism is like housework. Every couple of years you have to do it again."

KIM HILL CRSNZ





Image: NIWA

# EXPLORING THE SEA FLOOR WITH SOUND



A Catalyst: Seeding project to develop protocols and methodologies to identify and quantify features such as gas, oil, and freshwater in the ocean using marine acoustic technology wrapped up in September 2018. The project set up a multidisciplinary research consortium with internationally recognised experts in marine acoustics and geophysics, spatial analysis and environment and held a workshop. Members were from New Zealand (NIWA, University of Auckland), France (CNRS-Géosciences Rennes, IFREMER), Australia (Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Tasmania – IMAS-UTAS), USA (University of New Hampshire, Centre for Coastal and Ocean Mapping – UNH-CCOM), Germany (GEOMAR), and Belgium (FPS Economy).

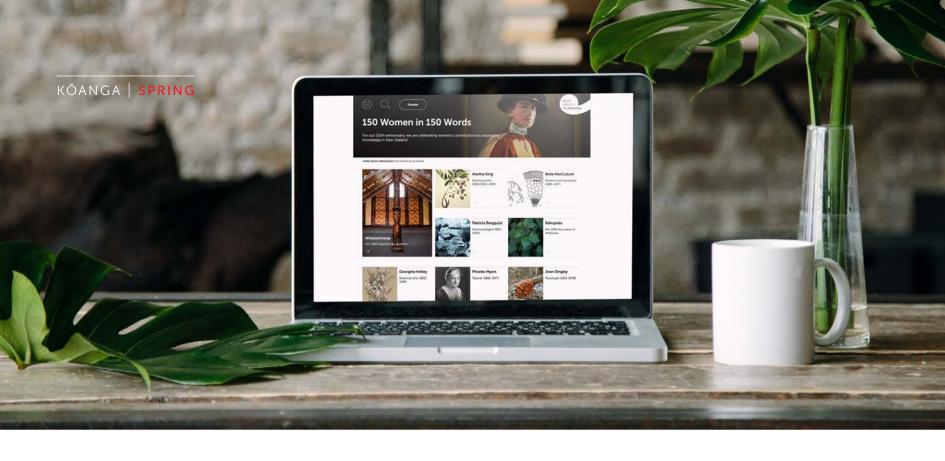
The highlight of the project was a geophysical survey of a hydrothermal vent field in the Bay of Plenty close to Whakaari White Island volcano. Twenty participants from eight organisations contributed by bringing specific expertise and equipment on board the New Zealand Research Vessel (R.V.) Tangaroa. The voyage collected acoustic data and video recording of gas bubble and liquid seepages at the seafloor as well as sediment and water samples. It demonstrated that marine acoustic technology holds promise as a method for New Zealand to gain valuable information about resources (fish, minerals, hydrocarbons) in our Exclusive Economic Zone.

"The survey proved exceptionally successful and demonstrated the potential to differentiate methane and CO2 bubbles in the water column. A result thought impossible up until now."

GEOFFROY LAMARCHE, NZ PRINCIPAL INVESTIGATOR, NIWA









# 150 WOMEN IN 150 WORDS

In 2018 we continued our online series to celebrate women's contributions to expanding knowledge in New Zealand, restarting on 19 September, 125 years from when New Zealand women won the right to vote. The 150 Women in 150 Words series covers wāhine women contributing knowledge from when Māori first came to Aotearoa through to women contributing knowledge today. The profiles were shared on social media and we have received a lot of positive feedback that people have enjoyed learning about these outstanding women.



### TOHATOHA

SHARE

# TREATING WORMY LAMBS AND FINGERREADER WINNING VIDEO TOPICS

For this year's 180 Seconds of Discovery video competition, organised by the Society's Early Career Researchers Forum, New Zealand-based postgraduates and early career researchers were invited to share their rangahau research in a 3-minute video. The submitted videos received over 20,000 views from around the world and 1,326 votes. The Future Leader Award with a \$3,000 prize went to Seer Ikurior for his video on his research to more easily identify lambs with parasites. The People's Choice Award with a prize of \$1,000 went to Suranga Nanayakkara with his video 'FingerReader: Enabling People with Visual Impairments to Access Information on the Go'.



"Parasitism is a major animal health challenge for grazing lambs, as well as being an important source of economic loss to livestock producers. Animals suffering from parasitism typically display a voluntary reduction in feed intake and altered grazing behaviour. These changes are potentially important as indicators of disease. My research is exploring the diagnostic value of these behavioural changes recorded by GPS and accelerometer sensors. The aim is to facilitate earlier detection of parasitism and target treatment to individual animals who need treatment."

SEER IKURIOR



VIEW VIDEO: WORMY LAMBS: USING SENSING TECHNOLOGIES TO MAKE TARGETED TREATMENTS

"People with visual impairments face numerous difficulties with existing state-of-the-art technologies including problems with accuracy, mobility, efficiency, cost, and, more importantly, social exclusion. The design of FingerReader addresses these challenges as it allows users to simply point at objects to perform a recognition and interpretation task on what the FingerReader sees. They then hear the result spoken to him or her through a bone conduction headset. We believe FingerReader will make a significant impact on how the visually impaired community can independently access information on the go."

SURANGA NANAYAKKARA



VIEW VIDEO: FINGERREADER: ENABLING PEOPLE WITH VISUAL IMPAIRMENTS TO ACCESS INFORMATION ON THE GO.

## **TŪHURA** EXPLORE

# GENE EDITING FOR THE PRIMARY INDUSTRIES



During 2018 we continued our major expert advice project to explore the ethical, social, legal, regulatory, environmental and economic implications of gene editing for Aotearoa. Following the release of papers exploring the use of gene editing in healthcare and for pest control in 2017, in October we released a discussion paper on the potential future use of gene editing in New Zealand's primary industries. We held workshops in Hamilton, Napier, Wellington and Dunedin for people to share their thoughts with the expert panel and reference group members.

The paper explored five scenarios of potential use:

- To reduce environmental impact (reduce wilding pines).
- To respond to insect pests and environmental stress (improve forage grass).
- To speed up innovation (develop new apple varieties faster).
- To protect taonga species used in the primary industries (protect Mānuka from disease).
- To provide new human health benefits (remove potential allergens from milk).

Each scenario highlighted agricultural, ethical/social and legal considerations as well as risks and potential benefits.

"Myrtle rust and kauri dieback disease have got people thinking about what we can or should do to conserve our native taonga species."

IRENE KEREAMA-ROYAL, GENE EDITING EXPERT PANEL MEMBER



READ REPORT GENE EDITING FOR THE PRIMARY INDUSTRIES



# ACCELERATING RESEARCH CAREERS WITH RUTHERFORD DISCOVERY FELLOWSHIPS

EACH YEAR ON BEHALF OF THE GOVERNMENT WE AWARD RUTHERFORD DISCOVERY FELLOWSHIPS TO 10 LEADING EARLY-TO MID-CAREER RESEARCHERS, SUPPORTING THEM TO ACCELERATE THEIR RESEARCH CAREERS IN NEW ZEALAND.

In 2018 the awarded Fellows' research spanned a wide variety of interesting questions such as how best to manage whale stranding by determining factors that influence animal stress and survival, understanding potential longer-term social impacts of traumatic brain injuries, exploring how to support refugee integration in Aotearoa, and the development of minimally-invasive methods to detect gastrointestinal disorders.

### 2018 RUTHERFORD DISCOVERY FELLOWS

**Dr Timothy Angeli**, University of Auckland, for research entitled: Electrophysiologically-based diagnostics and therapeutics for gastrointestinal disorders: bridging the gap from engineering benchtop to clinical bedside.

**Dr Sarah Diermeier**, University of Otago, for research entitled: Long non-coding RNAs as new drivers of tumour progression.

**Dr Ceridwen Fraser**, University of Otago, for research entitled: The race for new space: disentangling the processes that shape global patterns of biodiversity.

**Associate Professor Jay Marlowe**, University of Auckland, for research entitled: Dislocation in an age of connection: mapping refugee settlement trajectories within an increasingly mobile world.

**Dr Jonathan Squire**, University of Otago, for research entitled: Cosmic turbulence, microinstabilities, and the magnetisation of the universe.

**Dr Karen Stockin**, Massey University, for research entitled: The application of artificial intelligence (AI), innovative technologies and evolutionary theory to address the conservation-welfare nexus during human-wildlife interactions.

**Dr Lisa Te Morenga**, Victoria University of Wellington, for research entitled: Naku te rourou, nau te rourou, ka oranga ai te iwi (With my food basket and your food basket the people will be well).

**Associate Professor Alice Theadom**, Auckland University of Technology, for research entitled: Developing a biopsychosocial model of mild traumatic brain injury.

**Dr Jonathan Tonkin**, University of Canterbury, for research entitled: Rethinking ecological networks in changing environments.

**Dr Krushil Watene**, Massey University, for research entitled: Intergenerational justice: obligations and decision-making.



KŌANGA | SPRINC

# HUMAN LONGEVITY: MYTHS AND POSSIBILITIES

British gerontologist Professor Sarah Harper, founder of the Oxford Institute of Population Ageing, gave a talk in October, presented by Royal Society Te Apārangi in partnership with Ryman Healthcare. She argued that, with death pushed back across the life course so that most people in high income countries can expect to reach age 80 and over, our societies and communities need to rethink our lives and the institutions which frame them. She also explored how we are attaining such long lives, whether they will be healthy or frail and if there is a maximum age a human can live to.

'We live in societies where we have always had regular generational succession. We are used to inheriting assets and wealth and status from our parents in a regular way. What happens when we don't inherit from our parents until we are in our 80s or what happens if we don't inherit from our grandparents until we are in our eighties? What happens to the world of work, when we are all in work in our sixties, seventies and eighties. What happens to younger generations? I think that generational succession is going to be a pressing concern going forward."

PROFESSOR SARAH HARPER



WATCH VIDEO: HUMAN LONGEVITY: MYTHS AND POSSIBILITIES

T O H A T O H A
S H A R E



# CELEBRATING A COLLECTION OF 150 MĀORI NON-FICTION BOOKS AND AUTHORS



Together with Ngā Pae o te Māramatanga, we launched the Te Takarangi project to celebrate Māori scholarship in Aotearoa. The project marked Ngā Pae's 15th anniversary as New Zealand's Māori Centre of Research Excellence and Royal Society Te Apārangi's 150th anniversary.

From mid-February 2018, a pukapuka book from the sample list of 150 non-fiction books was profiled online and on social media daily with the final entry shared during Te Wiki o te Reo Māori 2018. The list of 150 books was curated by Co-Director of Ngā Pae o te Māramatanga Professor Jacinta Ruru FRSNZ (Ngāti Raukawa, Ngāti Ranginui), Jeanette Wikaira (Ngāti Pukenga, Ngāti Tamaterā, Ngāpuhi) and Associate Professor Angela Wanhalla (Ngāi Tahu).

An event was held in mid-October at Parliament to celebrate the collection and to provide an opportunity for project partners and authors to come together. A beautiful taonga display to house the cover images of the books in the collection was created by artist Len Hetet and was debuted at the event. This display piece will travel around the country to different locations to continue the work of the project to encourage wide reading of the books in the collection and other books by Māori writers and scholars.

"This is a powerful opportunity to celebrate together with Te Apārangi the long history of Māori scholarship that exists in Aotearoa. The cumulative weight of the research these books embody is outstanding, representing an incredible collection of voices of Māori inspiration for this nation, talking to us from the past and charting a pathway forward into the future,"

TĀ SIR TĪPENE O'REGAN, NGĀ PAE O TE MĀRAMATANGA FORMER CHAIR





# 2018 RESEARCH HONOURS AOTEAROA



THE ACHIEVEMENTS OF NEW ZEALAND
RESEARCHERS, SCHOLARS AND INNOVATORS
WERE CELEBRATED IN MID-OCTOBER AT THE
2018 RESEARCH HONOURS AOTEAROA, HOSTED
BY ROYAL SOCIETY TE APĀRANGI.

Over 450 guests from the research and business community attended the event held at Te Papa in Wellington where the Society presented 21 awards, including the inaugural Te Puāwaitanga Award in recognition of an eminent and distinctive contribution to Te Ao Māori. The Health Research Council of New Zealand also presented three awards. A highlight of the evening was a stirring kõrero speech given by the Society's Patron, the Rt Honourable Dame Patsy Reddy, Governor-General of New Zealand.

"There can be few times in our history when we've been so indebted to the skill of our researchers and scientists – in both identifying our follies and in providing us options for the way forward.

As always, the goal is to promote wider understanding of that work, so more New Zealanders understand our past as well as our present-day challenges – and appreciate and value your contributions to the solutions.

If we consider one of the most pressing issues – climate change – it's clear that apathy, despair, denial and wilful ignorance are not going to deliver positive outcomes.

We need broad understanding and consensus about what sustainability looks like – and how we can live without causing further harm to the natural world – as well as how to mitigate the harm we've already inflicted on it.

That's where the mission of Royal Society Te Apārangi becomes so valuable, particularly the various ways that you seek to inform and influence the public, the private sector, and our decision-makers. If key influencers can be persuaded, so too can our communities.

If our citizens understand the implications of research findings, and what they can do on a personal and local level, they are empowered to make a positive difference."

RT HONOURABLE DAME PATSY REDDY, GOVERNOR-GENERAL OF NEW ZEALAND



VIEW VIDEO OF DAME PATSY'S SPEECH

### 2018 RESEARCH HONOURS AOTEAROA AWARDEES

### TOP HONOURS



The **Rutherford Medal**, presented for an exceptional contribution to New Zealand research, was awarded to Professor Rod Downey FRSNZ for his revolutionary research into mathematical logic and computer science. Based at Victoria University of Wellington, Professor

Downey is an internationally recognised logician known for his research into computability – how can mathematical processes be algorithmically implemented either in theory or practice – and the study of randomness.



Professor Linda Tuhiwai Smith CNZM FRSNZ received the inaugural <u>Te Puāwaitanga Award</u> in recognition of the eminent and distinctive contribution she has made to Te Ao Māori, and to Māori and Indigenous knowledge. Based at the University of Waikato and

of Ngāti Awa and Ngāti Porou descent, Professor Smith is a nationally and internationally recognised scholar. Her ground-breaking research in Indigenous methodologies and kaupapa Māori has contributed to the advancement of Māori research, education and society for nearly 40 years.

### **LEADERSHIP**



The <u>Thomson Medal</u> was awarded to Professor Emerita Carolyn Burns CBE FRSNZ, University of Otago, for her outstanding leadership and service to environmental science and conservation. In addition to achieving the very highest standards in her academic discipline

of lake and wetland ecology, she is recognised for bringing her scientific expertise to serve both the scientific and wider communities at the highest levels and has made a deep and lasting contribution to environmental science and conservation.

### COMMUNICATION



Dr Helen Taylor from the University of Otago was awarded the <u>Callaghan Medal</u> for her science communication around conservation genetics and threatened species. One of her highly successful initiatives has been 'The Great Hihi Sperm Race',

where people could place bets on which of the 128 birds had the fastest swimming sperm. This campaign raised more than \$11,000 for hihi conservation and drew supporters from 17 countries, spreading the message widely about potential fertility problems for inbred birds.

### PHYSICAL SCIENCES



Distinguished Professor Marston Conder FRSNZ was awarded the **Jones Medal** for his lifetime achievement and leadership in mathematics. Professor Conder, University of Auckland, is a world authority on the mathematics of symmetry and chirality in discrete

structures, especially those with maximum possible symmetry in their class. The award also recognises his instrumental role in developing and promoting New Zealand mathematics, which New Zealand-born Fields medallist Sir Vaughan Jones FRS Hon FRSNZ, for whom the medal is named, says has experienced a "renaissance".



Mathematical physicist Professor Matt Visser FRSNZ was awarded the **Hector Medal** for his research into both classical and quantum gravity, including work on black holes, cosmology and "analogue spacetimes". Based at the School of Mathematics and Statistics at

Victoria University of Wellington, Professor Visser's research addresses foundational issues in Einstein's general relativity and its interface with quantum physics.

### HUMANITIES AND SOCIAL SCIENCES



Historian Professor Barbara
Brookes MNZM was awarded the
Humanities Aronui Medal for
her outstanding contribution to
humanities scholarship. Professor
Brookes from the University of
Otago is an authority in the history
of women, medical history and

New Zealand history. She published her award-winning book *A History of New Zealand Women* in 2016.



Biological anthropologist Professor Lisa Matisoo-Smith FRSNZ was awarded the Mason Durie
Medal for her ground-breaking work that has, through strong relationships with New Zealand's Indigenous people, reshaped our understanding of the last great

human migration into the Pacific. A second focus of her work is to understand the health of ancestral New Zealanders and the biological bases for present-day health inequalities.



Dame Dr Claudia Orange DNZM
OBE CRSNZ was awarded the Pou
Aronui Award for her sustained
service to the humanitiesaronui. Pre-eminent Treaty of
Waitangi scholar, Dame Claudia
has dedicated much of her
distinguished career to, in her

words, "taking the Treaty to the people". She has also been a major force for the Dictionary of New Zealand Biography and is recognised for her leadership at Te Papa Tongarewa as head of collections and research.



Associate Professor Suzanne Pitama (Ngāti Kahungunu, Ngāti Whare) was awarded the Metge Medal for her influence on Indigenous health education.

Based at the University of Otago, Christchurch, she has made a considerable contribution to

inspiring and developing new research capacity and knowledge for health professional education to address critical Indigenous health inequities in Aotearoa. She has designed, developed and evaluated entirely new Māori health models applicable to clinical practice.

# TECHNOLOGY, APPLIED SCIENCE AND ENGINEERING



Distinguished Professor Geoff Chase FRSNZ was awarded the <u>MacDiarmid Medal</u> for physiological modelling of human metabolism used for 'in-silico' testing. These computer models have been used to treat intensive care patients in New Zealand

and overseas, and are being extended to treat type-2 diabetes in other patient groups. His models are estimated to have saved 350 lives and \$6-12M at Christchurch Hospital alone over 12 years and are bringing us much closer to the ideal of personalised medicine in an intensive care setting.



A research team from AgResearch led by Dr David Hume received the <u>Pickering Medal</u> for work to discover, patent and commercialise a new endophyte for ryegrass. The endophyte provides ryegrass with high levels of protection against insect pests while maintaining the

health and productivity of grazing animals, resulting in large gains in farming productivity. It has been estimated that the use of AR37 endophyte in New Zealand has a cumulative value to date of \$125 million and will have contributed NZ\$3.6 billion to the economy through the life of its patent.

### BIOLOGICAL AND MEDICAL SCIENCES



Dr Bruce Hayward MNZM FRSNZ was awarded the <u>Hutton Medal</u> for his outstanding contributions to the knowledge of New Zealand's marine ecology and geology. He is an internationally-eminent expert on living and fossil foraminifera, which are microscopic marine

amoeba that have tiny shells that are abundantly preserved in the fossil record. He has studied them to learn about past climate conditions, mass extinctions, sea levels and earthquakes. He has also published books for a general reader on geology and volcanoes.



Professor Brett Delahunt ONZM FRSNZ received the Hercus Medal for his research on prostate and kidney cancer. Professor Delahunt is an internationally-recognised pathologist from the University of Otago, Wellington. His scientific work and insight have been central

to the development of an internationally-accepted classification system of important prognostic markers for prostate and renal cancers.

### EARLY CAREER RESEARCHERS



Dr Arini Loader (Ngāti Raukawa, Ngāti Whakaue, Te Whānau-a-Apanui), Victoria University of Wellington, was awarded the inaugural <u>Te Kōpūnui Māori</u> <u>Research Award</u> for pushing the boundaries of Māori Studies by incorporating history, te reo Māori

and literary studies into her research. She has been unlocking the context behind historical texts written in te reo Māori and in doing so giving us a better understanding of 19th Century Māori society and our history. This new award is to recognise innovative Māori research by promising early career researchers.



Dr Mohi Rua (Ngai Tūhoe, Ngāti Awa and Ngāti Whakaue), University of Waikato, also received the inaugural **Te Kōpūnui Māori Research Award** for his innovative research on poverty, homelessness and Māori men's health which is challenging the relevance of

mainstream Anglo-American psychology for Māori and other indigenous peoples. His research on Māori men challenges pernicious stereotypes and has shown that they see themselves as being carers, nurturers and positive contributors to their communities.



Associate Professor Maren Wellenreuther, Plant & Food Research, was awarded the **Hamilton Award** for her research to develop snapper or trevally as aquaculture-ready species for the seafood sector. She has been using novel tracking and genome

methods to achieve this and she is also an advocate for using genome-based methods to preserve biological diversity in the oceans.



Ms Lettie Roach, a PhD student at NIWA/Victoria University of Wellington, was awarded the **Hatherton Award** for her scientific paper that outlines a new global model for sea ice floe sizes. This new model takes into account changing floe sizes, both on the

surface and the thickness of the floe. It has the potential to make significant improvements to the simulation of polar regions in global climate models.



Dr Jurij Volčič, previously based at University of Auckland but now at Texas A&M University, was also awarded the <u>Hatherton Award</u> for his paper that develops new foundational tools for the emerging mathematical field called free analysis. A branch of algebra, Jurij's

work on noncommutative rational functions has already been used to prove a 50-year-old conjecture in linear algebra and has opened up approaches to overcoming future challenges.



Dr Carwyn Jones (Ngāti Kahungunu), Victoria University of Wellington, received the <u>Early</u> <u>Career Research Excellence Award</u> for Humanities for his groundbreaking book New Treaty, New Tradition. It reveals new ways of using Indigenous knowledge to

understand how law shapes society. Each chapter begins with a dialogue between a Māori father and his son, which gives the reader a personal, living introduction to Māori legal traditions. Overall it demonstrates the continuity between Māori history and contemporary Māori life, and brings home the dynamic vitality of Māori legal traditions in Aotearoa today.



Associate Professor Holly Thorpe, University of Waikato, received the Early Career Research Excellence

Award for Social Sciences for her research on the sociology of sport that is redefining the use of sports for development and peace in conflict and disaster zones. She

is the first scholar to critically examine the growth of action sports programmes across the developed and developing world, including skateboarders in quake-damaged Christchurch and parkour participants in Gaza.

# RESEARCHERS RECOGNISED FOR SUSTAINED RESEARCH EXCELLENCE

WE AWARDED THREE ESTABLISHED RESEARCHERS PRESTIGIOUS JAMES COOK RESEARCH FELLOWSHIPS IN 2018, WHICH PROVIDE FUNDING FROM THE GOVERNMENT FOR THEM TO UNDERTAKE STUDY OR RESEARCH IN THEIR FIELD OF ENDEAVOUR FOR TWO YEARS.

# T Ū H U R A E X P L O R E

Professor Tony Merriman FRSNZ, University of Otago, will research the genetic causes of gout and related diseases in Aotearoa New Zealand. He will examine the genome of Māori and Pacific populations to gain understanding of the role that inherited genetic variations play for the risk of developing metabolic disease.

Associate Professor Renate Meyer, University of Auckland, will use complex statistical methods to separate gravitational-wave signals from background noise in astronomical observations. This will enable us to better observe and understand some of the most mysterious aspects of our universe, such as the coalescence of black holes, or collision of neutron stars.

Professor Stephen Wratten FRSNZ, Lincoln University, will address threats to bee populations and their pollination efficacy. He will examine the nutrients and chemistry of flower pollens consumed by bees, and use this information to develop science-based drinking water. His research can provide world-class management protocols to ensure our bee populations remain healthy and productive.









# HIGHLY PROMISING RESEARCHERS

# AWARDED FELLOWSHIPS AND SCHOLARSHIPS

OUR RUTHERFORD FOUNDATION
TRUST AWARDED FIVE POSTDOCTORAL
FELLOWSHIPS AND THREE PHD
SCHOLARSHIPS WITH FUNDING FROM
GOVERNMENT IN 2018.



### Two-year New Zealand Postdoctoral Fellowships:

**Dr Benjamin Albert**, University of Auckland, for research entitled: Omega-3 fats during overweight and obese pregnancy, for metabolic protection of the offspring.

**Dr Alana Alexander**, University of Otago, for research entitled: Hologenomics for conservation: a first test of utility.

**Dr Kendon Bell**, Manaaki Whenua Landcare Research, for research entitled: Empirical measurement of the impact of climate change: correcting for measurement error in precipitation and understanding the incidence of impacts.

**Dr Nicola Day**, Auckland University of Technology, for research entitled: Assessing and predicting ecosystem-level resilience and vulnerability to global change.

**Dr Bella Duncan**, Victoria University of Wellington, for research entitled: Antarctic climate and flora in a warmer world: a geological perspective using molecular fossils.

**Dr Rebecca Gladstone-Gallagher**, University of Auckland, for research entitled: Assessing the role of biodiversity in maintaining coastal ecosystem health in the Anthropocene.

**Dr Matthew Nitschke**, Victoria University of Wellington, for research entitled: Molecular cartography of coral-symbiotic algae in 3D.

**Dr Christina Painting**, University of Auckland, for research entitled: Understanding the interacting effects of precopulatory and postcopulatory selection on reproductive success using the New Zealand giraffe weevil.

**Dr Oliver Wigmore**, Victoria University of Wellington, for research entitled: Improving understanding of debris-covered glacier dynamics, Haupapa/Tasman Glacier, New Zealand.

**Dr Victoria (Holly) Winton**, Victoria University of Wellington, for research entitled: How did marine primary production in the Ross Sea change over the past 2000 years?

### Three-year Cambridge Rutherford Memorial PhD Scholarships:

Mr Rakesh Arul, University of Auckland, for research entitled: Bonds with light – Can quantum optics be used to control chemistry?

**Ms Rachael Baxter**, University of Otago for research entitled: Investigation of timescales and processes of basaltic magma during storage.

**Ms Georgia Nixon**, University of Auckland for research entitled: Classical complexity verification of quantum computations.



VIEW MORE ON RUTHERFORD FOUNDATION 2018 AWARDEES



# THIRD PLACE IN BERLIN FOR FALLING WALLS NEW ZEALAND LAB WINNER

AUCKLAND UNIVERSITY OF TECHNOLOGY'S ANKITA POUDYAL, WINNER OF THE 2018 FALLING WALLS LAB NEW ZEALAND, WON THIRD PLACE IN THE INTERNATIONAL FINALE EVENT HELD IN BERLIN ON 8 NOVEMBER WITH HER PRESENTATION 'BREAKING THE WALLS OF INEFFICIENT FILTERS'.



Ankita Poudyal talked about her rangahau research on nano-fibre filters that efficiently remove particles and enable good air flow with the help of surface coating technology. These two functions are mutually exclusive in conventional filters.

Falling Walls Lab is an international forum that promotes interdisciplinary connections between aspiring academics, innovators, entrepreneurs, investors and professionals. Presenters have just three minutes to share their ideas.

Originally from Nepal, Ankita was selected from 19 early career researchers competing from New Zealand and the Pacific who pitched their ideas at the inaugural New Zealand Falling Walls Lab held by Royal Society Te Apārangi in September. This event was supported by the German Embassy in Wellington, Royal Society Te Apārangi Early Career Researcher Forum and the German-New Zealand Chamber of Commerce.

In the Berlin finale, Ankita competed against 100 other young researcher and entrepreneur finalists from all over the world and additionally won an opportunity to pitch her project at the prestigious Falling Walls Conference.

"I met most of the other finalists the next day at the coaching session. I realised that I was not there just to prove myself but in fact to represent New Zealand, my institution – Auckland University of Technology – and my home country Nepal. I felt proud, happy, excited and nervous all at the same time. There were students from undergraduate level, PhD candidates like myself, postdocs, surgeons, entrepreneurs and experienced researchers, all competing together. Falling Walls had organised group activities and a reception dinner so that participants could get to know each other and by the end of that day we had become less like competitors, and more like friends."

ANKITA POUDYAL



VIEW MORE ON FALLING WALLS LAB

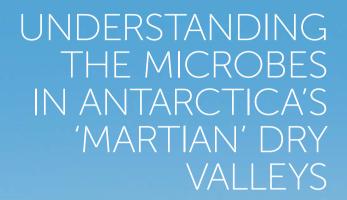
# MARSDEN FUND GRANTS SUPPORT INNOVATIVE RESEARCH IN AOTEAROA



The Marsden Fund allocated \$85.6 million (excluding GST) to 136 research projects across New Zealand in 2018. These grants support New Zealand's best investigator-initiated research in the areas of science, engineering, mathematics, social sciences and the humanities. Established researchers received 83 grants and early career researchers received 53 Fast-Start grants. This year's round saw the trend continue from previous years of increasing representation of women and Māori amongst the successful researchers.

"I was delighted to see strong engagement with mātauranga Māori in applications across a diverse range of disciplines. These ranged from a study of Māori responses to 20th Century welfare policies to the use of a waka-based craft to access and investigate remote volcanoes. These projects exemplify the thoughtful integration of Māori knowledge and methods with specific disciplinary approaches, and were evaluated as both rigorous and innovative by world-leading international referees."

PROFESSOR DAVID BILKEY, MARSDEN FUND COUNCIL CHAIR



Dr Adele Williamson, University of Waikato, was awarded a Marsden Fast-Start grant to study how microbes survive under the hostile conditions of Antarctica's Dry Valleys. She will identify the diversity of DNA repair systems present in these microbes that protects their genetic code from the extreme conditions. This question is especially important, because most of what we understand about bacterial DNA repair – and in fact about most cellular processes – comes from a few well-studied organisms that are easy to grow in a lab.

"What we know so far about the microbiota inhabiting the Dry Valleys is they have very little similarity at the DNA level to these model organisms and very few can be grown in the laboratory. As well as increasing our understanding of the organisms inhibiting the harsh yet fragile Antarctic ecosystem, the Dry Valleys are considered a good model of the Martian climate. Studying the molecular mechanisms that enable its inhabitants to survive can provide clues to how extraterrestrial life could look"

DR ADELE WILLIAMSON

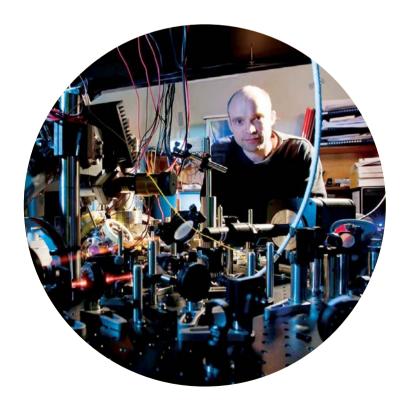
Q VIEW MORE ON DRY VALLEY MICROBES PROJECT

TÜHURA

EXPLORI



# SPOOKY ENTANGLEMENT



Dr Mikkel Andersen from the University of Otago will use his Marsden Fund grant funding to connect individual atoms through the spooky mechanism of "quantum entanglement", watching as the connection is created and destroyed. If two atoms become entangled, the measurement of one atom can influence possible measurements of another atom, even if the atoms are at opposite ends of the Solar System. This is why Albert Einstein once described the phenomenon as too "spooky" to be true. Andersen hopes to assemble individual atomic pairs held by laser beams, and watch through a sensitive microscope as the atoms entangle when they collide. If Andersen is successful in forming stable entanglements, this could lead to new technologies for unprecedented accuracy of measurements and speed of computing power.

"So far quantum entanglement has proven to be a very fragile resource that is easily lost. In particular it is often kept only at ultra-cold temperatures and any heating is detrimental. To make widespread entanglement based technologies, it is therefore very important to make more robust sources of it. If our idea to do this succeeds, it will provide a robust route to entanglement generation for future technologies."

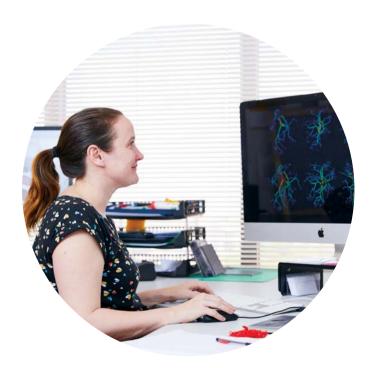
DR MIKKEL ANDERSEN



## **TŪHURA** EXPLORE

# WORLD-FIRST'S VIRTUAL PREGNANCY TO STUDY BLOOD FLOW TO THE PLACENTA

Bioengineer Dr Alys Clark, from the Auckland Bioengineering Institute, and Dr Jo James, from the School of Medicine at the University of Auckland, received a Marsden Fund grant to work on an international research project to study how changes in the blood flow affect a mother's ability to nourish her baby. This will be done through a virtual pregnancy that will feed back information to the researchers. It could lead to new tools for diagnosing and treating abnormal pregnancies where the placenta doesn't modify the blood vessels in the uterus to increase blood flow to the developing baby. This vital process fails in 10% of pregnancies, leading to foetal growth restriction where babies are born abnormally small. This disorder is almost impossible to predict and difficult to diagnose at an early stage of the pregnancy, even with modern medical imaging.



Q

"If somebody who isn't pregnant has tests they may have a CT scan, but there's radiation associated with that, which you don't want pregnant women to have, so there's only so much we can see during pregnancy. So what we can do with a virtual pregnancy is take the things we can see and take all the different bits of data from different clinical disciplines and put it all together. We can take ultrasound measurements of how the uterus is changing, and compare it with the computer-based simulation to try and develop new tools to spot the cases where the baby is not getting enough food."

DR ALYS CLARK

READ MORE ON VIRTUAL PREGNANCY PROJECT

Photo: MCrawford

# RESEARCHERS AND SCHOLARS AT THE TOP OF THEIR FIELDS ELECTED AS FELLOWS

TWENTY NEW NGĀ AHUREI A TE APĀRANGI FELLOWS AND THREE NGĀ AHUREI HONORE A TE APĀRANGI HONORARY FELLOWS WERE ELECTED IN 2018. NGĀ AHUREI FELLOWS ARE ELECTED INTO ROYAL SOCIETY TE APĀRANGI'S ACADEMY FOR OUTSTANDING DISTINCTION IN RESEARCH AND SCHOLARSHIP OR CONTRIBUTION TO ADVANCING PŪTAIAO SCIENCE, HANGARAU TECHNOLOGY AND ARONUI HUMANITIES.



### NGĀ AHUREI A TE APĀRANGI | FELLOWS



### **Professor Angus Macfarlane**

(Te Arawa), University of Canterbury, whose rangahau research has had a transformative impact on sociocultural theory and research practice in the context of educational challenges experienced by Māori. His attention toward theorising issues from within

both Māori and Western epistemologies has empowered Māori and non-Māori to frame research questions and select methodologies and data-gathering procedures that "make sense" to Māori whānau and educators and enable Māori to define the criteria for successful research outcomes.



Professor Carolyn (Kim) King, University of Waikato, is a specialist in animal ecology, particularly of small rodents and mustelids. Her research covers the areas of ecology, behaviour and genetics and her impact includes contributions to conservation, including work on improved methods of monitoring and

control of rodents and mustelids.



Professor Cather Simpson, University of Auckland, is internationally renowned for her contributions to fundamental new knowledge about how light interacts with matter. Her research has achieved seminal insight into multi-disciplinary areas ranging from ultrafast dynamics of heme proteins, laser-generated force

on sperm, and laser beam-shaping to transform materials at the microscale. She also applies that research to address important practical challenges, and thereby generates transformative impact through both.



Professor Charles McGhee, University of Auckland, is a corneal and cataract surgeon. As Maurice Paykel Professor of Ophthalmology and Head of Department at University of Auckland, he has grown the ophthalmology group from five to more than sixty staff and doctoral students, spanning clinical and

laboratory eye research. He is also founding Director of the New Zealand National Eye Centre, bringing together more than 120 ophthalmologists, optometrists and visual scientists in an internationally-recognised centre.



Professor Cynthia Farquhar, University of Auckland, seeks to provide evidence to improve women's health. Postgraduate Professor of Obstetrics and Gynaecology at the University of Auckland and a consultant clinician with the Auckland District Health Board,

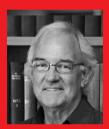
### KŌANGA | SPRING

she has initiated and led many clinical trials and Cochrane systematic reviews in the field of gynaecology and fertility. In 2005 she established, with others, the New Zealand Perinatal and Maternal Mortality Committee, which has driven policy changes in this area, and she was the inaugural Chair until 2013.



Professor David Bryant, University of Otago, is a world leader in the development of mathematical tools for inferring evolutionary relationships among biological organisms. He has made significant theoretical and practical contributions to phylogenetics – the field of biology studying the reconstruction of evolutionary history.

His research has been highly cited and applied to a diverse range of different areas, including early bacterial evolution, plant ecology, rapid identification of pathogens and even the origins of the Little Red Ridinghood fairy tale.



Professor David Williams, University of Auckland, is recognised nationally and internationally for his originality of thinking in the areas of constitutional law, colonial legal history and the Treaty of Waitangi. He has combined his expertise in history and law to produce ground-breaking studies which have challenged previous conventional

wisdom, recast the body of knowledge on Treaty of Waitangi jurisprudence, had a direct influence on public and official understanding of Treaty issues, and influenced Waitangi Tribunal and Supreme Court outcomes.



Professor Emily Parker, Victoria
University of Wellington, studies
enzymes, which are the catalysts
that make life possible. She has
made a sustained contribution to the
understanding of enzyme function at
the molecular and organism level. This
new knowledge has been applied to the

design and synthesis of enzyme inhibitors as potential drugs, especially antibiotics. It has also led to the use of enzymes as tools in the manufacture of valuable bioactive compounds.



public policy.

Professor Gillian Brock, University of Auckland, is one of the most significant scholars currently working in the field of global justice. Her scholarship spans ethics, political and social philosophy, several applied ethics fields and various interdisciplinary areas including those at the intersection of philosophy and



Professor Jason Tylianakis, University of Canterbury, studies how environmental changes affect interactions between species and their contribution to ecosystem functioning. He uses field data and the latest statistical methods to build up large networks to describe the interactions between species. These

networks can identify which species are most vulnerable to extinction, based on their location in the network, and this knowledge can be applied in reverse to understand how ecosystems develop and recover.



Professor John Creedy, Victoria University of Wellington, is a leading academic in public economics, labour economics, income distribution and the history of economic analysis. He has consistently aimed to address substantive and topical issues relevant to current public policy, both in

New Zealand and overseas. He has made a vital contribution to New Zealand through his work at Treasury and his research on important 'real world' policy issues, including superannuation, welfare and tax.



Professor John Gibson, University of Waikato, is an outstanding economist who has made significant contributions to knowledge around migration, particularly from the Pacific, and about survey-based measurement of living standards. He has led the Pacific Island-New Zealand Migration Study (PINZMS)

for over a decade to measure impacts of skilled, seasonal, and random ballot-based migration from the Pacific and has made major contributions to public policy especially in the area of Pacific-New Zealand migration policies.



Dr Laura Wallace, GNS Science, is a globally-recognised scientist who uses land surveying (geodetic), seismological and geological information to understand complex large-scale tectonic processes occurring at plate boundary zones. Soon after her arrival in New Zealand she discovered the

first slow slip event at New Zealand's Hikurangi subduction zone, and since then she has made these benign events and their relationship to catastrophic earthquakes central to her research. She has provided outstanding intellectual leadership in the study of plate boundary processes, including galvanising a large international group of scientists and raising funds to support multinational research into the Hikurangi subduction zone, which may be one of the greatest natural hazards faced by New Zealand.



### Professor Linda Waimarie Nikora.

University of Auckland, is an outstanding Māori scholar and leader whose research has been positively transformative for Māori and for the discipline of psychology. With colleagues, she has led important research investigations into Māori health, development, culture

change and resilience, death, Indigenous psychology, Māori sexuality, and media representations. Her research into the development of a kaupapa Māori curriculum fundamentally changed ways of working, researching, and training for indigenous psychologists worldwide, and she has grown a new generation of Māori psychologists.



Professor Margaret Hyland, Victoria University of Wellington, is a world authority in surface chemistry, engineering and processes. Her expertise includes surface properties, structures of materials, industrial reactions involving pollutant gases and materials degradation. In addition to

her strong academic standing, her work has had substantial global impact through application to aluminium smelting and other industrial processing.



Professor Merryn Tawhai, University of Auckland, is Deputy Director of the Auckland Bioengineering Institute and Director of the MedTech CoRE. She is at the international fore of computational physiology of the respiratory system. Her work is unique for its potential to address significant gaps in current clinical tools

for diagnosis of lung disease and testing interventional strategies before patient treatment.



Professor Robyn Longhurst, University of Waikato, is the author of highly original scholarship on gender, space and 'the body' that has transformed the way that human geographers and other social scientists understand peopleplace relationships since the mid 1990s. The concept of embodiment is now

seen as integral to feminist research, as well as to all research on space and place.



Professor Simon Malpas, University of Auckland, is principal investigator of the Implantable Devices Group at the Auckland Bioengineering Institute. His group is at the forefront of the development of the next generation of medical devices utilising IP in the areas of wireless power, communication and

sensing of pressure. His initial fundamental research in the area of cardiovascular control led him to develop technology to address basic science questions around how the brain controls blood pressure. This led to medical devices for monitoring brain pressure after trauma and power transfer through the skin for fully implantable heart pumps.



Professor Stephen Robertson, University of Otago, is a clinician-scientist who studies the genetic determinants of congenital malformations, particularly in children. He is the Curekids Professor of Paediatic Genetics and his particular research interest is in a group of disorders called the filaminopathies,

which are caused by mutations in a family of genes encoding for proteins called filamins. Somewhat unexpectedly, it was found that a mutation in one of the filamin genes causes both disorders of brain development and bone development. Insights gained from these disorders have filled gaps in understanding how bone develops in response to chemical and mechanical forces, and in parallel how stem cells in the brain produce neurons that build the human cerebral cortex.



Professor Susy Frankel, Victoria University of Wellington, is a preeminent scholar in international intellectual property law and its links with international trade, as well as the protection of Indigenous peoples' knowledge. Professor Frankel was president (2015-2017) of the global

intellectual property researchers' association, ATRIP, and her scholarship has influenced the development of New Zealand's intellectual property law and the interpretation of international agreements in the formation of domestic policy. Also, she is at the forefront of law working with other disciplines.

### NGĀ AHUREI HONORE A TE APĀRANGI | HONORARY FELLOWS



Professor Thomas Higham is the Director of the world's leading AMS radiocarbon dating laboratory at the University of Oxford. An international archaeological scientist with New Zealand roots, his principal research focuses currently on the Eurasian expansion of Anatomically Modern

Humans (AMH) from Africa. By revamping radiocarbon dating, his research is painting a new picture of humans' arrival in Europe.



### Professor Ichiro Kawachi.

Harvard University, is a worldleading epidemiologist studying the determinants of population health, helping to develop the field of social epidemiology; including social capital and neighbourhood impacts; cardiovascular epidemiology; and

behavioural economics and public health. Since completing his medical degree and doctorate in New Zealand, he has been an outstanding contributor to the University of Otago Wellington Summer School over a twenty-year period.



### Professor Warrick Couch,

Swinburne University of Technology, is a New Zealand citizen with a highly distinguished international reputation for his research in astronomy and astrophysics, especially galaxy evolution and cosmology. He has made outstanding contributions to the

measurement of galaxy evolution and identification of the physical mechanisms that drive it.





# IS EXPOSURE TO ARTIFICIAL BLUE LIGHT CAUSING PERPETUAL JETLAG?

In November we released a report that pulled together all the evidence about what is known on the effects of artificial blue light for hauora health, for wildlife and for studying the night sky. It found that artificial blue light outside normal daylight hours disrupts our body clock and makes it hard to sleep and function well. It can also cause negative flow-on effects such as increased risk of obesity, depression and potentially some types of cancer. For wildlife, artificial light disrupts rhythms of activity throughout the day and across different seasons. It can disrupt plant growth, pollination and reproduction and animal migration, predation and communication. The paper also found that artificial lights disrupt our ability to see the night sky and our ability to learn more about our universe through astronomy. For solutions, it recommends reducing exposure to blue light outside daylight hours by reducing electronic screen use, replacing bluer lightbulbs with yellow 'warmer' ones, improving outside lighting and sleeping in a dark room, summed up by the ditty:

'Blue light at night, not so bright, blue light in the morning, stops you yawning...'

TÜHURA EXPLORE "People need to be exposed to blue light during the day, particularly in the morning, to keep their internal body clock in sync with the actual light-dark cycle. The best way of receiving this light is by being outside or via strong natural light coming in through a window. But, at the other end of the day, we need to limit how much blue light we are exposed to so as to not disrupt our sleep cycle and the many other factors of metabolism that are associated with our body clock, like digestion and cell renewal."

DR LORA WU, SENIOR RESEARCH OFFICER, SLEEP/WAKE RESEARCH CENTRE, MASSEY UNIVERSITY AND CONTRIBUTOR TO THE REPORT



VIEW BLUE LIGHT AOTEAROA REPORT AND VIDEO



# KATHLEEN CURTIS ATRIUM



Our first female Fellow, mycologist and founder of plant pathology in New Zealand, Kathleen Curtis FRSNZ, had the atrium of the Science Centre at the University of Auckland named in her honour as part of a programme to celebrate 125 years of women's suffrage in New Zealand.

Distinguished Professor Margaret Brimble FRS FRSNZ gifted the university a portrait of Kathleen Curtis on behalf of Royal Society Te Apārangi. Professor Brimble also shared some details of Kathleen Curtis's life and achievements at the ceremony.

"Kathleen Curtis was instrumental in the establishment of plant pathology in Aotearoa New Zealand, and much of her work during the 1920s and 30s focused on horticulture, pasture, and forestry, with her investigations of fungal die-back in Pinus Radiata and black root-rot in tobacco leading to the development of methods to control or mitigate their impact on New Zealand's economy. Curtis' scientific research was deeply rooted in applications for New Zealand – but also in discovery and pure research; she located a puffball fungus in the mid 1920s, named Claustula fisheri curtis."

DISTINGUISHED PROFESSOR MARGARET BRIMBLE FRS FRSNZ





# TAHI RUA TORU TECH

THE INAUGURAL NATIONAL CHAMPIONSHIP FINALS OF THE TAHI RUA TORU TECH CHALLENGE TOOK PLACE AT TE PAPA IN DECEMBER.
COMBATTING MENTAL HEALTH,
PREVENTING POLLUTION AND ENABLING SUSTAINABLE COMMUNITY CARE WERE THE WINNING SOLUTIONS.

Tahi Rua Toru Tech (123Tech) is an exciting new digital challenge for school students built around the successful TechHub CREST Challenge which previously operated at Years 9 and 10 but is now available at all school levels across years 1-13.

Run by a partnership between the Ministry of Education and IT Professionals New Zealand (ITP), Royal Society Te Apārangi is ITP's strategic and delivery partner. The in-class component of the challenge uses a special version of CREST designed to help students at all levels work through the process of problem solving. In a digital technology context this includes defining a problem, experimenting on possible solutions, taking guidance from industry mentors, creating a solution and reflecting on it.

All participating schools, kura and code clubs throughout New Zealand were able to nominate teams for the regional championships. Regional winners were automatically entered into the national championship and received an all-expenses paid trip for their team and one kaiako teacher or chaperone to Wellington for the national gala awards event.

"The projects on show were truly inspiring and show New Zealand has a promising digital technology future in hands like these. Tahi Rua Toru Tech proves digital technologies are not just about coding, it's about problem solving, creativity and team work – there's something for everyone!"

DR MICHELLE DICKINSON, TAHI RUA TORU TECH CHAMPIONSHIP AMBASSADOR



VIEW MORE ON TAHI RUA TORU TECH





New Zealand."

GUEST EDITORS: JOANNE CLAPCOTT, ERICA WILLIAMS, ANNE-MARIE JACKSON, DANIEL HIKUROA, CHRIS HEPBURN, JAMIE ATARIA AND RAURU KIRIKIRI.

VIEW MORE ON SPECIAL ISSUE JOURNAL

# POWERING POTENTIAL:

STUDENT SOLUTIONS TO WATER QUALITY, DIABETES AND MORE



TŪHURA

EXPLORE

The fourth Powering Potential event took place in December with forty students from across New Zealand travelling to Wellington to work in teams to tackle some 'wicked problems' posed by scientists and technologists who mentored the students. The students had 48 hours to research an issue before presenting potential solutions to a public audience. This programme, supported by Freemasons New Zealand, seeks to give students valuable skills and experiences, and demonstrate to them the benefits of following a career in science and technology.

Students were challenged to come up with solutions to issues as diverse as how artificial intelligence can benefit society, how gene edited organisms could be regulated, what the new measurement standards mean for communications across the galaxy and how can we clean up and better manage our fresh water?

Team 'Sugar Rush' was challenged with finding solutions to treat and prevent Type 2 diabetes, which disproportionately affects Māori and Pacific populations. The team suggested that community-run live-in diabetes intervention camps be set up to make the treatment culturally appropriate and less intimidating than current treatments in clinical settings. Their mentor was Dr Donia Macartney-Coxson, a Senior Scientist at ESR.

"My team has been awesome. They have researched, absorbed and assimilated so much information and they generated novel ideas into the bargain! Given that they were pretty much silenced by the enormity of the question when I first posed it, this was even more impressive. They each found an area which interested them and worked intensely on it and then when they came back together they demonstrated excellent team work – seeing the threads of similarity in all their individual work and supporting each other to summarise and present 'their section' in the best and most cohesive way. I was very impressed".

DR DONIA MACARTNEY-COXSON



VIEW MORE ABOUT 2018 POWERING POTENTIAL

# WĀNANGA HUARAHI HOU MĀORI – A NEW JOURNEY MĀORI

THE NEED FOR TE APĀRANGI TO CHANGE HOW IT OPERATES TO REPRESENT AND SUPPORT ALL THOSE WHO GENERATE KNOWLEDGE IN AOTEAROA WAS ACKNOWLEDGED AS PART OF OUR REFLECTIONS DURING THE 150TH ANNIVERSARY IN 2017. WE COMMITTED TO MAKING BROAD CHANGES TO ACHIEVE THIS. PART OF THIS COMMITMENT WAS TO DEVELOP RELATIONSHIPS WITH IWI, HAPŪ, WHĀNAU MĀORI RESEARCH ORGANISATIONS AND KAI RANGAHAU RESEARCHERS AS WELL AS THEIR NETWORKS AND KAHU HOTERE WAS APPOINTED INTO THE SENIOR MANAGEMENT TEAM TO SUPPORT THIS ASPIRATION.



One of the first major initiatives was holding a two-day Royal Society Te Apārangi staff Wānanga at Pipitea Marae in Thorndon in December to give staff members the opportunity to experience Māori tikanga culture and customs first hand. Staff were privileged to hear from guest speakers at the event including kaumātua Bill Nathan who told the fascinating history of the Pipitea Marae and the Ngāti Pōneke Young Māori Club. Andrew Judd, former Mayor of New Plymouth, shared his experience of recognising his own racism while in office. Also Puawai Cairns, Head of Mātauranga Māori at Te Papa gave staff her insights into her role. Staff also had the opportunity to reflect, share personal stories and enjoy delicious kai.

# NEW CODE OF PROFESSIONAL STANDARDS AND ETHICS

UNDER OUR ACT WE ARE REQUIRED TO ESTABLISH AND ADMINISTER FOR MEMBERS A CODE OF PROFESSIONAL STANDARDS AND ETHICS IN PŪTAIAO SCIENCE, HANGARAU TECHNOLOGY AND ARONUI HUMANITIES TO SUPPORT THEM TO FOLLOW EXEMPLARY ETHICAL BEHAVIOUR AND WORLD CLASS RESEARCH AND SCHOLARLY PRACTICES.



Following a lengthy revision and consultation process, our new code was finalised at the end of 2018 for a commencement date of 1 January 2019.

The code was redeveloped to:

- give effect to our diversity principles;
- separate what is advice/guidelines from what is actually the enforceable code;
- make the standard by which complaints will be adjudicated as clear as possible;
- include good practices in Māori research and engaging with Māori communities:
- include contemporary good practice in regard to genetic technologies, materials and information.

The new code includes a section on values and principles and a section on responsibilities and standards. There is also a separate interpretation document that sets out how the responsibilities and standards can be met.







# 2018 PRIME MINISTER'S SCIENCE PRIZES

The Prime Minister's Science Prizes, now in their tenth year, recognise the impact of science on New Zealanders' lives, celebrate the achievements of current scientists and encourage scientists of the future. The Society administers the prizes on behalf of government and the ceremony was hosted at Parliament in March 2019 attended by over 300 invited guests.

The 2018 Prime Minister's Science Prize, the premier award for science that is transformational in its impact, was awarded to the STRmix<sup>TM</sup> team from the Institute of Environmental Science and Research (ESR). The 16-member team is recognised for the development and advancement of STRmix<sup>TM</sup> software that has been used in more than 100,000 cases worldwide to interpret DNA material from multiple individuals at a crime scene. Before STRmix<sup>TM</sup> started being used in 2012 a lot of evidential material was wasted because many mixed DNA profiles were too complicated to analyse. STRmix<sup>TM</sup> is now the number one software for the interpretation of DNA profiles internationally and is routinely used in case work by more than 40 laboratories around the world.

The Prime Minister's 2018 MacDiarmid Emerging Scientist Prize Winner was awarded to <a href="Dr">Dr</a> Peng Du</a> from the Auckland Bioengineering Institute at the University of Auckland. Peng is leading the world with his development of devices that help in the fast, reliable diagnosis and treatment of gut problems. He uses a combination of experimental recording and mathematical modelling to understand what happens to the food we eat, and the interactions between waves of bioelectrical activity generated by the gut and its movements to ensure essential nutrients can be absorbed. Prototype manufacturing of the devices he is creating is underway and Peng hopes they will lead to improved management and treatment of challenging digestive conditions.

The Prime Minister's 2018 Science Teacher Prize was awarded to Wellington science teacher <u>Carol Brieseman</u> from Hampton Hill School in Tawa. Carol believes that igniting students' natural curiosity and inspiring them to constantly question events around them is key to their lifelong learning success. Her Year 5 and 6 students know that there is no such thing as a dumb question and if their teacher doesn't know the answer, they can work it out together.

Initiatives instigated by Carol at Hampton Hill School include the installation of solar panels, a school vegetable garden with worm farms, compost bins and student-designed water tanks, a greenhouse made from recycled bottles, a human sundial and a five senses garden. Carol, who has 30 years teaching experience, shares her capabilities widely by supporting and mentoring teachers at Hampton Hill and other schools.

The Prime Minister's 2018 Science Communication Prize was awarded to Professor James Renwick from Victoria University of Wellington. In the past five years, James has been involved in more than 100 public presentations about climate change, given more than 200 media interviews in New Zealand and internationally and presented at numerous conferences focused on climate change and how to mitigate its effects. He says he feels a sense of duty to tell the world about the science behind climate change, the consequences that are unfolding and the urgent need for action. James will use the prize funds to build collaborations on climate change between artists and scientists and to further strengthen links with tangata whenua.

### The Prime Minister's 2018 Future Scientist Prize

was awarded to former Onslow College student Finnegan Messerli for his research into a physics problem that could ultimately help scientists better understand the risks of avalanches and slips. Finn's project began when he was asked to explain at an international physics tournament why grains like salt form a cone-like pile when they are poured onto a surface. It required him to find a method of testing the properties of the grains. "Essentially I designed the method I would have liked to have at my fingertips when I was working on the problem," says Finn. He is the third student from Wellington's Onslow College to win the Future Scientist award in the Prizes's 10-year history. All three winning students have been taught by Kent Hogan, who is Head of Science at the school.



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# NO TE HURIHURINGA ON REFLECTION

IT IS MY PRIVILEGE AND PLEASURE TO CONTRIBUTE SOME BRIEF COMMENTS TO THE ANNUAL REVIEW FOR 2018, A YEAR OF SIGNIFICANT CHANGE AND FURTHER ACHIEVEMENT FOR ROYAL SOCIETY TE APĀRANGI.



As I write, the tragic events of the mosque massacres in Christchurch are still fresh in my mind, and our country is beginning a national discussion about how better to address intolerance, racism and hate. This context serves to further underline my commitment to three priorities I signalled as central to my tenure as President: enhancing equality and diversity in all its forms, stronger support for Māori researchers and Mātauranga Māori, and better support for our emerging researchers.

As my term as President only commenced in July 2018, I cannot take all the credit for the many achievements of the last year. My predecessor, Emeritus Professor Richard Bedford and his fellow Council members offered wise leadership and created a strong platform for change. The current Council is continuing to build on that platform, reviewing and refining the way Royal Society Te Apārangi works as an organisation.

I am immensely proud of all those who contribute to the many and diverse work programmes of our organisation. In addition to the commitments of my fellow Council members and the wonderful staff of Royal Society Te Apārangi, we have identified and sought out the best people to support us in our engagements with partners, panels, expert advice, commitees, schools, ministries and our increasingly diverse publics. We could not do the work of Royal Society Te Apārangi on our own. Mahi ngātahi as one together.

In particular, I want to acknowledge the contributions of the Council members, the Academy, Council sub-committees, Constituent Organisations and the dedicated Branches who make up the structure of Royal Society Te Apārangi. The organisation continues to be very ably led by Chief Executive Dr Andrew Cleland, and I want to particularly commend the kaimahi staff for the exceptional work they do. This year has seen enormous change and, while there is still much to do, I am honoured to be on this journey with this rōpū group. Tēnā rawa atu koutou many thanks to you all.

Amongst this year's highlights was the 2018 Research Honours Aotearoa dinner held in Wellington on 17 October. Recognising the best and the brightest across the research spectrum –from humanities to the applied sciences and technology – through our medal and awards programme, is always a hugely inspirational event. In the same week we celebrated Te Takarangi, the sample list of 150 Māori non-fiction books, at a wonderful event at Parliament. This project marked Ngā Pae o te Māramatanga's 15th anniversary as New Zealand's Māori Centre of Research Excellence and was the finale event for Te Apārangi's 150th anniversary celebrations.

### HIGHLIGHTS 2018

As part of my Presidential induction, Andrew Cleland and I also visited a number of our partner academies in Australia, Scotland, Wales, England and Canada. It was very encouraging to learn that all academies are grappling with similar questions to those that preoccupy Royal Society Te Apārangi: how to better reflect the full diversity of the research community, how to develop a more inclusive research culture, how to support the new generation who are themselves more diverse and are likely to have very different research careers to those of their predecessors, and how to build new relationships in an era where themes of engagement and advancement are increasingly prominent.

Seen together, these activities underline the growing importance of engaging with different people and perspectives. To reach our full intellectual potential, we must constantly challenge ourselves and expose ourselves to the richly varied ideas and diverse understandings our world has to offer. We also know that our research is much more powerful when it is put to use. With this Annual Review we reach out to say thank you to all those in the research sector in Aotearoa New Zealand. It is your inspiration, influence and impact that underpins all that we do at Royal Society Te Apārangi.

Kia hora te marino, kia whakapapa pounamu te moana, hei huarahi mā tātou i te rangi nei, aroha atu, aroha mai, tātou i a tātou katoa, Hui e! Tāiki e! May peace be widespread, may the sea be like greenstone, a pathway for us all this day, let us show respect for each other, for one another, bind us all together.

Kia tau te rangimārie ki a tātou katoa, may peace be upon us all, our friends in the Muslim community and to those in Ōtautahi Christchurch.

Heoi anō, kia kaha be strong, kia maia persevere, kia ora be well.

Ngā mihi maioha.

Professor Wendy Larner FRSNZ FACSS
ROYAL SOCIETY TE APĀRANGI PRESIDENT, 11 APRIL 2019









# KUPUTAKA | GLOSSARY

aronui	humanities
arotakenga	evaluation, review
hangarau	technology
hou	new
hōtoke	winter
huarahi	journey, procedure
kai	food
kaiako	teacher
kaimahi	staff
kairangahau	researcher
kaupapa Māori	way of doing things, a Māori approach
kōanga	spring
kōrero	talk, discussion
mahi	work
mātauranga	knowledge, understanding, vision, wisdom
ngahuru	autumn

pukapuka	book
pūtaiao	science
rangahau	research
raumati	summer
rua	two
tahi	one
taiohi	youth
taonga	treasure
tau	year
tauira	student
te ao Māori	the Māori world
tohatoha	share
tono	demand, command
toru	three
wahine	woman
wāhine	women
wānanga	learning seminar, discussion gathering
whānau	family



