ROYAL SOCIETY **TE APĀRANGI**

Highlights
Te Tau

2018

ROYAL SOCIETY
TE APĀRANGI

Arotakenga

Our year in review

Tēna koutou katoa. He mihi tēnei ki te whānau whānui. As we reflect on 2021 – another tumultuous year during which the world had to face the challenges posed by the Covid-19 pandemic – we once again were heartened and grateful we could continue in most aspects of our mahi to support New Zealanders to tūhura explore, torohē discover and tohatoha share knowledge. We share many of our activities during 2021 in this publication.

This year, our theme is the many faces of the weather. As the climate warms, extreme weather events will become more frequent. MetService issued warnings for about 60 severe weather events in 2021, including three red warnings. The year brought multiple floods, gales and lightning strikes as well as a heavy snow storm, a tornado and bioluminescent algal blooms – dubbed the 'aurora of the sea'.

Rārangi ūpoko

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Ngā tai hīnātore o te kahurangi
The incandescent glimmering tides

Warm, calm weather can cause the rare phenomenon of ocean bioluminescence. The `aurora of the sea' is caused by blooms of plankton flashing neon blue in response to the wave disturbance.

Q1

Image courtesy of Grant Birley Ch@sing_Horizonz©

"My admiration for those who volunteer in the public service and my goal to amplify their voices comes from the inspiration of my mother."

DR ANDREW CLELAND

Poroporoaki

for Dr Andrew Cleland

A gathering was held at Te Whare Apārangi in Huitanguru February for the poroporoaki farewell of Dr Andrew Cleland FRSNZ, who had been Chief Executive of Royal Society Te Apārangi for over six years.

Outgoing Society President Professor Wendy Larner FRSNZ spoke on how Andrew had continued to strengthen relationships with mana whenua and CRIs, his dedication to supporting research best practice and his contribution to the Society's governance structures. Wendy noted that Andrew's legacy includes the Society being admitted as the 28th member of the Council of Academies of Engineering and Technological Sciences (CAETS) in 2019 and the Research Charter for Aotearoa New Zealand Andrew helped to develop.

Andrew reflected on his 'two-part career', the first part being in food engineering research, and the second where he could focus more on his passion for public service. Before joining the Society, he served as Chief Executive of Engineering New Zealand (formerly IPENZ) for 14 years.

VIEW MORE ON ANDREW'S FAREWELL
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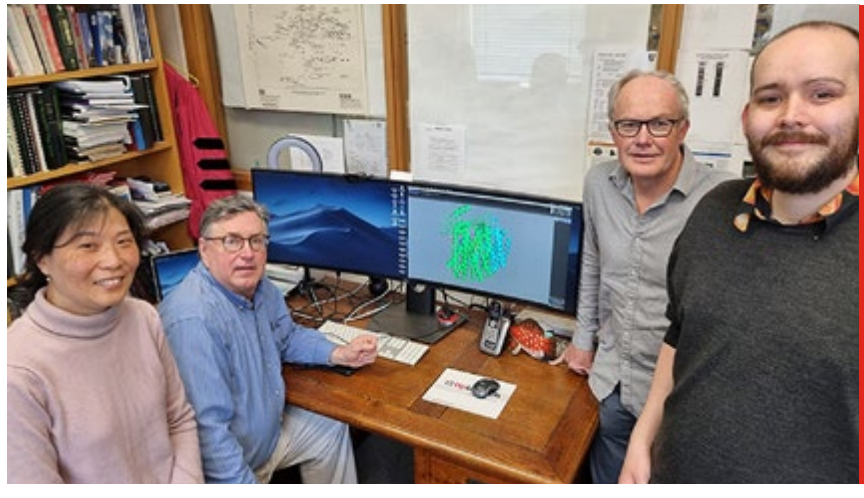


VIEW MORE ON THE RESEARCH
bit.ly/2021HL-5

SEEDING GRANTS SUPPORT NEW SMALL AND MEDIUM PRE-RESEARCH STRATEGIC PARTNERSHIPS THAT CANNOT BE SUPPORTED THROUGH OTHER MEANS. THEY ARE ADMINISTERED BY THE SOCIETY WITH FUNDING FROM THE MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT.

Fast-tracking tuberculosis treatment

Catalyst: Seeding and a Marsden Fund grant have been supporting a research project seeking a breakthrough in fighting the world's deadliest infectious disease: tuberculosis. TB kills about 1.5 million people every year. There is a vaccine, but it is only moderately effective in children and doesn't really work for adults, so treatment is the only option for many sufferers. Unfortunately, the current treatment needs to be taken for six months or more and has such extreme side effects that many people cannot complete it.

Professor Kurt Krause and Professor Greg Cook, from the University of Otago, are part of an international collaboration with Nobel Prize winner Professor Hartmut Michel, of Germany's Max Planck Institute of Biophysics, that has determined the atomic structure of a protein from the bacteria called bd oxidase. This discovery will serve as an important template for drug discovery and for producing fast acting drugs – ideally a four-week course, instead of the current protocol.

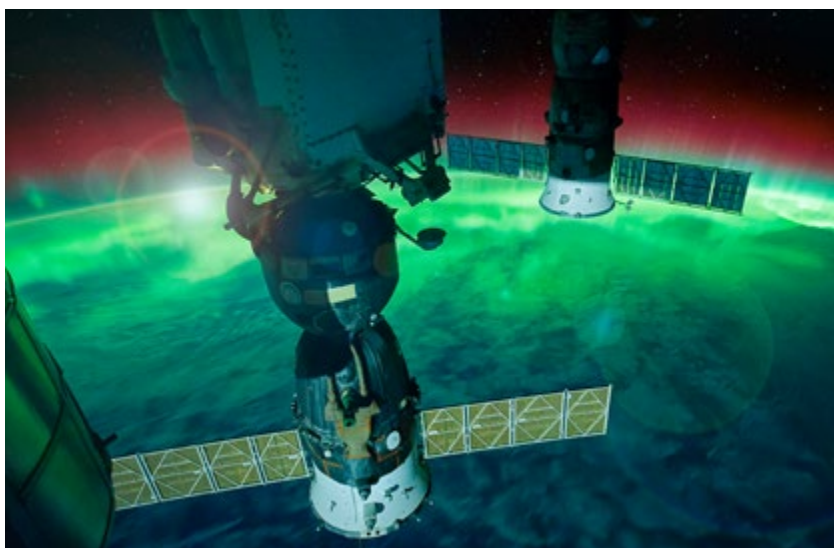
The team are now building on the bd oxidase structure to understand its mechanism, identify inhibitors and refine these inhibitors into a multi-drug cocktail to rapidly cure tuberculosis.

"It is going to take a long time to reach this goal, but having the structure now in hand gives us exactly the encouragement we need to keep pushing forward toward our goal of rapid treatment for TB."

KURT KRAUSE

Latest science & 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 SO THAT MEMBERS OF PARLIAMENT HAD THE OPPORTUNITY TO HEAR KŌRERO PRESENTATIONS ON TOPICAL RESEARCH AREAS.



IN 2021, THE TOPICS PRESENTED WERE:

Recovery from Covid-19 – how research is helping address our recovery in Aotearoa New Zealand as we begin to look beyond the global pandemic. With Associate Professor Helen Petousis-Harris and Dr John McDermott.

Opportunities for regenerative tourism in Aotearoa New Zealand – as we begin to emerge from the pandemic, what do we want to see from tourism? Do we go back to business-as-usual, or is there an opportunity to rethink our approach? With Professor James Higham and Dr Christian Schott.

Innovative solutions to New Zealand's current housing challenges – how can we solve the many and varied challenges facing housing in New Zealand with housing innovations and sustainable wood. Featuring Guy Marriage and Andrea Stocchero.

Cybersecurity – how New Zealand researchers, working at the cutting edge of cybersecurity, are helping to protect computer systems and, ultimately, our people. With Dr Giovanni Russello, Dr Danielle Lottridge and Dr Clémentine Gritti.

Aotearoa New Zealand's place in space – how New Zealand researchers working in the space sector are putting satellites into space and using the data obtained to benefit Aotearoa New Zealand. With Dr Sarah Kessans and Dr Dave Kelbe.

LEARN MORE ABOUT THE SPEAKER'S SCIENCE FORUM
bit.ly/2021HL-7

Ngā Kete Mātauranga

MĀORI SCHOLARS AT THE RESEARCH INTERFACE

THE NEW LANDMARK COLLECTION *NGĀ KETE MĀTAURANGA: MĀORI SCHOLARS AT THE RESEARCH INTERFACE* FEATURES 24 MĀORI ACADEMICS WHO SHARE THEIR PERSONAL JOURNEYS, REVEALING WHAT BEING MĀORI MEANS TO THEM IN THEIR WORK. THEIR PERSPECTIVES PROVIDE INSIGHT FOR ALL NEW ZEALANDERS INTO THE POSITIVE INFLUENCE OF MĀTAURANGA IN THE RESEARCH SECTOR.

Production of the book and photography were supported by the Society and the Marsden Fund Te Pūtea Rangahau a Marsden. Outgoing President Professor Wendy Larner FRSNZ provided a foreword. She explains that this "beautiful and powerful collection" has grown out of a partnership with Ngā Pae o te Māramatanga to celebrate Māori scholars and to strengthen relationships between Māori and non-Māori research communities. "In profiling the contributions of a cross-section of leading Māori scholars and their engagements with mātauranga, this inspirational collection will fundamentally change disciplinary debates in Aotearoa and beyond. It significantly advances understanding of issues such as the environment, politics, well-being and learning, and the interface between the land, the ocean, the sky and the people."

"It is an enormous privilege to live and work in Aotearoa, and to be in a research environment in which Māori and non-Māori knowledges encounter each other on a daily basis There is much we can learn from each other. Nā tātou katoa – this is part of all of us."

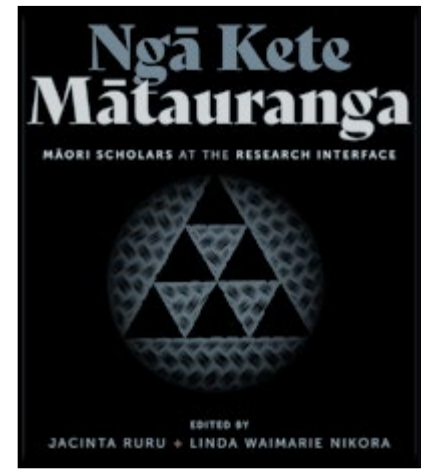
The book is edited by Professors Jacinta Ruru FRSNZ and Linda Waimarie Nikora FRSNZ of Ngā Pae o te Māramatanga and is published by Otago University Press.

"Māori philosophy reminds us that we're all part of a voyage that spans generations of people, who have travelled across landscapes, oceans and entire continents to be here."

KRUSHIL WATENE, NGĀTI MANU, TE HIKUTU, NGĀTI WHĀTUA ŌRĀKEI, TONGA

"Māori have always been scientists and have always observed, tested, applied, experimented and created with every element in their world. They asked questions and searched for answers. This is science, this is Māori."

RANGI MATAMUA FRSNZ, TŪHOE



"Ideals may be good to aspire to but I also have a great deal of respect for people who can change their minds about something in the face of stronger evidence."

MARIA BARGH, TE ARAWA, NGĀTI AWA

"It is easy to want to be a Māori academic, but the reality is much harder."

ANNE-MARIE JACKSON, NGĀTI WHĀTUA, NGĀPUHI, NGĀTI KAHU O WHANGAROA, NGĀTI WAI

"Elasticity in Māori philosophy presents an extraordinary opportunity to think beyond and unseat the laws of our operational system. Our bodies may be constrained by the laws of physics, but our minds are not."

OCEAN RIPEKA MERCIER VAN BERKEL, NGĀTI POROU

"It is the next generation of rangatahi who are now a critical part of our resurgence."

MEIHANA DURIE, NGĀTI KAUWHATA, RANGITĀNE, NGĀTI POROU, RONGO WHAKAATA, NGĀI TAHU

"For many Indigenous peoples, the major force affecting population outcomes has been the distinctive experiences of dispossession and colonisation."

TAHU KUKUTAI FRSNZ, NGĀTI TIIPA, NGĀTI KINOHAKU, TE AUPŌURI

"Kaupapa Māori research has provided me with a community of practice that has supported, critiqued and assisted me to grow and develop as a clinician and an academic."

SUZANNE PITAMA, NGĀTI KAHUNGUNU

"Māori contributions to resource management involve more than just a contribution to an ordinal number in an econometric model."

SHAUN AWATERE, NGĀTI POROU

"In this new knowledge landscape, Māori scholars attain jobs to add capacity and capability not only to universities but to Māori society too."

MARAMA MURU-LANNING, WAIKATO, NGĀTI MANIAPOTO, NGĀTI WHĀTUA

"In New Zealand history, iwi historical mātauranga had been conspicuously absent and often seen as unreliable traditions and 'pre-histories'."

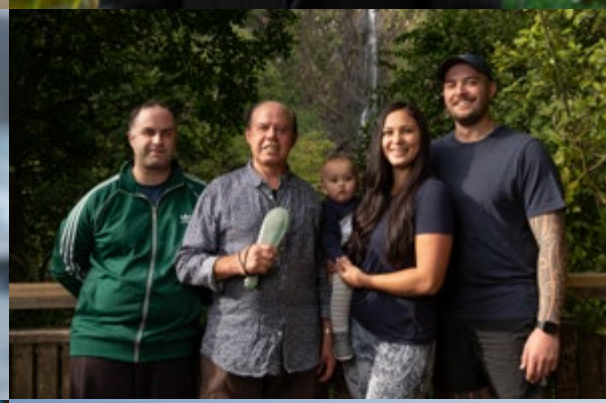
NĒPIA MAHUIKA, NGĀTI POROU

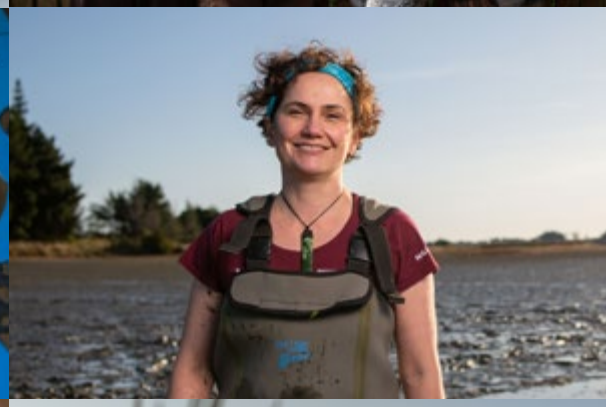
"I began to realise that there were broader values that were intrinsic to my upbringing and heritage that science alone seemed unable to address."

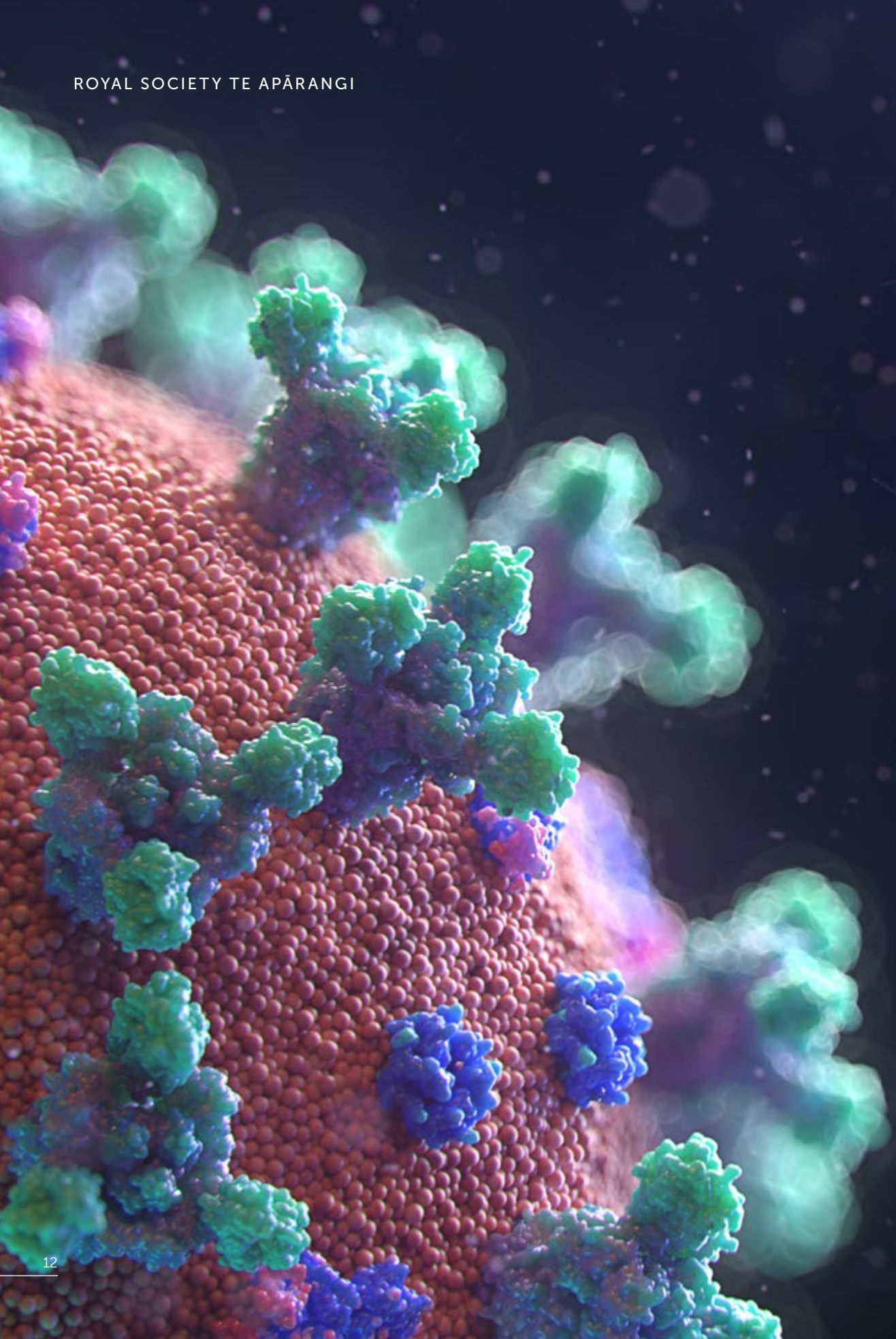
SHAUN OGILVIE, TE ARAWA (NGĀTI WHAKAHEMO), NGĀTI AWA (NGĀTI PŪKEKO)

LEARN MORE ABOUT *NGĀ KETE MĀTAURANGA*
bit.ly/2021HL-11







Science Media Centre continues assisting Covid-19 reporting

THE RAPIDLY CHANGING NATURE OF THE COVID-19 PANDEMIC KEPT THE SCIENCE MEDIA CENTRE BUSY IN 2021 AS THEY SOUGHT INNOVATIVE WAYS TO LINK REPORTERS WITH EXPERTS ABLE TO PROVIDE ANALYSIS ON THE RAPIDLY EVOLVING SITUATION.

The Covid Vaccine Media Hub launched in Poutū-te-rangi March in partnership with the AusSMC, the international SMC network and allied organisations in seven regions and countries including Taiwan, Sub-Saharan Africa, Spain and the US. The Hub, which is supported by the Google News Initiative, brings together expert commentary, explainers and the latest research from the SMCs in multiple languages to help journalists and fact-checkers around the world report on the science behind Covid-19 vaccines.

The SMC's weekly Coronavirus Emerging Research Tracker continued throughout 2021, providing an easy-to-understand digest of new publications and trends in Covid-19 research.

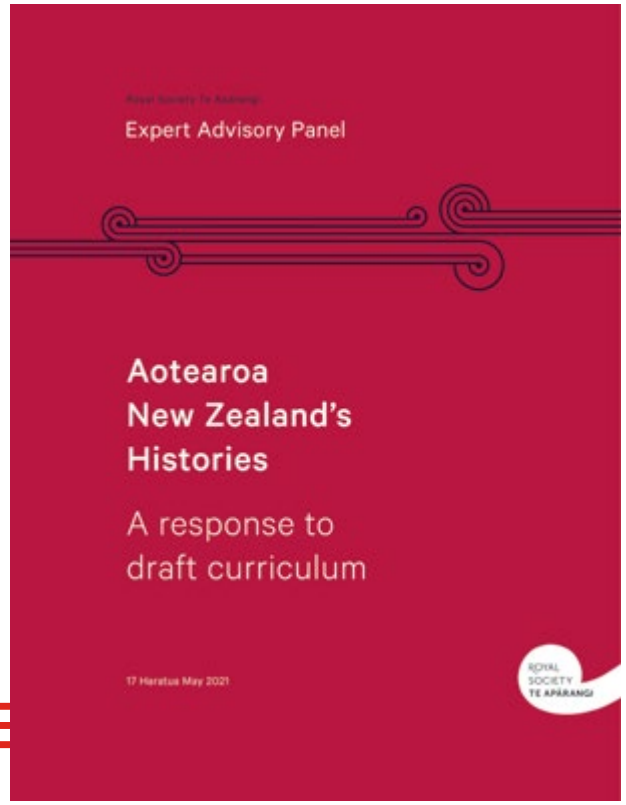
The service launched in May 2020 using emergency Covid funding and has received widespread positive feedback from scientists, journalists and policy makers alike.

The SMC also continued to work with Prime Minister's Science Prize winner Te Pūnaha Matatini (TPM) on special initiatives related to Covid disinformation during the year. These included 'Kia Kotahi Rā' – a wānanga on Covid vaccine information with the community of Tūwhakairiora Marae in Wharekahika, East Cape, and 'A Disinformation Conversation'– a roundtable event for government agencies, media and researchers, jointly hosted by TPM, the SMC and Internet NZ.

VIEW MORE ON SMC'S COVID-19 RESPONSE
bit.ly/2021 HL-13

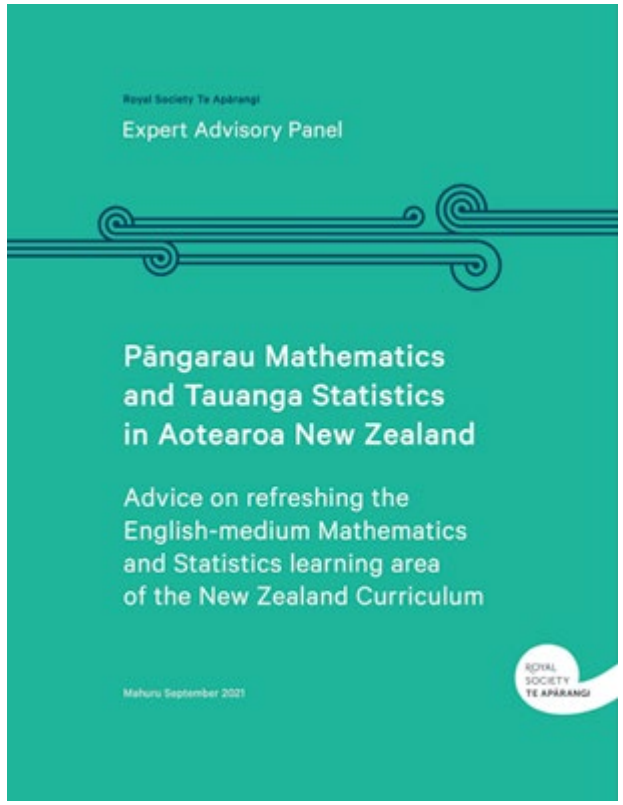
Education reports

DURING 2021, THE SOCIETY PRODUCED THREE REPORTS FROM EXPERT PANELS THAT HAD BEEN CONVENED TO PROVIDE INDEPENDENT SOURCES OF EXPERTISE TO THE MINISTRY OF EDUCATION.



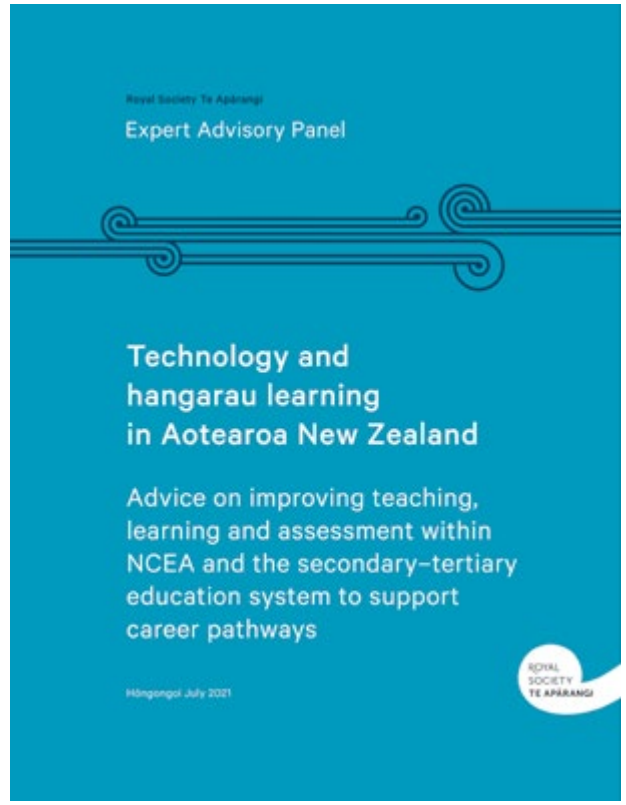
VIEW HISTORY REPORT
bit.ly/2021HL-15a

The report 'Aotearoa New Zealand's Histories: a response to draft curriculum' responded to the development of a core curriculum for Years 1–10. While the expert panel supported the introduction of Aotearoa New Zealand's Histories into the core curriculum, it had concerns about the brevity, fragmentation and, therefore, coherence of the curriculum draft as released in Hui-tanguru February 2021.



VIEW MATHEMATICS REPORT
bit.ly/2021HL-15b

The report 'Pāngarau Mathematics and Tauanga Statistics in Aotearoa New Zealand' provided advice on refreshing the English-medium mathematics and statistics learning area of the New Zealand curriculum. It found that to improve mathematics and statistics learning in New Zealand, investment and changes were needed at virtually all levels of the education system.

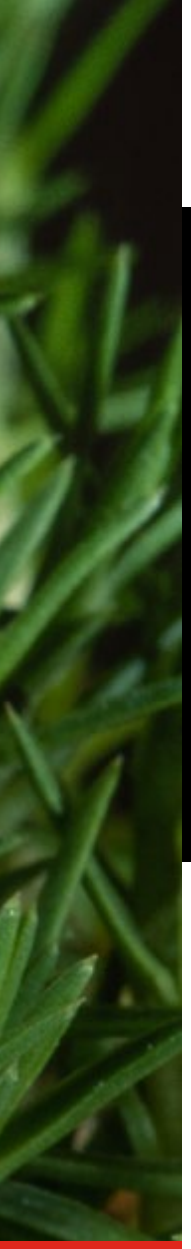


VIEW TECHNOLOGY REPORT
bit.ly/2021HL-15c

The report 'Technology and hangarau learning in Aotearoa New Zealand' provided advice on improving teaching, learning and assessment of technology and hangarau within the NCEA and the secondary–tertiary education system to support career pathways. It affirmed that broad-based technology education aligns with the goals of Aotearoa New Zealand to be a nation of world-leading innovators and recommended changes to emphasise technological literacy rather than technical education.

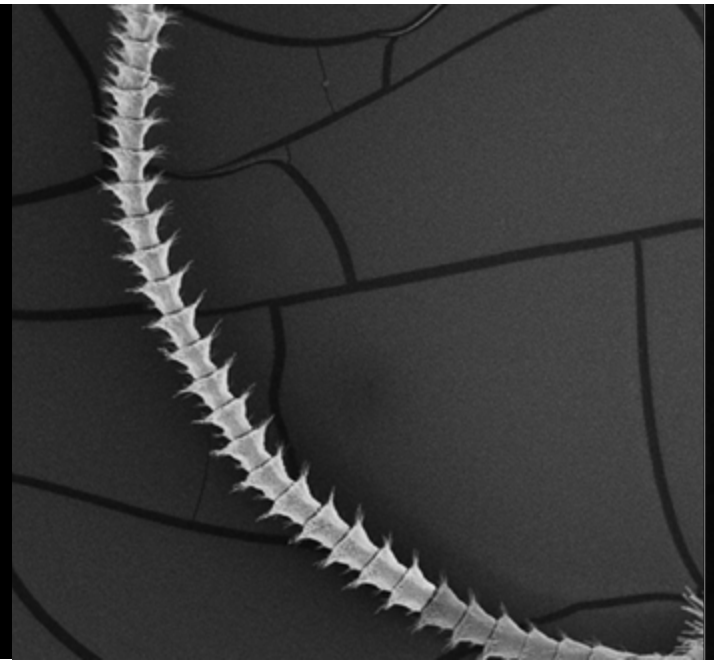
Banjo player, Hosea Easton, at the home of William and Lydia Williams, Carlyle Street, Napier.
Williams, Edgar Richard, 1891-1983: Ref: 1/1-025620-G. Alexander Turnbull Library/records/22311733

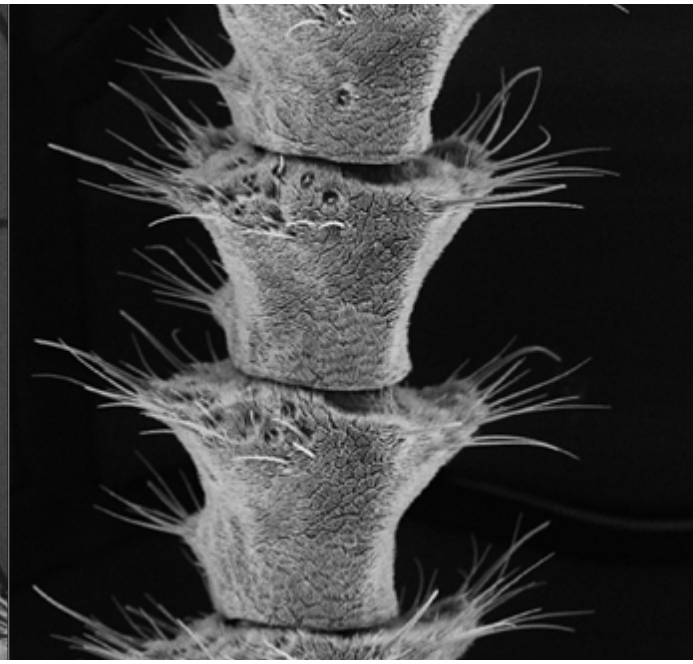
Targeted pest-control in pastoral systems



"These new methods were so successful that we were able to extract female sex pheromones for three out of seven porina species during one flight season in 2020 and have extracted pheromones from a fourth species in 2021. This is a world-first and puts the project on a path to characterising the pheromone chemistry of the porina species complex. This fundamental research is the basis for novel species-specific control methods to protect New Zealand pastures."

SARAH MANSFIELD,
NEW ZEALAND PRINCIPAL INVESTIGATOR.





Images: Dr Kye Chung Park

Through the Catalyst: Leaders fund, AgResearch was able to bring over Professor Rikard Unelius from Linnaeus University Sweden, to work with Dr Sarah Mansfield on a targeted approach for managing the porina moth species that are a pasture pest with Professor Max Suckling, Dr Ashraf El-Sayed and Dr Kye Chung Park from Plant & Food Research.

Pest management against pests such as grass grub and porina in New Zealand pastures relies heavily on broad-spectrum organophosphate insecticides. However, these insecticides are harmful to all insects, not just pests, and pose risks to humans, livestock and the wider environment, so are being phased out globally. Pastoral farmers need new pest control options that are environmentally safe, cost-effective and fit for purpose.

One approach is to manipulate insect pheromones – species-specific compounds used by insects for communication and mate-finding. Use of pheromones for pest control is widely used in horticulture and agriculture but is much less common in pastoral farming. The challenge for New Zealand's pastoral sector is a lack of information regarding the role of pheromones in the biology and ecology of pasture pests.

This collaboration seeks to assess the feasibility of pheromone-based control tactics for the subset of porina moths that are pest species. Laboratory and field studies will establish the specificity of pheromone responses. Initially, new rearing methods needed to be developed to ensure a supply of healthy porina moths.

The Catalyst: Leaders scheme supports incoming and outgoing targeted international fellowships for exceptional individuals who cannot be supported through other means. It is administered by the Society with funding from the Ministry of Business, Innovation and Employment.

VIEW MORE ON CATALYST: LEADERS
bit.ly/2021HL-17

Hikohiko ana te uira i te rangi
Lightning flashes in the sky

2021 brought many intense storms with lightning strikes. As the climate warms and Antarctica's ice sheets melt, extreme weather events will become much more frequent.

Q2

Prime Minister's Science Prizes

THE ANNUAL KO NGĀ PUIPUIAKI PŪTAIAO A TE PIRIMIA PRIME MINISTER'S SCIENCE PRIZES WERE AWARDED IN PAENGA-WHĀWHĀ APRIL 2021 AT AN EVENT AT THE NATIONAL WAR MEMORIAL IN TE WHANGANUI-A-TARA WELLINGTON. THESE PRIZES RECOGNISE THE IMPACT OF SCIENCE ON NEW ZEALANDERS' LIVES, CELEBRATE THE ACHIEVEMENTS OF CURRENT SCIENTISTS AND ENCOURAGE SCIENTISTS OF THE FUTURE.

Te Pūnaha Matatini team members: **Shaun Hendy** MNZM FRSNZ, **Michael Plank**, Alex James, **Nicholas Steyn**, Audrey Lustig, Rachelle Binny, **Siouxsie Wiles** MNZM, **Kate Hannah**, Giulio Dalla Riva, Max Soar, **Andrew Sporle**, **Dion O'Neale**, Emily Harvey, Oliver Maclaren, Adrian Ortiz-Cervantes, Frankie Patten-Elliott, Steven Turnbull, David Wu, Mike O'Sullivan, **Ilze Ziedins**, Cameron Walker, Kevin Ross, **Pieta Brown** and Ning Hua.

TE PUIAKI PŪTAIAO MATUA A TE PIRIMIA SCIENCE PRIZE

The premier award for science that is transformational in its impact was awarded to Te Pūnaha Matatini for its Covid-19 response.

Te Pūnaha Matatini, hosted at University of Auckland, is a multidisciplinary Centre of Research Excellence, set up to apply complexity science to 'critical issues of our time'. The team's response has been multifaceted. Throughout the pandemic, they have developed a series of new mathematical models and ran a multitude of different scenarios to inform the unique situation New Zealand found itself in. They have done modelling work and analysis on a wide number of areas including hospital capability, contagion rates and likely disease spread, virus genomic tracing, contact tracing, vaccination and healthcare inequalities. Communicating their findings has been key, with team members often in the media. Another strand of the work of Te Pūnaha Matatini has been to analyse and counter misinformation and disinformation.

The results of this work were translated for use by the Government policymakers and front-line operators and helped inform the Government's response to the Covid-19 pandemic.

"The Te Pūnaha Matatini pandemic response team is not winding up. We want to set up the tools we've developed and leave them for the next pandemic modellers. We had to build our tools from scratch and we don't want Aotearoa to be caught in that situation again. So we will be leaving our tools, making them open so they can be maintained in perpetuity, so next time we meet an infectious disease crisis they are there for people to use."

SHAUN HENDY

THE SOCIETY IS THE SECRETARIAT OF THE PRIZES ON BEHALF OF GOVERNMENT.

VIEW MORE ON THE WINNERS
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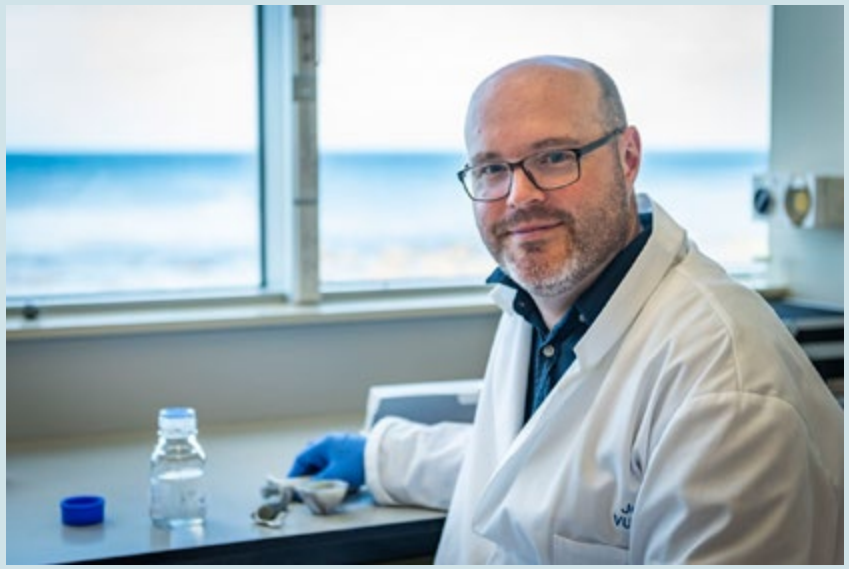


TE PUIAKI KAIPŪTAIAO MAEA MACDIARMID EMERGING SCIENTIST PRIZE

Won by **Dr Christopher Cornwall**, a Rutherford Discovery Fellow at Te Herenga Waka – Victoria University of Wellington, for his cutting-edge research on how marine organisms will fare under climate change. Chris studies how warmer and more acidic ocean water affects the ability of calcifying marine organisms to lay down calcium carbonate to grow and make their skeletons. This includes the foundation marine organisms called coralline algae, which are calcifying seaweeds that cement reefs together, both in temperate and tropical waters, but also signal to and provide a home for many other species, such as pāua and kina. His cutting-edge research using boron isotopes showed for the first time the pH levels inside the organisms where they lay down this calcium carbonate. He followed up with studies to see if the ability to keep their internal pH constant under ocean acidification is a trait that can be gained in a lifetime or over many generations. Next, he has led a team to assess and model how over 200 tropical reefs will be able to grow and survive at varying levels of carbon dioxide in the atmosphere.

TE PUIAKI WHAKAPĀ PŪTAIAO PRIME MINISTER'S SCIENCE COMMUNICATION PRIZE

Professor Michael Baker MNZM is an epidemiologist with the University of Otago, Wellington and has been New Zealand's go-to science expert since the start of the pandemic, with more than 2,000 interviews within the first year alone. Michael describes the period at the start of March 2020 just before New Zealand went into lockdown as "the most intense period of my working life". Michael says he developed a concept of Covid-19 elimination and concluded it was the optimal response strategy. He also concluded New Zealand needed an intense lockdown to stamp out the virus and give the country time to build the capacity to manage the pandemic. Michael promoted these ideas actively through multiple forms of science communication and was hugely relieved when they were adopted by the Government.

TE PUIAKI KAIWHAKAAKO PŪTAIAO
PRIME MINISTER'S SCIENCE TEACHER PRIZE

Queenstown teacher **Sarah Washbrooke** is the first technology teacher to win this prize. Her hands-on approach to teaching technology is so engaging for her students that they often remain unaware of the depth and range of learning they are doing. Sarah ensures her students remain engaged by making sure to offer them real-life authentic projects and also involves the wider Wakatipu community in setting challenges. She hopes that by following the design-thinking process, her students develop empathy, problem solving and the resilience to try again in order to set them up for life. Sarah also develops and shares resources with the wider New Zealand technology teaching community.

TE PUIAKI KAIPŪTAIAO ĀNAMATA
PRIME MINISTER'S FUTURE SCIENTIST PRIZE

James Zingel, a former student of Bethlehem College in Tauranga, won this prize for his research project on breast cancer. He ran a breast cancer dataset run through both a classical computer and a quantum computer in an effort to see which is superior in analysing the data and determining the type of breast cancer present. James had spent hundreds of hours delving into this project and had learnt so much in terms of quantum physics and machine learning. Progressing from a general understanding of quantum physics theory, to describing it in maths, and finally coding it in a language that generated coherent results was a fantastic progression he enjoyed immensely. His findings showed that, at the moment, the classical method worked better than the quantum one, but excited about the possibilities of quantum computing, he said "I think the quantum algorithm will much outperform the classical one in the very near future."

Top kairangahau elected as Ngā Ahurei a Te Apārangi Fellows

TWENTY-THREE NGĀ AHUREI HOU A TE APĀRANGI NEW FELLOWS WERE ELECTED TO THE ACADEMY OF THE ROYAL SOCIETY TE APĀRANGI FOR THEIR DISTINCTION IN RESEARCH AND ADVANCEMENT OF MĀTAURANGA MĀORI, HUMANITIES, TECHNOLOGY AND SCIENCE IN 2021. THEY ARE WORLD LEADERS IN THEIR AREA OF RESEARCH AND SCHOLARSHIP. THE ACADEMY OF THE SOCIETY RUNS THE FELLOWSHIP NOMINATION AND SELECTION PROCESS.

Dr **Barbara Barratt** FRSNZ, AgResearch, pioneered internationally-relevant research into the biosafety of introduced biocontrol agents for insect pests. In the 1990s this was a new, contentious and complex aspect of applied ecology. Through her vision and determination, Barbara has become a leader in the field, both in New Zealand and internationally. A key example of impact is her contribution to the identification and biosafety assessment of a parasitoid wasp for biocontrol of clover root weevil. She now leads a major theme in a multi-agency research collaboration on border biosecurity risk assessment, in partnership with the Environmental Protection Authority, the Ministry for Primary Industries and the Department of Conservation. Barbara's significant research contributions led to her being elected President of the International Organisation for Biocontrol (IOBC) and she is central to IOBC Global's 'Commission on Biological Control and Access and Benefit Sharing'.

Professor **Laura Bennet** FRSNZ, University of Auckland, is an international leader in fetal physiological research, and is head of the Department of Physiology and co-director of the Fetal Physiology and Neuroscience Group. Her work is noted for her original discoveries in preterm fetal physiology and pathophysiology, leading to key new knowledge about how babies adapt to adverse challenges such as oxygen deprivation and infection. Her research informs new methods for detecting babies at risk of injury and provides the fundamental physiology underpinning new perinatal treatments and clinical management strategies. She has received numerous prizes, invitations to speak, student successes and invited academic roles. Laura engages in fostering researchers around the world and strongly advocates for research advancement through her diverse national and international leadership roles, including changes to our research landscape to meet commitments to Te Tiriti o Waitangi.

Professor Emerita **Barbara Brookes** MNZM FRSNZ, University of Otago, has contributed to a vast international expansion of the historical canon from the 1970s, particularly in relation to the history of gender. It continues to be innovative and widely published, winning her such significant accolades as the Royal Society Te Apārangi Humanities Aronui Medal, being made a Member of the New Zealand Order of Merit and the 2017 Ockham Award for the best work of illustrated non-fiction. Barbara is both a skilled synthesiser and an innovative user of source materials as varied as archives, personal papers, film and photography. Her award-winning History of New Zealand Women sophisticatedly knits these sources together to create her 'magisterial' and 'highly readable' book. Her engaging and inclusive personal research and scholarly collaborations have cast a historical lens on topics as diverse as women's caring work, mental health and notions of the healthy body.

Professor **Andrew Barrie** FRSNZ, University of Auckland, has played a key role in advancing New Zealand architecture on the world stage with his innovative architectural design and research. The originality of his design projects – in the form of buildings, exhibitions, installations, and objects – is evidenced by over 60 national and international awards, including some of the most prestigious prizes in New Zealand and global architecture. A leader in the field of timber design, his 2016 Cathedral Grammar Junior School is one of the most awarded works of architectural design in New Zealand history. He is also among the Pacific region's leading critics and commentators on contemporary architecture, having published three books on the work of internationally renowned Japanese architects, and over 200 critical reviews, articles, and research outputs on Japanese and New Zealand architecture.

Professor **Elizabeth Broadbent** FRSNZ, University of Auckland, has achieved an international reputation and peer recognition in both social robotics and health psychology. One of her most notable contributions is the development and testing of healthcare robots, especially for improving outcomes in rest-home and dementia care and chronic illness. Her work is notable for the incorporation of mental attributions, so that robots' characteristics can be tuned to people's personalities, attitudes and needs for companionship. This is innovative interdisciplinary work of exceptional quality. Her contributions to health psychology include assessment tools for illness perceptions and the development of novel interventions. Also notable are her studies demonstrating the effects of psychological interventions on inflammatory processes and wound healing. Together, this work contributes to improved understanding and application of psychological processes with international impact.

Professor Emeritus **Margaret Carr** ONZM FRSNZ, NZ Association of Research in Education (NZARE) and University of Waikato, has had an immense impact on early childhood education in Aotearoa New Zealand and internationally. She was one of four lead coordinators and writers – alongside Sir Tamati Reedy, Tilly Reedy and Helen May – of the 1996 bicultural and sociocultural curriculum, Te Whāriki. This introduced learning dispositions as a new outcomes language and a 'weaving' metaphor about pedagogy. In response, Margaret developed an original assessment tool that has had a profound influence on national and international early years practice and commentary. Scholarly response was extended in seven Teaching and Learning Research Initiative projects with teachers and two Marsden Fund projects – (i) disposition and design in early years, and (ii) a bi-cultural project, with Te Kōhanga Reo o Mana Tamariki, on creative capacity building in the early years.

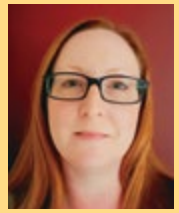
Professor **Murray Cox** FRSNZ, Massey University Te Kunenga ki Pūrehuroa, is one of the world's foremost authorities on the genetics of Island Southeast Asia and the Pacific. Recognised internationally for driving major advances by developing inventive new analytical methods, Murray moves beyond the usual emphasis in molecular anthropology of tracing human movements to reveal the social and health implications of past contact and interaction. His research leadership stems from coupling deep understanding of local communities with quantitative innovations spanning genetics, statistics and anthropology. His resulting discoveries have captured global attention, with articles in *The Economist* and *The New York Times*, fellowships at the Max Planck Institute and Oxford University, and the Royal Society Te Apārangi Te Rangi Hīroa medal for his anthropological work to reconstruct processes of transformation and change in past societies using genetic data.

Professor **Claudia Geiringer** FRSNZ, Te Herenga Waka – Victoria University of Wellington, has produced multi-award-winning scholarship that stands out for its rigour, elegance and high impact. She is the only scholar to have been thrice awarded the Sir Ian Barker Published Article Award. Her work is regularly relied on by judges both in New Zealand and abroad in developing important public law doctrines. In addition, her scholarship has precipitated significant changes, such as to the parliamentary rules governing the use of urgency, and to government policy concerning the award of New Zealand citizenship in humanitarian cases. She is recognised internationally as a leading expert on the New Zealand constitution, as well as on the constitutional protection of human rights in the Anglo-Commonwealth. She has held a number of international posts and fellowships, and her perspectives are regularly sought by an international audience of scholars, judges and practitioners.

Professor **Christian Hartinger** FRSNZ, University of Auckland, is recognised internationally as a distinguished researcher in biological inorganic chemistry. He has made many highly influential contributions that impact on drug discovery but also provide fundamental understanding of drug-protein interactions and reactivity at the interface between chemistry and biology. His innovative approaches have established new directions in metallodrug research, and his developed methodologies continue to have far-reaching impact in the community. His findings challenge paradigms about the reactivity of metal compounds towards biomolecules and thereby inform the design of novel biomaterials. Christian is a highly regarded mentor to his PhD students and postdoctoral fellows. His research has earned him many accolades and is at the forefront of biological inorganic chemistry, while his bioanalytical work lays the foundation for translation to the clinic.

Professor **Peter Fineran** FRSNZ, University of Otago, is an internationally recognised leader in bacterial immune mechanisms who has greatly advanced our understanding of interactions between phages, mobile genetic elements and bacteria. In particular, he has made world-leading contributions to the area of CRISPR-Cas biology and abortive infection systems. He applies his expertise in phage biology to develop phage-inspired antimicrobials, currently to tackle agricultural pathogens. Peter is a strong research mentor, training over 50 post-graduates and 14 post-doctorates, and an accomplished science communicator. His scientific excellence is evident from his impressive publication record and international distinctions, including being recognised as a top 1% cited researcher (*Web of Science*) and receiving the Microbiology Society Fleming Prize (UK), which is awarded to an outstanding researcher within 12 years of achieving their PhD.

Associate Professor **SallyAnn Harbison** MNZM FRSNZ, Institute of Environmental Science and Research Ltd (ESR) and University of Auckland, has led the research and development of significant advances and innovation in forensic DNA and RNA analysis. These innovations have been applied by SallyAnn and her colleagues directly in forensic investigations. SallyAnn received a New Zealand Science and Technology Medal in 1996 for her outstanding contribution to the development and application of DNA systems for forensic science in New Zealand. This science provided the basis for the advancement of DNA profiling including the DNA Profile Databank, a significant crime-fighting tool. SallyAnn is recognised internationally for providing casework-ready, accredited science for the justice sector derived from her research activities. She is currently researching forensic applications of next-generation sequencing (massively parallel sequencing).



Professor **Debbie Hay** FRSNZ, University of Otago, is an innovative molecular pharmacologist whose seminal contributions have enhanced understanding of the roles of G protein-coupled receptors (GPCRs) in conditions such as migraine, diabetes and obesity. GPCRs are key human drug targets but have complex patterns of selectivity. Her research has defined how receptor activity-modifying proteins (RAMPs) modulate GPCR activities and brought new understanding of how peptide ligands are engaged. This knowledge crucially underpinned the development of several new first-in-class therapeutic drugs, particularly for migraine. An extraordinarily productive, highly cited (Clarivate) scientist (164 publications, two patents, H-index 47) and an outstanding mentor of young researchers, Debbie has established herself as a world leader in a complex field, in high demand internationally as a collaborator, speaker, writer and consultant to industry.

Professor **Stephen Henry** FRSNZ, Auckland University of Technology, is a biological designer who has been involved with research concerned with biosurface modification for four decades. In 1996, with colleague Nicolai Bovin, they invented the breakthrough 'multi-functional bio-paint' platform called Kode Technology. Kode Technology allows for rapid modification of virtually any biological or non-biological surface with virtually any small molecule. Steve's mission is to make it easy for scientists to utilise Kode technology in their research and for businesses to incorporate Kode innovation into new products. There are over 75 academic publications on the technology and global use of Kode ranges from virus, liposome and cell research, to Covid-19 and transfusion diagnostics, and an immuno-oncotherapeutic product in phase 2 trials, plus an extensive pipeline. Steve currently holds the positions of CEO for Kode Biotech and subsidiaries and he is also a Professor of Innovation at AUT.

Associate Professor **Amokura Kawharu** FRSNZ, Ngāpuhi, Ngāti Whātua o Kaipara, Ngāti Whātua o Ōrākei, New Zealand Law Commission, is the foremost scholar of New Zealand arbitration law. Through arbitration, a dispute can be resolved outside state courts but with the same legal effect as a High Court judgment. The law was formerly based on 19th century English law, and arbitration was seldom used. Although an established field elsewhere, New Zealand had no tradition of arbitration scholarship. With new laws adopted in 1996 and the re-birth of arbitration practice, Amokura established arbitration as a field of academic study in New Zealand, has led reform and development of arbitration law through her scholarship and advocacy, and raised its profile internationally. As President of the Law Commission, she is now also leading the consideration of te ao Māori in the process of law reform.

Professor **Tahu Kukutai** FRSNZ, Ngāti Kinohaku, Ngāti Tiipa, Te Aupōuri, University of Waikato, focuses on two distinct but complementary areas in her research: Māori demography and Indigenous data sovereignty. She has undertaken a broad range of applied population research, from iwi projections and demographic profiling, to survey-based analysis of Māori identity and whānau structure. She has published widely on Māori demography and ethnic identity and is recognised internationally for her work on state practices of ethnic and racial classification and census taking. The impact of her work is demonstrated by the uptake by iwi, Māori organisations (such as the Independent Māori Statutory Board) and government agencies (Ministry of Social Development, Te Puni Kōkiri, Superu, Treasury), as well as many advisory roles (such as Chief Science Advisor Forum, 2018 Census External Data Quality Panel, Iwi Chairs Forum). She is Pou Matarua Co-Director of Ngā Pae o te Māramatanga.

Professor **Philip Hill** FRSNZ, University of Otago, is McAuley Chair of International Health and Foundation Director of the University of Otago's Centre for International Health, and is a world leader in tuberculosis case contact research, using this powerful research platform to evaluate new tools against tuberculosis, and to test hypotheses about the properties of the pathogen and how it relates to interventions, including vaccines. His research has had significant impact, including on how new tools are used in practice, and in guiding new approaches to biomarkers and vaccine evaluations. He has a focus on training the next generation of global health researchers, especially from under-resourced countries.

Professor **W. Bastiaan Kleijn** FRSNZ, Te Herenga Waka – Victoria University of Wellington. The way we communicate has changed dramatically over the last 30 years. Bastiaan Kleijn has made a significant impact on the technology we all use daily. Every mobile telephone in the world uses an audio encoder-decoder based on Bastiaan's generalised analysis-by-synthesis principle. He founded a company that provided the enabling audio coding technologies to Skype, the pioneer in internet communications. Recently, he was first in reducing the bit rate required for coding speech by an order of magnitude through generative synthesis. Bastiaan has made significant contributions in fields ranging from speech processing through spatial audio to machine learning. His inventiveness and research competence are reflected by more than 75 patents and widely cited work (Google h-index 59).

Associate Professor **Sonja Macfarlane** FRSNZ, Ngāi Tahu, Ngāti Waewae, Massey University Te Kunenga ki Pūrehuroa, is an influential scholar of Māori and Indigenous knowledge, with a particular focus on enhancing the social, cultural, educational and health outcomes achieved by Māori. Her reputation is characterised by promoting culturally responsive, evidence-based approaches in education and psychology. Sonja has played a key role in the advancement of alternative ways for educators and psychologists to improve cultural awareness and responsivity, leading to the implementation of practices that accrue benefits for Māori learners (education) and clients (psychology). Her culturally grounded publications and applied practice models in these disciplines have established her as an authority on the ways professionals can engage authentically within their professional spaces. With a commitment to building Māori capacity and capability, she is a highly sought after doctoral supervisor and examiner of theses.

Professor **Nigel Perry** FRSNZ, Plant & Food Research and University of Otago, has contributed greatly to new knowledge on natural products, the diverse molecules that regulate many interactions in nature. He is a world leader in understanding the impacts of production and processing on natural products in medicinal and culinary plants. He has discovered more than 80 previously unknown compounds from New Zealand native marine and terrestrial plants and animals. He combines excellence in fundamental science with a drive to create impacts through practical applications. He is an inventor on six patents, including an insect attractant in commercial use around the world. He works with Māori on taonga organisms, combining mātauranga and science. Nigel received the 1994 NZ Science & Technology Medal for excellence and the 2013 NZ Institute of Chemistry Prize for Industrial and Applied Chemistry.

Professor **Stephen Todd** FRSNZ, University of Canterbury, is a highly influential scholar in private law. He is author or part-author of seven books (30 including successive editions) and author of 49 articles and of chapters in 21 books. His work is widely cited and has had exceptional impact in New Zealand courts and in higher courts overseas. He has been an invited presenter at many international conferences, in particular the New Zealand Supreme Court Conference (2014) and High Court of Australia Centenary Conference (2003). Stephen achieved world distinction on being awarded the John Fleming Memorial Prize for Torts Scholarship (2006). He was the Rutherford Scholar and Visiting Fellow at Trinity College, Cambridge (2017). Stephen has been consulted by major research bodies, the New Zealand Law Society and the New Zealand Royal Commission on Genetic Modification.

Professor **Angela Wanhalla** FRSNZ, Ngāi Te Ruahikihiki, Ngāi Tahu, University of Otago, is an award-winning scholar of gender and colonialism. She has demonstrated that interracial relationships are a significant aspect of colonialism and its legacy in New Zealand. Her research and published works focus on the intersections between gender, race and sexuality in colonial history, with a specific focus on the connections between race and intimacy within and across colonial cultures. Angela was Partner Investigator on an Australian Research Council Discovery Project on violence and intimacy in settler societies, she is an active member of the Centre for Research on Colonial Culture, a co-editor of the *New Zealand Journal of History* and serves on the editorial boards of *Australian Historical Studies* and the *Journal of Pacific History*.

Professor **Murray Thomson** FRSNZ, University of Otago, is a researcher in dental epidemiology and health services who has made important and sustained contributions to knowledge in a number of fields over the last three decades. His work in the renowned Dunedin Study has enhanced understanding of oral health throughout life. He is an expert on the oral condition ‘dry mouth’ and has developed measures that are being widely used in clinical practice and research. He has also made important contributions to understanding of the oral health of the ageing population and of the effectiveness of dental care in improving the lives of children and their families. Murray’s national oral health survey work in Australasia has been internationally influential. He has also provided many years of service as an Editor-in-Chief for international scientific journals.

Professor **John Townend** FRSNZ, Te Herenga Waka – Victoria University of Wellington, is an internationally recognised geophysicist who has made societally important discoveries regarding the stresses on faults and the processes governing earthquakes. He has co-led an ambitious, decade-long mission to drill into, sample, and monitor the Alpine Fault, and led inaugural studies of the seismic noise field, low-frequency earthquakes and the tectonic stress field. He maintains an extensive network of international collaborators, and attracts high-calibre students and early-career researchers to Aotearoa, who have gone on to successful academic careers. John’s advice is widely sought by international scientific organisations (including as President of the Seismological Society of America) and national and international government agencies. He has cemented Aotearoa’s position as a global leader in earthquake science through his influential research and outstanding scientific leadership.

From chief executive to patron as Governor-General

At the end of Whiringa-ā-nuku October, Professor Dame Cindy Kiro DNZM, Ngāpuhi, Ngāti Kahu, Ngāti Hine, who had been Ahorangi Chief Executive of the Society for a few months following the departure of Dr Andrew Cleland FRSNZ, was sworn in as Governor-General of New Zealand.

On the announcement of the position in Haratua May 2021, outgoing Society President Professor Wendy Larner said on behalf of the organisation that she was "truly delighted' with the appointment.

"Dame Cindy is extremely passionate about serving Aotearoa New Zealand and this is an unprecedented opportunity for Dame Cindy to continue to serve the country at the highest level. She has spoken about this being an opportunity to both bring forth the voices for those who don't have a voice and also to unify our great nation."

As Governor-General, Dame Cindy has agreed to continue to be our organisation's patron.

Following Dame Cindy's departure as Ahorangi, Dr Roger Ridley, Mātanga Rangahau—Director of Expert Advice and Publishing served as Acting Chief Executive until late Whiringa-ā-rangi November, when Paul Atkins started as Tumu Whakarae Chief Executive, joining the Society from his previous role as Chief Executive of Zealandia.

VIEW MORE ON DAME CINDY'S APPOINTMENT
bit.ly/2021HL-29

"We have no doubt Dame Cindy will continue to be a champion for the principles that we collectively hold dear: the value of research, scholarship, mātauranga and evidence-based decision making. E te kotuku rerenga tahi, tēnā koe. Kua tae atu koe ki te taumata ikeike o rawenga. Nei rā ka mihi."

WENDY LARNER

"I undertook to become the Editor-in-Chief of the *Journal of the Royal Society of New Zealand* to help cement its place as a talisman for documenting scientific excellence in Aotearoa New Zealand. The journal's scope has adapted along with the aims of Royal Society Te Apārangi to reflect a wide diversity of thought and disciplines."

RICH MCDOWELL

New lead editor of JRSNZ

In Pipiri June, Professor Richard McDowell FRSNZ was appointed Editor-in-Chief of the *Journal of the Royal Society of New Zealand* (JRSNZ). Rich is a world-leading scholar working across land and water resources. He is a Principal Scientist at AgResearch and a Professor at Lincoln University. He has been the Chief Scientist for the Our Land and Water National Science Challenge since 2014.

The *Journal of the Royal Society of New Zealand* is the Society's flagship multidisciplinary title, as well as New Zealand's oldest learned periodical, continuing from the *Transactions and Proceedings of the New Zealand Institute*, first published in 1868. The journal's content spans science, mātauranga Māori, technology and the humanities.

Rich took over from Professor R. Ewan Fordyce FRSNZ, who led the journal since 2015.

SEE MORE ON NEW EDITOR-IN-CHIEF
bit.ly/2021HL-30

Special COVID-19 journal supplement

As the flagship title of Royal Society Te Apārangi, the *Journal of the Royal Society of New Zealand* (JRSNZ) published an open access he āpiti supplement in Haratua May on the latest scientific findings and knowledge across disciplines on the Covid-19 pandemic, especially focusing on Aotearoa. This project had a dual purpose: to elucidate our understanding of the disease and its control measures, and to call on the Aotearoa research community to jointly explore, manage and understand the pandemic's significance and impacts on our society, economy and people. The selected papers cover New Zealand's response to Covid and the varied impact of 'lockdown' on our 'team of 5 million' through many lenses including health, legal, philosophical, psychological, educational and te ao Māori. The Society is grateful for the considerable mahi of all those involved in the publishing of this supplement.

VIEW JOURNAL SUPPLEMENT
bit.ly/2021HL-31

He Pito Mata Awakening the Potential Early Career Research Wānanga

IN PIPIRI JUNE, OVER 300 DELEGATES CONVENED IN TE WHANGANUI-A-TARA WELLINGTON TO CONNECT, SHARE AND AMPLIFY THE KŌRERO OF EARLY CAREER RESEARCHERS (ECRS) IN AOTEAROA. ECRS INCLUDE THOSE STUDYING A MASTERS OR PHD AND UP TO 10 YEARS POST PHD.

The wānanga was convened by Royal Society Te Apārangi Early Career Researcher (ECR) Forum, and was championed by outgoing Society President, Professor **Wendy Larner** FRSNZ, who has made supporting ECRs one of the pillars of her presidency. She acted as kaiwhakataki MC alongside ECR Forum Co-Chair Dr **Sereana Naepi**, and Dr **Rangi Matamua** FRSNZ.

Guests were welcomed with a mihi whakatau from mana whenua, and were presented with a bold programme, thanks to the many speakers and special guests who lent their support to the wānanga.

Courtney Johnson, Tumu Whakarae Chief Executive, and **Arapata Hakiwai**, Kaihautū Māori Co-leader, shared their perspectives and experiences of co-leadership at Te Papa.

Yvonne Tahana (TVNZ), **Natalie Mankelow** and **Ngarangi Walker**, gave a korowai and kōrero on strategic communications, reputation and relationships.

Kate Hannah and **Jo Bailey** outlined an approach to transdisciplinary research, diverse teams and Covid-19 misinformation.

> "We need better support for 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."
>
> WENDY LARNER

SEE MORE ON WĀNANGA
bit.ly/2021HL-34

Associate Professor **Maria Bargh**, Associate Professor **Sacha McMeeking** and Dr **Rangi Matamua** shared what mātauranga in practice meant to them in a session facilitated by Professor **Tahu Kukutai** FRSNZ.

Professor Larner facilitated an entertaining conversation with Dr **Selina Tusitala Marsh** ONZM FRSNZ.

The ECR Forum was also delighted to hold two engaging panel discussions. The first, on communication and leadership in practice, with Dr **Ashley Bloomfield**, Professor **Shaun Hendy** MNZM FRSNZ and Associate Professor **Siouxsie Wiles** MNZM, and the second with representatives from the ECR Forum.

Other special guests included Professor **Dame Juliet Gerrard** DNZM FRSNZ, Professor **Dame Jane Harding** DNZM FRSNZ, Professor **Michael Baker** MNZM, Associate Professor **Peng Du**, members of the media who cover science and government science advisers.

The wānanga provided ECRs with an opportunity to make new connections and debate issues, such as employment stability, funding and support. In particular, ECRs discussed and drew attention to what conditions allow ECRs to thrive and possible ways to rethink the current research, science and innovation environment to address both their hopes and concerns. They envision a sector that is founded on strong relationships, provides more stable employment and seeks to deal with inequities within itself.

Ngā mihi maioha **Taylor Teatarua** who provided illustrations of the event.

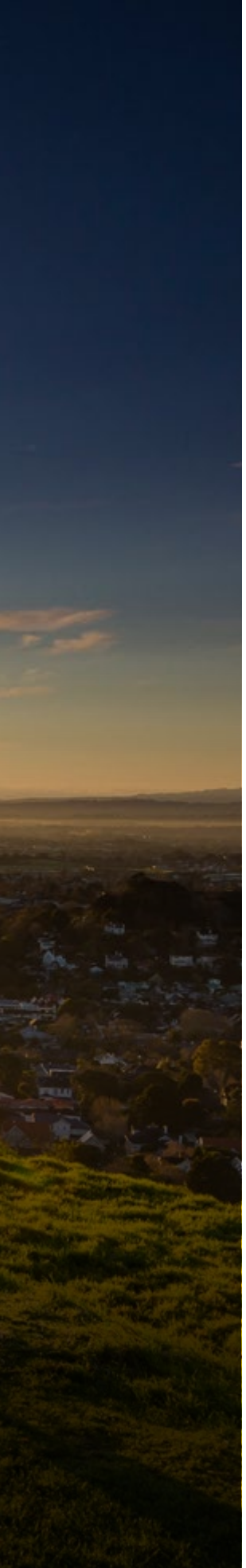
Kaupapa

The name and kaupapa of the wānanga 'He Pito Mata' is taken from the whakatauki 'Iti noa, he pito mata', which refers to a small uncooked portion of kūmara that was replanted to produce many more kūmara. Here it relates to awakening the potential of early career researchers in Aotearoa.

Glen Skipper, Te Ātiawa Nui-Tonu, Ngāti Rārua, Ngāti Tama, coordinates kūmara gardens at three locations in Taranaki. He is working at reconnecting Māori whānau with heritage varieties of kūmara and traditional growing methods. The different types of kūmara need different conditions and nurturing to thrive, come in many colours, shapes and sizes and have different specialities – similar to early career researchers!

Glen kindly supplied a collection of these diverse heritage kūmara taonga for us to learn about at the wānanga.

Te whitinga mai o te rā



THE MBIE SCIENCE WHITINGA FELLOWSHIPS, A ONE-OFF GOVERNMENT INITIATIVE, PROVIDED $10 MILLION TO SUPPORT RESEARCHERS EARLY IN THEIR CAREER, IN A RESEARCH SYSTEM AND GLOBAL ENVIRONMENT HEAVILY IMPACTED BY COVID-19.

The fellowships seek to support up-and-coming researchers to rise and establish a career in their chosen field of research. This is captured in the name of the fellowship 'Te whitinga mai o te rā', which can translate to 'the rising of the sun'.

Thirty were selected for the two-year fellowship in Pipiri June 2021, valued at $320,000 per award, for research undertaken in any field (including the humanities, mātauranga and social science) at an eligible New Zealand research institution. The recipients were selected with a novel stratified selection ballot, ensuring a diverse set of researchers was chosen.

The fellowships are supported by the New Zealand Government with funding from the Ministry of Business, Innovation and Employment (MBIE) and administered by the Society.

TE WHITINGA FELLOWSHIP RECIPIENTS

Dr **Sylvia Frain**, Auckland University of Technology, for research titled: A second sun: the legacies of nuclear imperialisms across Oceania.

Dr **Tui Matelau-Doherty**, Auckland University of Technology, for research titled: The value of positive ethnic and national identities for Māori and Pacific people in New Zealand.

Dr **Reem Abbas**, Auckland University of Technology, for research titled: Enhancing New Zealand's response and resilience to future pandemics: towards a minimum dataset for health disasters.

Dr **Greer Gilmer**, GNS Science, for research titled: Southward migration of the westerly wind belt: what is the impact on South Island water resources?

Dr **Leon Salter**, Massey University, for research titled: Examining the effects of the expansion of gig work on health and wellbeing in a post-pandemic economy.

Dr **Mahonri Owen**, Massey University, for research titled: Semi-autonomous brain controlled interfaces to overcome physical and nervous system disorders.

Dr **Rebecca Fitzgerald**, Massey University, for research titled: Forecasting volcanic ballistic projectile hazard from blue sky eruptions at touristic volcanoes.

Dr **Rebecca Campbell**, Plant & Food Research, for research titled: High resolution epidemiological models for plant disease prediction and risk management in Aotearoa New Zealand.

Dr **Kris Taylor**, University of Auckland, for research titled: 'Boys talk': Working with boys and young men towards the prevention of gender-based harassment and violence through a series of workshop interventions.

Dr **Jennifer Eom**, University of Auckland, for research titled: Dissecting the molecular and functional diversity of tumour associated fibroblasts in the tumour microenvironment.

Dr **Febelyn Reguyal**, University of Auckland, for research titled: NZ electric vehicles: eco-friendly now, how about in the future?

Dr **Anna Forsyth**, University of Auckland, for research titled: Developing neuroimaging biomarkers of drug action for mental health medicines.

Dr **Jesse Wiki**, University of Auckland, for research titled: Developing a spatial microsimulation model for population health and health policy in Aotearoa New Zealand.

Dr **Moeata Keil**, University of Auckland, for research titled: 'It takes a village': caring for children in Pacific post-separation families.

Dr **Siobhan Tu'akoi**, University of Auckland, for research titled: Co-designing a health promotion intervention for sustained rheumatic fever and rheumatic heart disease prevention in South Auckland Pacific communities.

Dr **Tara McAllister**, University of Auckland, for research titled: Transforming how we do science in Aotearoa with mātauranga Māori.

Dr **Samantha Heath**, Unitec New Zealand, for research titled: Fit for the future: reimagining nurse preparation for practice in New Zealand's changing demography.

Dr **James Hewett**, University of Canterbury, for research titled: Deep vein thrombosis: getting to the heart of the problem.

Dr **Wei Teng**, University of Canterbury, for research titled: In the lay-reader's eyes: reassurance of translation quality.

Dr **Amba Sepie**, University of Canterbury, for research titled: Strategies for decolonisation: Indigenous knowledges and regenerative cultural design.

Dr **Anne Marie Sohler**, University of Otago, for research titled: A new life at the bottom of the world: exploring the embodied effects of colonialism in 19th century Pākehā and Chinese migrants to New Zealand.

Dr **Xiaolin Cui**, University of Otago, for research titled: Minimally invasive delivery of exosomes for myocardial infarction therapeutics.

Dr **M-Remy Muhsin**, University of Otago, for research titled: Targeting cryptosporidiosis with novel peptoid therapeutics.

Dr **Paul Brown**, University of Waikato, for research titled: Developing accurate preventative crime models that reduce systemic biases.

Dr **Jessica Tupou**, Te Herenga Waka – Victoria University of Wellington, for research titled: Culturally responsive early intervention for tamariki Māori with takiwātanga/autism.

Dr **Katharina Robichon**, Te Herenga Waka – Victoria University of Wellington, for research titled: Towards personal medicine: analysis of receptor abundances in multiple sclerosis to determine treatment regime.

Dr **Juergen Oesterle**, Te Herenga Waka – Victoria University of Wellington, for research titled: Using cosmogenic radionuclides and fission-track thermochronometry to benchmark human-enhanced erosion in a time of rapid climate change.

Dr **Matt Majic**, Te Herenga Waka – Victoria University of Wellington, for research titled: Mean path length in optical billiards.

Dr **Samuel Crawley**, Te Herenga Waka – Victoria University of Wellington, for research titled: Comparing public opinion on climate change in Aotearoa New Zealand and Australia: belief and issue salience.

Dr **Julian Mackay**, Te Herenga Waka – Victoria University of Wellington, for research titled: Chainmail: holistic specifications for robust programs.

VIEW MORE ON TE WHITINGA FELLOWSHIPS
bit.ly/2021HL-38

Drawing Science workshop

Building on the remarkable science communication collaboration between Dr Siouxsie Wiles MNZM and Toby Morris – which began during the early weeks of the Covid-19 outbreak and quickly went global – the Science Media Centre and *The Spinoff* hosted a workshop for illustrators and scientists in Pipiri June to capture lessons from their experience and seed new collaborations.

Alexander Turnbull Library, Wellington, New Zealand. Ref: DCDL-0040970

THE DRAWING SCIENCE WORKSHOP, SUPPORTED BY NZ ON AIR, DREW APPLICATIONS FROM OVER 200 RESEARCHERS AND 100 ILLUSTRATORS FOR ONLY 30 PLACES, SHOWING THERE IS STRONG DEMAND FOR DEVELOPMENT INITIATIVES TO SUPPORT MORE VISUAL COMMUNICATION OF RESEARCH.

A series of videos, articles on *The Spinoff* and commissioned work have already resulted from connections made on the day.

The Science Media Centre is keen to encourage successful researcher–illustrator collaborations. They have created an open source Drawing Science directory of illustrators as a starting point for researchers and will be releasing an illustrated guide for researchers wanting to work with illustrators, with input from Toby Morris/ *The Spinoff*.

One collaboration that is coming to fruition thanks to Drawing Science is between researcher Carmen Timu-Parata, Ngāti Kahungunu, New Zealand Breastfeeding Alliance and University of Otago, and illustrator Adele Jackson, Ngāti Raukawa. They have been working on an image they hope to launch with kaumātua for Matariki 2022 to share the positive effects of breastfeeding.

"The image portrays the struggle of indigenous Māori to carry on traditional knowledge around breastfeeding across the generations. It shows Hineahuone, our atua who looks after childbirth, and links the genetic influence from her tūpuna through whakapapa. It also demonstrates ideas around epigenetics. The image wouldn't have happened without Drawing Science and I hope the course continues to inspire and encourage, especially tangata whenua."

CARMEN TIMU-PARATA

VIEW MORE ON DRAWING SCIENCE
bit.ly/2021HL-41

Farewell to Royal Society Te Apārangi President Wendy Larner

In late Pipiri June Royal Society Te Apārangi President Professor Wendy Larner FRSNZ was honoured at an event in Te Whanganui-a-Tara, where her portrait by Marianne Muggeridge was unveiled. It is a tradition at the Society to hang the portraits of past presidents within our whare, remembering and honouring their contributions.

Wendy finished her three-year term as President on 30 June 2021. Over the three years, Wendy focused on how we as an organisation and as a nation can better support equity and diversity in all its forms, on how we can better incorporate and support mātauranga Māori and Māori researchers and on how we can better support early to mid-career researchers.

Under her outstanding leadership, the Society has widened its focus across its various programmes to better support and represent the diversity of the research community in Aotearoa and has also launched campaigns to amplify and illuminate underrepresented voices.

Also farewelled from the Society's Council at the end of Pipiri June were Associate Professor Siouxsie Wiles MNZM, Dr Moana Theodore and Associate Professor Melinda Webber.

Our financials

For the financial year to 30 June 2021, the Royal Society of New Zealand group, combining Royal Society Te Apārangi and its associated Endowment Fund Trust, generated a surplus of $0.427m (*excluding* net gains on investment property, land and buildings). Total comprehensive revenue and expense for the year (*including* net gains on investment property, land and buildings) was $1.085m.

The Total Assets of the group increased by $0.641m during the year, to a closing value of $24.172m at year end. The physical land and buildings on our Turnbull Street site were revalued at year-end and increased in value by $0.7m to a net value of $14.5m at 30 June.

Our appointed auditors are Grant Thornton and their Independent Auditor's Report is included in the financial statements.

VIEW 2021 AUDITED FINANCIAL STATEMENTS
bit.ly/2021HL-43

He hukapapa kōmāmā

The pallid grey-white hoar frost

Hoar frosts are typically caused by days of fog and freezing temperatures, like this hoar frost at Kellands Ponds, Twizel. As the climate warms, fewer frosts are predicted across the country.

Q3

Te Tapeke Fair Futures in Aotearoa

THE SOCIETY'S EXPERT ADVICE TEAM CONTINUED ITS MAJOR WORK TO SUPPORT TE TAPEKE FAIR FUTURES EXPERT PANEL IN 2021. THIS DIVERSE, MULTIDISCIPLINARY PANEL HAS BEEN CONVENED TO EXAMINE ISSUES OF FAIRNESS, EQUALITY AND EQUITY IN AOTEAROA NEW ZEALAND.

Its overall intention is to raise public awareness of data and evidence, and to encourage New Zealanders to think about their own views on fairness and what a fair future would look like for them. The name 'Te Tapeke' comes from 'Ka tapeke katoa te iwi' and embraces the concept of including everyone, leaving no-one behind.

The panel produced spotlight papers, highlighting particular areas of concern, and expert commentaries, each written from the perspective of an individual panel member.

"New Zealand is a small country of five million. As a forward-thinking, culturally diverse nation with a Tiriti foundation, we have a platform from which we can realise te tapeke fair futures in Aotearoa, and show leadership in the pursuit of fairness globally. New Zealand has long defined itself by its commitment to a 'fair go' for all. In that spirit, Te Tapeke Fair Futures panel believes that a fairer and more just society is within reach."

DAME LOWELL GODDARD

Spotlight on Housing

shows the housing crisis is experienced most acutely by Māori, Pacific peoples, ethnic communities, people with disabilities, children, and those in poverty.

"People living in warm, dry houses have fewer housing-related hospital admissions, and days off work and school."

PHILIPPA HOWDEN CHAPMAN

Spotlight on Poverty

calls attention to the increase in poverty in this country in recent decades, with some children experiencing severe and persistent poverty.

"The magnitude of the challenge of achieving low rates of poverty for all sections of the community must not be underestimated."

JONATHAN BOSTON

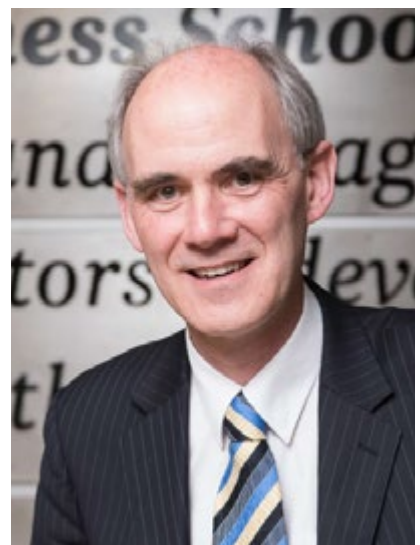
Spotlight on Health

shows data that underlines how some groups are more vulnerable to particular lifecycle diseases, and that inequity and deprivation shortens life expectancy – notably for Māori and Pacific peoples.

"Access to health services in this country is a story of ongoing inequity."

BARBARA BROOKES




The expert commentaries further explore the equity experiences of groups, including Māori, refugees, migrants, and rainbow people. The commentary on the economic effects of the Covid-19 pandemic shows how economic outcomes will be experienced unfairly – by this generation and those to come. The paper on fair access to justice explores transformative change in the legal system.

The panel agrees that contemporary New Zealand is now a society with significant levels of disadvantage and deprivation, with the available evidence indicating this is disproportionately concentrated in Māori, Pacific peoples, and disadvantaged groups. Targets to achieve greater equity must be made and met, it says, and historic and structural drivers should not be overlooked in future decision-making.

SEE MORE ON TE TAPEKE FAIR FUTURES
bit.ly/2021HL-49

THE EXPERT PANEL

Dame Lowell Goddard DMNZ, QC, Ngāti Kahungunu, Te Aitanga-a-Māhaki, Ngāi Tūhoe, former New Zealand High Court Judge (Co-convenor); Associate Professor **Andrew Erueti**, Ngā Ruahinerangi, Ngāti Ruanui (Taranaki), Āti Hau (Whanganui), University of Auckland (Co-convenor); Professor **Jonathan Boston** ONZM, Te Herenga Waka – Victoria University of Wellington; Dr **Alan Bollard**, Te Herenga Waka – Victoria University of Wellington; Professor Emerita **Barbara Brookes** MNZM, University of Otago; Associate Professor **Elana Curtis**, Ngāti Rongomai, Ngāti Pikiao, Te Arawa, University of Auckland; Dr **Monique Faleafa** MNZM, PricewaterhouseCoopers New Zealand; Distinguished Professor **Philippa Howden Chapman** CNZM QSO FRSNZ, University of Otago Wellington; Associate Professor **Jay Marlowe**, University of Auckland; Associate Professor **Barry Milne**, University of Auckland; Professor **Missy Morton**, University of Auckland; Associate Professor **Krushil Watene**, Ngāti Manu, Te Hikutu, Ngāti Whātua o Orākei, Tonga, Massey University Te Kunenga Ki Pūrehuroa; Dr **Jess Berentson-Shaw**, The Workshop; and Dr **Vincent Wijeysingha**, Massey University Te Kunenga Ki Pūrehuroa.

Taiao Aronui

MĀ TE RANGITĀMIROTIA O NGĀ KURA E WHĀ E TOROKAHA AKE AI.

THROUGH THE BINDING TOGETHER OF THE FOUR KURA THEY ARE STRONGER.

Hōngongoi July 2021 saw the first of four wānanga for Taiao Aronui, a professional leadership programme in pūtaiao science and mātauranga Māori for kaiako as a complementary strand of the Science Teaching Leadership Programme. This pilot programme was designed in collaboration with Rangitāmiro rōpū to inspire and elevate tamariki, whānau, hapu and iwi within Rotorua. Rangitāmiro is a collaboration of Rotorua Primary, Te Kura o Te Koutu, Te Kura o Hurungaterangi and Te Rangihakahaka.

With a strong focus on mātauranga Māori and pūtaiao, this programme provides kaiako with opportunities to connect with like-minded people in the rohe through wānanga, professional development pathways and relationship-building.

One of the three baskets of knowledge, the basket of aroha, peace, arts and crafts benefits all living things. This basket relates to knowledge acquired through careful observation of the environment. Taiao Aronui is based around detailed observation of the local environment.

Supporting international exchange of ideas

CATALYST: INFLUENCE SUPPORTS NEW ZEALAND'S PARTICIPATION AND MEMBERSHIP IN KEY INTERNATIONAL FORA. ON BEHALF OF THE NEW ZEALAND RESEARCH BASE, THE SOCIETY MANAGES THE COUNTRY'S REPRESENTATION IN MORE THAN 40 INTERNATIONAL SCIENTIFIC UNIONS. THIS FACILITATES THE SHARING OF NEW ZEALAND'S EXPERTISE WORLDWIDE AND HELPS ENABLE THE INTERNATIONAL EXCHANGE OF IDEAS. IT IS FUNDED BY THE MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT.

"Science is crucial to many challenges we face including Covid-19, climate change, rapid technology development, mental health and widespread social change... We will continue to accelerate momentum to ensure that we clearly project a global voice for science through better engagement with the scientific and global policy communities and wider publics. Science can and must make a difference in ensuring a better world."

SIR PETER GLUCKMAN

In 2021, a number of key appointments were made, including:

Sir Peter Gluckman ONZ FRS FRSNZ became President of the International Science Council (ISC), taking up the position as head of the council's governing board for a three-year mandate.

Dr David Crossman, University of Auckland, was re-elected to the council of the International Union of Pure and Applied Biophysics. Biophysics is the application of physics to understand biology and is an interdisciplinary endeavour.

Dr Libby Liggins, Massey University, was invited to serve on the Scientific Committee of the ISC's World Data System. The World Data System is an interdisciplinary body that seeks to support trusted data services for global science.

Professor Gary Wilson, GNS Science, was appointed Vice President for Administration for the Scientific Committee on Antarctic Research (SCAR).

Professor Geoff Chase FRSNZ, University of Canterbury, joined the board of directors for the International Council of Academies of Engineering and Technological Services (CAETS).

Dr Bapon Fakhruddin, Tonkin + Taylor, joined the task group on FAIR Data for Disaster Risk Research for the ISC's Committee on Data (CODATA).

Professor Wickliffe Abraham, University of Otago, joined the council of scientists for the Human Frontier Science Program (HFSP).

Pledge for openness about animal research and teaching

The Society was one of 21 New Zealand organisations to commit to communicating openly about animal use in research and teaching.

This made New Zealand the first country outside Europe to have an animal research openness agreement. New Zealand has long been committed to maintaining and improving high standards of animal welfare, as well as undertaking world-leading research and teaching using animals, controlled under the Animal Welfare Act 1999. The scientific community in New Zealand recognises the importance of demonstrating and promoting values that contribute to these animal welfare standards.

The openness agreement was launched at the Australian and New Zealand Council for the Care of Animals in Research and Teaching (ANZCCART) 2021 conference in Hōngongoi July. The New Zealand Committee of ANZCCART is a special committee of the Society.

The signatories have formally agreed to the agreement's five commitments and actions that can be taken to fulfil them.

"The Openness Agreement in Aotearoa New Zealand will help organisations that conduct, fund or support animal research communicate about the crucial work that is being done on the public's behalf, by dedicated researchers, technicians and animal care staff. The judicious use of animals in research remains vital to scientific, medical, and veterinary progress."

DR JODI SALINSKY, CHAIR OF THE OPENNESS AGREEMENT WORKING GROUP

VIEW READ MORE ON THE OPENNESS AGREEMENT
bit.ly/2021HL-52

Special issue on the volcanism of Te-Ika-a-Māui

"The special issue updates our understanding of the beautiful stratovolcanoes of Mount Taranaki, Mount Ruapehu and Mount Tongariro. In addition, Taupō, for which one relatively recent eruption remains one of the largest known on Earth."

JAMES SCOTT

In Hōngongoi July, the second of a two-part special issue on volcanism in Zealandia and the SW Pacific was published in the *New Zealand Journal of Geology and Geophysics*, one of eight peer-reviewed journals the Society manages.

The first part had provided regional summaries of volcanism, including of Te Waipounamu the South Island and Antarctica. Part two summarises volcanism of Te Ika-a-Māui the North Island.

One of the most significant paradigm changes in recent times has been the recognition that New Zealand forms only a small part of the much larger Te Riu-a-Māui Zealandia continent.

Being largely a watery continent means there is an extensive record of water-magma interaction. In addition, the way volcanic research is undertaken has changed since the 1980s.

The special issue was assembled prior to the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) Scientific Assembly meeting in Rotorua planned for 2023. The guest editor was James Scott, Associate Professor of Geology at the University of Otago and President of the Geoscience Society of New Zealand.

VIEW MORE ON VOLCANISM SPECIAL ISSUE
bit.ly/2021HL-53

Photography by Craig Miller, Image 118946, GNS Science/EQC

"Nabokov and Popper were contemporaries, both living through most of the twentieth century and both uprooted by war and revolution. In many ways, nevertheless, they were antithetical, but what for me links them is their love of freedom and their delight in the endless adventure of discovery."

BRIAN BOYD

VIEW MORE ON ADVENTURE OF DISCOVERY EVENT
bit.ly/2021HL-54

The adventure of discovery

2020 Rutherford Medallist Distinguished Professor Brian Boyd FRSNZ spoke about the relationship between the arts, humanities and sciences in his 2021 Rutherford Lecture.

He focused on both Vladimir Nabokov, thought by some to be the greatest writer of the 20th century, and Karl Popper, thought by others to be the most fertile thinker of the century. Both were passionate about science and contributed to it at high levels, and both saw knowledge of all kinds as an adventure of endless discovery.

Brian also considered how evolution, without which we cannot explain life on Earth – including social life, and culture – may help explain art, thought, and discovery.

The lecture took place in Auckland in Here-turi-kōkā August a few days before the national lockdown to prevent community spread of the Delta strain of Covid-19. Unfortunately, his talks in other centres had to be cancelled.

Robotic capsule for gut sampling a winning idea

> "Early diagnosis of gut-related problems is important, but we don't have the tools to fully diagnose the gut."
>
> MUHAMMAD REHAN

Muhammad Rehan from Massey University won the Falling Walls Lab New Zealand contest and the opportunity to present his idea at the Berlin Falling Walls finale with his robotic capsule that aims to break down the wall of gut sampling.

As Rehan pointed out in his 3-minute pitch, gut-related issues cause 8-million deaths a year and affect countless others. Gut-related problems include cancer, coeliac disease, crohn's disease and irritable bowel syndrome. The current method for taking gut samples is using faecal samples. These are easy to obtain and non-invasive but they can't give you information about a specific location along the nine metres of gastrointestinal tract.

The solution is his 'robotic capsule'. The size of a large capsule, it can be swallowed and then with its spring loaded and sealing mechanism, it can open to take a sample at a specific location in the gut and then seal closed, so as not to be contaminated with material from lower in the tract before it is passed out. The capsule can be followed in the intestinal tract by imaging and remotely controlled to take a sample. It is also possible that the change of pH from the stomach to the small intestine could trigger it to take a sample. Another option is for the capsule to open at a specific time after swallowing. Rehan's team is believed to be the first in the world to collect a microbiota sample from a gut lining. An engineering graduate originally from Pakistan, Rehan is pursuing a PhD in microrobotics.

Falling Walls Lab New Zealand is held by Royal Society Te Apārangi with support from the German Embassy in Wellington, the Ministry of Business, Innovation and Employment, Catalyst: Leaders fund and EURAXESS Australia & New Zealand. Falling Walls Lab is a global platform for students and early career professionals to pitch their innovative solutions to pressing challenges.

VIEW MORE ON ROBOTIC CAPSULE
bit.ly/2021HL-55

2021 MARKED 150 YEARS SINCE THE BIRTH OF ERNEST RUTHERFORD FRSNZ.

Rā whānau Rutherford

Born in Brightwater, near Nelson, he gained three degrees in New Zealand before winning a scholarship to study at Cambridge University in the UK. In 1908 he won the Nobel Prize in Chemistry "for his investigations into the disintegration of the elements, and the chemistry of radioactive substances". He went on to make even more stunning discoveries in physics about the parts of an atom. We celebrated his legacy with a number of activities. These included sharing 150 facts about Lord Rutherford, a design competition for tauira to design a new $100 bill featuring his work and contributions and a video series highlighting his life and the impact of his discoveries on science and society today.

We also published a special issue in the *Journal of the Royal Society of New Zealand* guest edited by Niels Kjærgaard and Daniel Schumayer.

"Rutherford was the person who really discovered the founding principle of radiocarbon dating. He looked at uranium and how that breaks down in a sequence which is known. It can be used for dating fossils going back millions of years."

ASSOCIATE PROFESSOR SIÂN HALCROW, EXPLAINING THE LINK BETWEEN RUTHERFORD AND THE CARBON DATING SHE USES IN HER RESEARCH

MORE ON RĀ WHANAU RUTHERFORD 150
bit.ly/2021HL-56

2021 Rutherford Discovery Fellowships

Each year on behalf of the government, the Society awards Rutherford Discovery Fellowships to leading early- to mid-career researchers, supporting them to accelerate their research careers in New Zealand.

In 2021, the fellowship span a wide variety of interesting topics, including:

- using te ao Māori approaches to co-develop science pūrākau narratives to facilitate kaitiakitanga guardianship and conservation through genomics research of endangered species
- developing low cost and environmentally-friendly solar cells made entirely from organic compounds to increase the energy efficiency of electricity generation from the sun
- using online citizen science to perform large scale studies to understand how the human mind perceives and produces music, and why music appears across cultures with such remarkable diversity.

> "Being awarded a Rutherford Discovery Fellowship is an immense recognition. It is a substantial investment in individuals to intensively pursue their world-class research programmes at a critical stage in their careers. But beyond this, it is an opportunity to be part of a very special group of young New Zealanders who are not only deeply ambitious for their discipline but also highly driven to make a profound and substantial impact on Aotearoa, its international reputation, and the wellbeing of its people."

PROFESSOR CLEMENCY MONTELLE, SELECTION PANELLIST AND FORMER RUTHERFORD DISCOVERY FELLOW

VIEW MORE ABOUT THE 2021 RUTHERFORD DISCOVERY FELLOWS
bit.ly/2021HL-57

2021 RUTHERFORD DISCOVERY FELLOWS

Alana Alexander, Te Hikutu, Ngāpuhi, University of Otago, for research titled: Creating pūrākau of past, present, and future conservation impacts using genomics.

Htin Lin Aung, University of Otago, for research titled: Development of patient- and community-centric tuberculosis healthcare services: a multidisciplinary approach to close the health inequalities gap.

Amanda Black, Lincoln University, for research titled: Genomes to giants: restoring resilient soil ecosystems in kauri forests.

Calum Chamberlain, Te Herenga Waka – Victoria University of Wellington, for research titled: Probing the variability in earthquake nucleation mechanisms in New Zealand.

Kelly Dombroski, University of Canterbury, for research titled: Transitioning to caring economies through transformative community investments.

Jessica Lai, Te Herenga Waka – Victoria University of Wellington, for research titled: Patents and power: a critical analysis of knowledge governance.

Khoon Lim, University of Otago, for research titled: 3D bioprinting of functional vascular networks.

Samuel Mehr, Te Herenga Waka – Victoria University of Wellington, for research titled: Psychological and cultural foundations of music.

Sereana Naepi, University of Auckland, for research titled: Planning for change: an analysis of neoliberalism, equity and change in higher education.

Michael Price, Te Herenga Waka – Victoria University of Wellington, for research titled: The physics of next generation solar panels and light emitters for sustainability.

Justin Rustenhoven, University of Auckland, for research titled: Cleaning the brain drains: augmenting meningeal lymphatic dysfunction in aging and neurodegenerative disease to alleviate cognitive decline.

He kapua rere ā manu
Cloud fleetingly captured as a bird in flight

Photographer Susan Blick captured this photo of a perfectly-formed tūī in the clouds above Aoraki Mt Cook in kōanga spring.

Q4

SUSAN BLICK
PHOTOGRAPHY

2021 Research Honours Aotearoa

CONTRIBUTIONS OF INNOVATORS, KAIRANGAHAU MĀORI, RESEARCHERS AND SCHOLARS THROUGHOUT AOTEAROA NEW ZEALAND WERE RECOGNISED BY THE AWARDING OF THE 2021 RESEARCH HONOURS AOTEAROA MEDALS AND AWARDS. UNFORTUNATELY, THE COVID-19 ALERT LEVELS MEANT WE WERE UNABLE TO HOST FACE-TO-FACE EVENTS IN 2021. ACADEMY CHAIR PROFESSOR CHARLOTTE MACDONALD SAID NOT BEING ABLE TO PRESENT THE AWARDS IN PERSON IN NO WAY DIMINISHED THE PRIDE OR DELIGHT FELT IN AWARDING THESE PRIZES.

"Across a great many fields of research, we see outstanding work bringing new knowledge into being, expanding the way we understand the world, and changing the lives of people. A particular feature of 2021 is the success of research groups. We applaud their collaboration."

CHARLOTTE MACDONALD

THE ACADEMY OF ROYAL SOCIETY TE APĀRANGI ASSESSES THE NOMINATIONS FOR SELECTING THE WINNERS OF THE SOCIETY'S MEDALS AND AWARDS. OUR PARTNER, THE HEALTH RESEARCH COUNCIL OF NEW ZEALAND, ALSO PRESENTS THREE MEDALS FOR RESEARCH HONOURS AOTEAROA EACH YEAR.

IMPACT OF HOUSING ON HEALTH

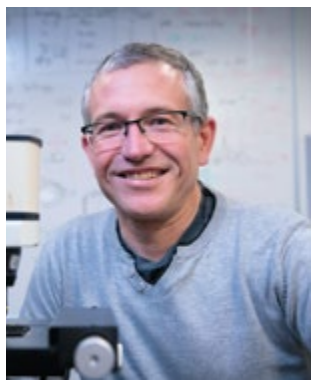
The **Rutherford Medal** is a prestigious award instituted by Royal Society Te Apārangi, at the request of the Government. Awarded annually, it recognises preeminent research, scholarship or innovation by a person or team and comes with a $100,000 prize from the Government. In 2021 it was awarded to Distinguished Professor **Philippa Howden-Chapman** CNZM QSO FRSNZ and the **He Kāinga Oranga/Housing and Health Research Programme** including Professor **Julian Crane**, Associate Professor **Michael Keall**, and Associate Professor **Nevil Pierse** from University of Otago, Wellington. The award was given for the groundbreaking research that has quantified the effects of housing interventions on occupants' health and wellbeing, and informed legislation and policy. The team's research has shown how straightforward housing improvements to cold, damp and unsafe conditions can significantly reduce rates of infectious, respiratory and cardiovascular disease and deaths, particularly for children and older people. This research has influenced public policy innovation and implementation.

LEADERSHIP FOR NEW ZEALAND ANTARCTIC RESEARCH

Professor **Gary Wilson** from GNS Science was awarded the **Thomson Medal** for leadership in developing New Zealand's international profile in Antarctic research. Through his roles as Director of the New Zealand Antarctic Research Institute, Chief Scientific Advisor at Antarctica New Zealand and the New Zealand delegate to the Scientific Committee on Antarctic Research, Gary has provided important and strategic leadership for the New Zealand Antarctic Research Programme, which has supported more than 100 New Zealand researchers and research students to conduct research in many frontier areas and present their findings at the highest international level.

HOW NUTRIENTS MOVE THROUGH SOIL INTO WATER

Professor **Rich McDowell** FRSNZ from AgResearch and Our Land and Water, National Science Challenge, received the **Hutton Medal** for outstanding contributions to the knowledge of nutrient flows in soils and water, and informing farm management and environmental policy. A soil scientist, Rich is best known firstly for showing how contaminants move across land and into water, and secondly how to manage land to mitigate losses. He has used this knowledge to inform policy and has made an immense contribution to the strategies available in New Zealand and overseas for mitigation of nutrient losses to water



REVOLUTIONISING CHEMICAL ANALYSIS AT THE NANOSCALE

The **Hector Medal** was awarded to Professor **Eric Le Ru**, Te Herenga Waka – Victoria University of Wellington, for his world-leading research in analytical chemistry using surface-enhanced spectroscopies. He is a pioneer in the research field of how electromagnetic fields are enhanced around metallic nano-objects, how this changes the interactions between molecules and materials, and how this knowledge can allow molecules to be detected by vibrational spectroscopy techniques, such as surface-enhanced Raman spectroscopy (SERS). This knowledge is leading to the creation of next-generation biosensors based on this new understanding in physics and chemistry.

DECOLONISING TOWNS AND CITIES

The **Te Rangaunua Hiranga Māori Award** was presented to the **Imagining Decolonised Cities** team for their innovative combining of decolonial scholarship with urbanism practice and engaging rangatahi as mātauranga co-producers. The work of the team has led to clear and thoughtful discussions of what decolonisation could look like and has moved society to rethink curriculums, admissions practices, teaching practices, and how to better serve our community. The interdisciplinary collaboration between iwi and university researchers alongside rangatahi has ensured the work is relevant and accessible to whānau, hapū and Māori communities.

CREATING SPACE FOR MĀORI IN THE ACADEMY

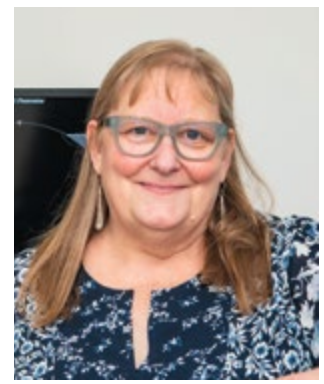
Professor **Linda Waimarie Nikora** FRSNZ (Te Aitanga a Hauiti, Ngāi Tūhoe) from the University of Auckland received the **Te Rangi Hiroa Medal** for transforming Psychology for Māori and Aotearoa by indigenising the discipline, and for enduring contributions to shaping the foundations for promising and flourishing futures for all New Zealanders. Linda's first notable achievement was championing for recognition of the Treaty of Waitangi responsibilities into the New Zealand Psychological Society, which led to the establishment of the Bicultural National Standing Committee on Bicultural Issues. Among many firsts, Linda became the first Māori Professor of Psychology while at the University of Waikato, where she co-developed the Māori and Psychology Unit, which has been central to the rise of mātauranga Māori-focused research.

SOCIO-POLITICAL FILMMAKER TACKLING DIFFICULT ISSUES

Professor **Annie Goldson** ONZM FRSNZ, from the University of Auckland, was awarded the **Humanities Aronui Medal** for her documentaries that explore difficult contemporary socio-political issues ranging from war, genocide, and sexuality to surveillance and her influential academic work. Her 26 films have attained critical and commercial success. Titles include *Kim Dotcom: Caught in the Web* on surveillance, privacy, internet piracy and geo-political relationships; *First in Family* about five students who are first in whānau to enter university; *The Eruption: Stories of Survivors*, examining the Whakaari/White Island eruption and its aftermath and most recently *A Mild Touch of Cancer* which explores the science and history of cancer immunotherapy.

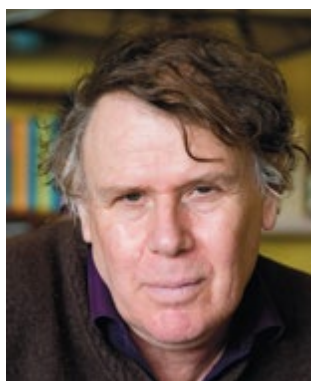
TRANSFORMING TREATMENT OF VIOLENT INDIVIDUALS

The **Mason Durie Medal** was awarded to Professor **Tony Ward** FRSNZ, Te Herenga Waka – Victoria University of Wellington, for his original work on treating violent individuals that has been hugely influential around the world. Tony is a clinical psychologist who has been working in the clinical and forensic field for over three decades. His preeminent research has reshaped correctional models across the globe. His work has driven substantial empirical research projects, resulting in treatment programme innovation in at least 15 countries. Tony's pioneering research has transformed correctional rehabilitation both nationally and internationally, positioning New Zealand on the global map for forensic psychology.



RELEARNING THE ABILITY TO SWALLOW

Distinguished Professor **Maggie-Lee Huckabee** from the University of Canterbury received the **MacDiarmid Medal** for sustained excellence in translational research to improve patient outcomes, decrease healthcare costs and create innovative technologies associated with swallowing impairment. Maggie-Lee has developed a 'therapeutic video game' that gives biofeedback to patients to improve aspects of their swallowing after stroke, brain injury or neurological disease. Her simple clinical diagnosis swallowing test is now used in 13 countries and is decreasing hospital stays and chest infections.



A TIRELESS SUPPORTER FOR NEW ZEALAND LITERATURE

The **Pou Aronui Award** was presented to Emeritus Professor **Harry Ricketts**, Te Herenga Waka – Victoria University of Wellington, for being one of the most prolific figures in New Zealand literature, as a writer, teacher, editor and promotor of local intellectual culture. He has written over 30 books – his most notable being his internationally acclaimed biography of Kipling, *The Unforgiving Minute: A Life of Rudyard Kipling*, which positioned him as one of the world's leading Kipling scholars. Harry has profoundly contributed to many facets of New Zealand literature and literary culture.

TECHNOLOGY TO TREAT DAIRY EFFLUENT

The **Pickering Medal** was awarded to Professor **Keith Cameron** ONZM FRSNZ and Professor **Hong Di** ONZM FRSNZ from Lincoln University for inventing new technology to treat dairy farm effluent to recycle water and reduce phosphate and E coli leaching into water. ClearTech® is a fully-automatic treatment system that uses a coagulant to produce 'clarified water' and 'treated effluent'. It reduces the volume of effluent that needs to be irrigated or stored; clarifies and recycles more than 50% of the water that can be used to wash the farmyard; and reduces the risk of contamination of rivers, lakes and groundwater, reducing phosphate and E coli leaching by over 90%.

COST-EFFECTIVE SUPERCONDUCTORS

Dr **Zhenan Jiang** from Te Herenga Waka – Victoria University of Wellington was presented the **Scott Medal** for global leadership in measuring and modelling the response of superconductors to applied currents and magnetic fields, thereby enabling cost-effective superconducting machines. High Temperature Superconductors (HTS) offer the promise of very low energy losses and increased power in electrical machines. Zhenan has developed the demanding measurement techniques required to understand the relationships between losses and fields, computational modelling to allow its prediction, and engineering methodologies to support its application. His work is allowing improvements to high-speed trains, aircraft motors and wind power generation.

VIEW MORE ON ALL 2021 RESEARCH HONOURS AOTEAROA WINNERS
bit.ly/2021HL-64

EARLY CAREER RESEARCH

AIRBORNE MICROPLASTICS CONTRIBUTE TO CLIMATE CHANGE

The **Cooper Award** was presented to Dr **Laura Revell**, University of Canterbury, for her chemistry-climate interaction modelling work and pioneering research on understanding how microplastics might impact the Earth's climate. Laura's research focuses on how greenhouse gases and airborne particulate matter behave in the atmosphere, and how Earth's climate is affected as a result. She has led numerous climate modelling studies examining how greenhouse gas emissions affect the ozone layer and air quality. Her research group recently reported the presence of airborne microplastics in New Zealand – the first study of its kind - and is studying how airborne microplastics interact with the global climate system.

TRUE VULNERABILITY OF THE SOUTH POLE TO GLOBAL WARMING

The **Hamilton Award** for encouraging excellence in scientific research by early-career researchers in New Zealand was presented to Dr **Kyle Clem**, Te Herenga Waka – Victoria University of Wellington, for his research on the warming of the remote interior of Antarctica. He has shown the true vulnerability of remote polar regions to warming, having identified the different influences of Antarctica's warming. Kyle's research offers crucial insights of global significance regarding the future of increasing global temperatures and natural variations.

ASSESSING WHICH VOLCANOES WILL ERUPT AFTER EARTHQUAKES

Dr **Gilles Seropian**, from the University of Canterbury, was presented with the **Hatherton Award** for providing a framework to understand why some volcanoes are more likely to erupt after an earthquake than others. Gilles' paper – the first review on this topic for 15 years – describes what is happening inside a volcano after an earthquake happens nearby. The study shows that the volcano's hydrothermal system (the topmost part where water is heated into steam) is particularly sensitive to earthquakes and that an earthquake cannot trigger an eruption unless the volcano is already close to erupting.

UNDERSTANDING THE IMPORTANCE OF INDIGENOUS WATER RIGHTS

The **Early Career Research Excellence Award for Humanities** was awarded to Associate Professor **Elizabeth Macpherson** from the University of Canterbury for her work on opportunities for Indigenous peoples' water rights in laws and policies around the world. In 2019, she released her book *Indigenous Water Rights in Law and Regulation: Lessons from Comparative Experience*, which is now regarded as the first comprehensive examination of laws and policies around the world that protect Indigenous peoples' rights to use and regulate water. This book is ground-breaking in its coverage and insights into international legal and policy frameworks for Indigenous water rights.

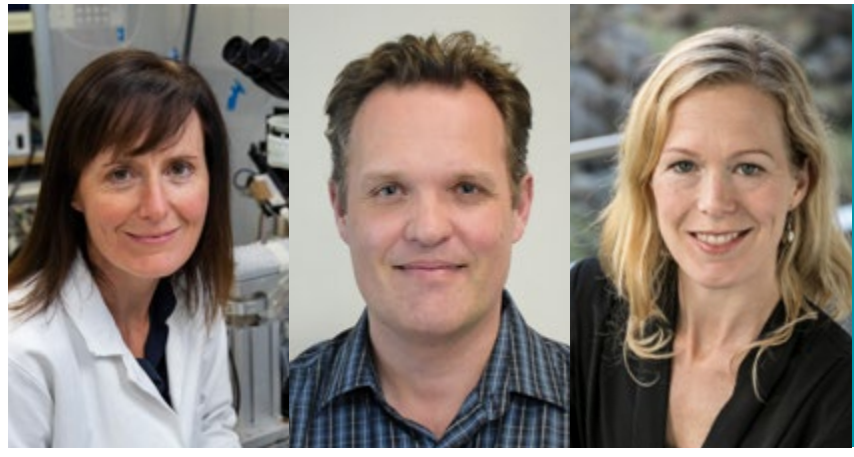
THE POWER OF LISTENING IN THE FACE OF STRUCTURAL INJUSTICE

Dr **Emily Beausoleil** from Te Herenga Waka – Victoria University of Wellington received the **Early Career Research Excellence Award for Social Sciences** for identifying key obstacles to listening by advantaged groups and creating effective anti-racism strategies. Emily's research helps to enhance equality of voice in diverse communities by studying the conditions that underlie chronic inattention and inaction by advantaged groups, and the insights these have for designing more effective forms of civic engagement.

SHIFTING THE BOUNDARIES OF SPEECH-LANGUAGE THERAPY WITH KAUPAPA MĀORI

The **Early Career Te Kōpūnui Māori Research Award** was received by Dr **Karen Brewer** (Whakatōhea, Ngāi Te Rangi) from the University of Auckland for a kaupapa Māori speech-language therapy resource for whānau with communication difficulties following stroke. The resource includes bilingual resources for therapists and whānau as well as an online course that covers the health inequities faced by Māori, and social determinants of health, racism, Te Tiriti o Waitangi, cultural safety, and power inherent in the therapist's role. This course shifts the boundaries of speech-language therapy beyond traditional 'cultural competence' to a public health approach that focuses on the culture of speech-language therapy as a discipline and the context of Māori as Indigenous peoples in a colonised society.

Research fellowships



‘LITTLE BRAINS’ OF THE HEART, GREEN HYDROGEN & WOMEN’S WELLBEING

THREE RESEARCHERS AT THE HEIGHT OF THEIR CAREERS HAVE BEEN AWARDED FELLOWSHIPS TO UNDERTAKE STUDY OR RESEARCH IN THEIR FIELD OF ENDEAVOUR FOR TWO YEARS, RECOGNISING THEIR SUSTAINED RESEARCH EXCELLENCE.

Associate Professor **Johanna Montgomery**, University of Auckland, will explore the underlying function of nerve cells called ‘ganglionated plexi’ clustered on the heart. These nerve cells act as ‘little brains’ controlling the rhythm of the heart. They play a key role in atrial fibrillation, a condition of the heart that causes an irregular and often rapid heart rate, and is linked to an increased risk for stroke, heart failure and dementia.

Associate Professor **Geoffrey Waterhouse**, University of Auckland, aims to advance Aotearoa New Zealand’s path to a Green Hydrogen Economy, whereby hydrogen is generated from water with renewable electricity, with the hydrogen produced then used in fuel cells to generate electricity as required. He will explore the potential of a new type of catalyst – metal single-atom catalysts – for driving the oxygen evolution and oxygen reduction reactions needed for these energy conversion reactions.

Professor **Holly Thorpe**, University of Waikato, will research how the global pandemic has impacted New Zealand women’s wellbeing – their social, physical, mental, and spiritual health, their connection to people and places, and their sense of belonging to their communities – as well as the strategies they have devised to rebuild relationships and renew a sense of hope in the future.

VIEW MORE ON THE 2021 JAMES COOK RESEARCH FELLOWS
bit.ly/2021HL-66

EARLY CAREER RESEARCHERS AWARDED

fellowships & scholarships

Our Rutherford Foundation awarded five postdoctoral fellowships and one PhD scholarship with funding from the government in 2021. The researchers will be exploring a diverse range of research topics, including:

- how to educate our innate immune system to improve long-term population health
- metallic catalysts to reduce carbon dioxide in the atmosphere
- neoliberalism and regimes of migrant detention in Aotearoa
- developing youth resilience and wellbeing through better "youth-adult helping relationships"
- impact of regenerative agriculture on soil microbial communities
- developing gene therapy for inherited eye diseases.

TWO-YEAR NEW ZEALAND POSTDOCTORAL FELLOWSHIPS

Dr **Hilary Dutton**, University of Canterbury, for research titled: Youth experiences of self-disclosure in youth-adult helping relationships.

Dr **Syrie Hermans**, Auckland University of Technology, for research titled: Regenerative agriculture in Aotearoa: are soil microbial communities indicators of agroecosystem benefits?

Dr **Kerry Hilligan**, Malaghan Institute of Medical Research, for research titled: Improving long-term population health through education of the innate immune system.

Dr **Charlie Ruffman**, University of Auckland, for research titled: Flicking the switch to reduce carbon dioxide by melting metallic alloys.

Dr **Neil Vallelly**, University of Otago, for research titled: The borders of capital: neoliberalism and regimes of migrant detention in Aotearoa New Zealand.

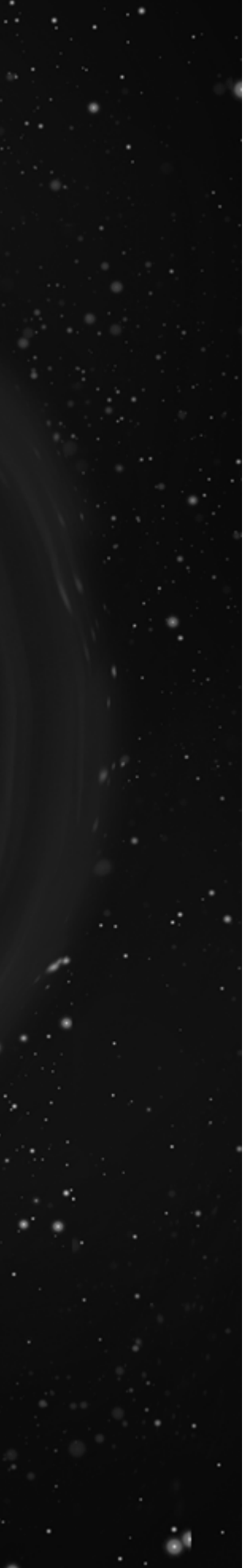
THREE-YEAR CAMBRIDGE RUTHERFORD MEMORIAL PHD SCHOLARSHIP

Dr **Rahul Makam** (MBChB), University of Cambridge, for research titled: Exploring gene therapy paradigms for mitochondrial blindness.

VIEW MORE ON RUTHERFORD FOUNDATION 2021 AWARDEES
bit.ly/2021HL-67

MARSDEN FUND SUPPORTS

innovative research in Aotearoa



TE PŪTEA RANGAHAU A MARSDEN ALLOCATED $82.345 MILLION (EXCLUDING GST) TO 120 RESEARCH PROJECTS LED BY RESEARCHERS IN AOTEAROA IN THE 2021 FUNDING ROUND. THESE GRANTS SUPPORT EXCELLENT NEW ZEALAND RESEARCH IN THE HUMANITIES, SCIENCE, MATHS, SOCIAL SCIENCES AND ENGINEERING. THE GRANTS ARE DISTRIBUTED OVER THREE YEARS AND ARE FULLY COSTED, PAYING FOR SALARIES, STUDENTS AND POSTDOCTORAL POSITIONS, INSTITUTIONAL OVERHEADS AND RESEARCH CONSUMABLES.

This year one large interdisciplinary project received a Marsden Fund Council Award worth $3 million (excluding GST) to investigate ways to decipher gravitational waves – ripples in space-time caused by accelerating massive objects.

Marsden Fund Fast-Start grants support early career researchers to develop independent research and build exceptional careers in New Zealand. In 2021, there were 44 recipients of Fast-Start grants. Project topics include Cook Islands Māori language; young onset Parkinson's disease; the effects of climate change on the kuku green lipped mussel; more sustainable South Pacific tourism in a Covid-19 world; and how girls deal with the potential dangers and potential social benefits of online media.

Established research leaders and their teams were awarded 75 Marsden Fund standard grants. The research projects address a range of issues of both local and international importance from how we age; understanding the mechanism of an artificial nose; how body temperature is regulated during pregnancy; through to investigating whether the building blocks of life can form in the atmosphere of Titan, Saturn's largest moon.

The engagement with mātauranga Māori was recognised across discipline areas. Some examples include investigating the cultural importance, sustainability and affordability of urupā tautaiao natural burials; exploring the potential for green innovation – including by Māori – in the environmental impact of body disposal; the genetic variations associated with gout; and using cutting-edge tools to better align archaeological findings with Māori history.

Te Pūtea Rangahau a Marsden is managed by Royal Society Te Apārangi on behalf of the New Zealand Government with funding from the Ministry of Business, Innovation and Employment. Nā Te Hīkina Whakatutuki te mana hāpai.

"The range of knowledge represented in this year's funded research is something to be proud of, with research excellence and scholarly impact in areas such as hauora health, climate, and languages. The outcomes of this research will benefit Aotearoa in many ways, for example, by helping us to better understand who we are and by discovering novel solutions for some of our most pressing problems."

PROFESSOR DAVID BILKEY,
MARSDEN FUND COUNCIL CHAIR

DECODING SIGNALS FROM THE UNIVERSE

An extensive collaborative team led by Professor Renate Meyer from the University of Auckland was awarded a Marsden Fund Council Award. The team will bring together expertise in mathematics, computational science, fundamental physics, and novel statistical methodologies from across Aotearoa to make core contributions to gravitational wave science and facilitate participation in the international Laser Interferometer Space Antenna (LISA) mission. LISA will measure low frequency gravitational waves, offering ringside seats to mergers of black holes and neutron stars, which are among the most enigmatic objects in the universe. The team will look at both the statistical challenges faced when attempting to extract the gravitational wave signals from the raw data, and the properties of key sources of gravitational waves. Fundamentally, the global effort seeks to realise the potential of gravitational wave observatories to advance stellar astronomy, galactic astrophysics, and fundamental particle physics.

"I am focused on the statistical side of things and analysing the data but it is awe inspiring to think about the huge universe out there."

RENATE MEYER

VIEW MORE ON MARSDEN FUND COUNCIL AWARD
bit.ly/2021HL-70a

"Social media can provide a megaphone for those sharing misinformation, and I worry about the harm that misinformation can cause. That said, I don't believe there is currently strong evidence that people are any more likely to believe misinformation or conspiracy theories now than in the past. Sharing misinformation and conspiracy theories is something humans have done for a very long time."

MATT WILLIAMS

FALLING DOWN THE CONSPIRACY THEORY RABBIT HOLE

Dr Matt Williams from Massey University was awarded a Marsden Fund Fast-Start grant to investigate what influences people in their decisions to believe, or not to believe, conspiracy theories. Conspiracy theories are attempts to explain significant events as the result of secret plots by powerful individuals or organisations. The spread of beliefs in unfounded conspiracy theories can have extremely serious consequences, such as the 2021 attack on the US Capitol by rioters and burning of cell phone towers here in Aotearoa due to conspiracy theories about 5G technology and Covid-19. Matt and his colleagues will launch a first-of-its-kind longitudinal study over two years. The study will answer three crucial questions: 1) When a person changes their belief about a conspiracy theory, what reasons do they give for this change? 2) To what extent does belief in one conspiracy theory lead to belief in other conspiracy theories? 3) Do negative experiences such as stress and depression contribute to belief in conspiracy theories?

READ MORE ON THE CONSPIRACY THEORY PROJECT
bit.ly/2021HL-70b

CAN SPIDERS COUNT?

Arachnologist Dr Fiona Cross, University of Canterbury, was awarded a Marsden Fund Standard grant to investigate whether spiders can count. It is known that some animals sense the number of things when they are differentiating individual objects, but do these discoveries hold true for spiders? Fiona and her team will examine this question in jumping spiders. The proposed research brings together a custom virtual reality setup and eye-tracking equipment to visualise in real time how jumping spiders can differentiate visual objects or cues. This research will provide a deeper understanding of animal cognition, as well as the deeper philosophical question of whether mathematics is only a physical descriptor of the physical world for humans or is innate to all life.

"We do know that jumping spiders can see remarkably well for an animal of their size – they have got these very special little eyes, so we know they will be able to see the prey, but using the technology it will give us a greater idea of how the spider is looking at the different numbers of prey it encounters."

FIONA CROSS

READ MORE ON SPIDERS COUNTING PROJECT
bit.ly/2021HL-70c

VIEW MORE ON THEIR GOLD CREST PROJECT
bit.ly/2021HL-71

Digital navigation of schools

CAITLIN NAYLOR AND JORDAN DAUBNEY FROM PALMERSTON NORTH GIRLS' HIGH SCHOOL WERE AWARDED A GOLD CREST FOR THEIR PROJECT TO CREATE A WEBSITE TEMPLATE TO ALLOW DIGITAL NAVIGATION OF SCHOOLS.

"In schools all over the country, complex and confusing paper maps are printed and wasted by students who quickly crumple or lose them. We hoped our project would increase hospitality, convenience and eco-friendliness of the schools."

CAITLIN NAYLOR AND JORDAN DAUBNEY

They investigated the feasibility of creating a template using traditional website coding (HTML, CSS and JavaScript) that would allow schools to easily create a wayfinding website. These websites would help those unfamiliar with a particular school's layout, such as new students, teachers and visitors, to easily navigate around the school. This project was an extension of their Team Silver CREST Challenge project, for which they created a navigation app for Palmerston North Girls' High School.

To create the website template, information was gathered from six local schools on different layouts, facilities and year levels. This information allowed the team to develop rough paper prototypes and then digital conceptual designs for the schools' websites. The template was then coded and refined with additional features (such as a search bar, hamburger menu, extra maps and information) to be as flexible for different school layouts and as useful and efficient for the user as possible.

The website template was then applied to make navigation websites for four schools and the ability to adjust for the different schools was confirmed. User testing on students unfamiliar with the school's layout found that the majority of students found the websites user-friendly and almost all could find locations on the school checklist using the navigation website.

2021 Ngā Takahoa a Te Apārangi Companions

IN HAKIHEA DECEMBER WE ANNOUNCED FOUR PEOPLE AS NEW NGĀ TAKAHOA A TE APĀRANGI COMPANIONS OF ROYAL SOCIETY TE APĀRANGI. THIS HONOUR RECOGNISES OUTSTANDING LEADERSHIP OR EMINENT CONTRIBUTIONS TO PROMOTING AND ADVANCING HUMANITIES, SCIENCE OR TECHNOLOGY IN NEW ZEALAND.

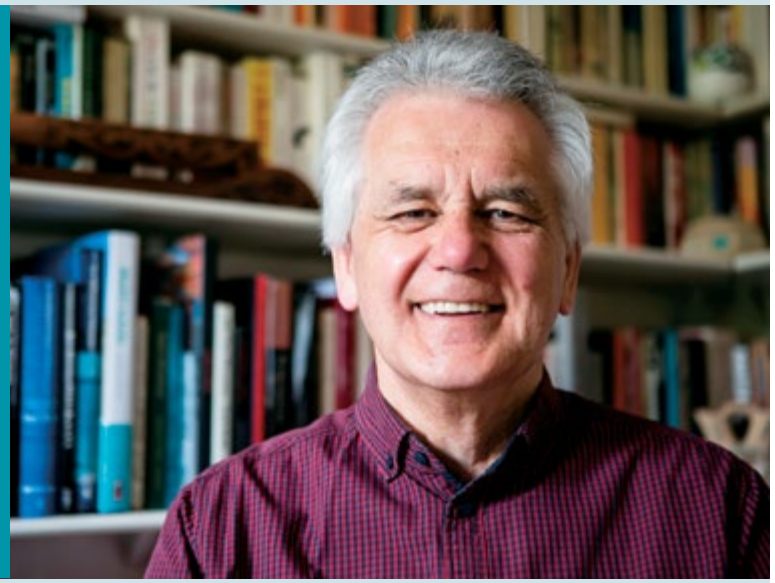


Photo: Aaron Smale

"No one's exercise of free speech should make another feel less free."

MOANA JACKSON

Dr **Moana Jackson**, Ngāti Kahungunu, Ngāti Porou, Rongomaiwahine, was among the most highly valued and respected lawyers in Aotearoa New Zealand. He was a specialist in Te Tiriti o Waitangi and constitutional issues. In 1988, Moana's ground-breaking report *He Whaipaanga Hou* was published for the then Justice Department, and continues to be a major influence on attempts to decolonise the criminal justice system in Aotearoa.

He was, most significantly, the first to argue that Māori should have the opportunity for an alternative justice system and that the Māori experience must be seen on Māori terms, not forced onto preconceived notions of Pākehā methodologies. He was a forerunner in this field and worked extensively overseas on international Indigenous issues. (Sadly, Moana Jackson died in Poutū-te-rangi March 2022).

Professor **James Renwick** CRSNZ, Te Herenga Waka – Victoria University of Wellington, is a leading researcher in atmospheric science and climate dynamics and is highly regarded through his leadership and commitment to outreach and communication about climate change. He was the recipient of the 2018 Prime Minister's Science Communication Prize, and was an integral member of the 'Melting Ice & Rising Seas Team', that won the 2019 Prime Minister's Science Prize. He is an authority on large-scale climate variability and climate change, focusing on the Southern Hemisphere and an advocate for evidence-based decision making. James is renowned for his dedication to advancing public understanding and awareness of the threat of climate change, and to ensuring the science is accessible to policymakers. He has been lead author on two reports for the Intergovernmental Panel on Climate Change.

"We have to talk. We can't not. This is a really hard problem, but we have to step up and we have to be courageous about it."

JAMES RENWICK

"Right now, we simply cannot afford to have any new major disruptions from invasive species – similar to PSA or Mycoplasma bovis – because our primary industries will be vital in pulling us through this period of economic disruption and uncertainty."

DAVID TEULON

Dr **David Teulon** CRSNZ, Plant & Food Research, has, through outstanding leadership, championed plant biosecurity research in New Zealand during a period of ever-increasing biosecurity threats. Invasive pests and diseases are a major threat to New Zealand agricultural and horticultural sectors, on which much of our economy is based. David has had an exemplary national and international impact on biosecurity research during his tenure as Director of Better Border Biosecurity (B3) a multi-partner, cooperative science collaboration. For eight years, he has markedly increased B3's relevance and led trusted partnerships with the Bio-Protection Research Centre and Biological Heritage National Science Challenge. He champions Māori capacity in biosecurity and his lure for the thrips pest dominates the world market.

Sir **William Te Rangiua (Pou) Tēmara** KNZM CNZM CRSNZ, Tūhoe, is a paramount scholar and prominent exponent of te reo Māori and kaupapa philosophy, and is a cultural authority on whaikōrero oratory, whakapapa, and karakia. As a language teacher and practitioner, Sir Pou's contributions to the retention and advancement of Māori language, cultural practices and values are unrivalled. He was until recently Professor of Tikanga and Te Reo Māori in the Faculty of Māori & Indigenous Studies, University of Waikato, and is now Professor of Māori Philosophy at Te Whare Wānanga o Awanuiārangi. One of his greatest triumphs was Te Panekiretanga o te Reo – a Māori language Institute of Excellence, which he led alongside Sir Tīmoti Kāretu and the late Dr Wharehuia Milroy for over 15 years. It produced a vast number of graduates of te reo Māori who would be considered some of the best exponents of the language today.

"Is there a greater honour than to be acknowledged by your enemy as a warrior."

SIR POU TĒMARA

VIEW MORE ON THE COMPANIONS
bit.ly/2021HL-74

"Revisiting what we mean by scientific freedom and responsibility in the 21st century is part of this important process of reflection and adaptation to the world around us. It must allow international scientific organisations like the ISC to mobilise the international scientific community toward action aimed at realising its responsibilities to society and advancing science as a global public good."

HEIDE HACKMANN, FORMER CEO OF INTERNATIONAL SCIENCE COUNCIL

Researchers combat new threats to key human rights

International Science Council
The global voice for science

On the United Nations' Human Rights Day, 10 Hakihea December 2021, a landmark paper on how to protect the human right to science was released. It examined current threats to science and proposed key actions to protect the right to share in and benefit from advances in science and technology.

Commissioned by the International Science Council and produced by a group of experts from around the world, including a former Society President Emeritus Professor Dick Bedford QSO FRSNZ, this paper proposes key actions for scientists, research institutions, science organisations, the private sector, and governments to combat the challenges for free and responsible science in the 21st century. Society kaimahi Frankie Vaughan worked on this initiative in her role as Kaimanaaki Kaunihera Pūtaiao – Ao Whānui Special Advisor to the International Science Council.

VIEW MORE ON HUMAN RIGHTS PAPER
bit.ly/2021HL-75

On reflection
No te huri huringa

KO TE TOHU O TE RANGATIRA HE MANAAKI I TE TANGATA.
THE SYMBOL OF A CHIEF IS CARING FOR PEOPLE.

The year 2021 has been another out-of-the-ordinary year for Aotearoa New Zealand and the world more generally. For the Society, it has been a year of great change.

The end of February 2021 saw Dr Andrew Cleland FRSNZ complete his seven-year tenure as Chief Executive of the Society. Professor Dame Cindy Kiro came into the role, only to be announced soon after as the next Governor-General of New Zealand in May. Dame Cindy is the first wahine Māori to take up this position. Dr Roger Ridley, Mātanga Rangahau Director Expert Advice and Publishing stepped in as Tumu Whakarae Acting Chief Executive to lead the Society until Paul Atkins could begin the role at the end of November.

Professor Wendy Larner FRSNZ finished her three-year term as President of the Society at the end of June 2021. As the incoming President I feel a sense of great privilege and also a strong sense of duty and enthusiasm to continue the mahi Wendy has done in identifying and developing solutions to issues in the research and knowledge sectors. This includes her dedication to supporting early career researchers to be able to fully contribute to this country's research and knowledge ecosystem, strengthening relationships with Māori researchers and te ao Māori, and supporting diversity in the research and knowledge sectors more generally. In June, we held a very successful wānanga He Pito Mata with the kaupapa of awakening the potential of early career researchers in Aotearoa. Another testament to the change Wendy had been driving through the organisation, following on from efforts of her predecessors with support from kaimahi staff, was the make-up of Fellows formally inducted into the Academy in 2021. They comprised an extremely diverse cohort from within and outside academia, which was wonderful to see. The Society benefits greatly from having a diverse range of expertise and disciplines to draw from to support our initiatives.

We are continuing to build on these initiatives and our strategic themes are now:

- **strengthening** diverse and inclusive relationships
- **growing** the reservoir of research and knowledge
- **communicating** and sharing knowledge
- **recognising** excellence.

As well as bringing many changes, 2021 has also been a year of great challenges. Covid-19 has threatened not only people's health and our health system, but also people's livelihoods and ways of life. I am so grateful to live in a country where government seeks and takes the advice of our experts. I would like to express my extreme gratitude to our esteemed Members, Companions, Fellows and associates who have been at the forefront of our response to the pandemic. These include Professor Dame Juliet Gerrard FRSNZ, Associate Professor Siouxsie Wiles MRSNZ, Professor Shaun Hendy FRSNZ, Professor Michael Baker and Professor Sir David Skegg FRSNZ, plus our own Science Media Centre, among many others. Their tireless and critical work has provided sage advice to government and kept the public of New Zealand well-informed about the changing face of the virus.

We also give heart-felt recognition to our medical and frontline essential workers, as well as all of the education sector and tauira students confronting the challenges associated with the Covid-19 global pandemic. Thank you all for your resilience, hard work and innovative ways of getting things done during this extraordinary year. Tino pai te mahi.

Challenges bring opportunities. I have been very proud of the work the Society has been able to do throughout the pandemic. In particular, Te Tapeke Fair Futures project, led through our Expert Advice team, has highlighted many challenges our nation faces. The spotlights of Te Tapeke focused on health, justice, housing and poverty. These topics were viewed through an equity lens, and painted a clear picture of the challenges we face, along with expert commentaries from panel members that further illuminated how we might begin to give different groups in New Zealand a "fairer go".

I would also like to commend the Society's research funding team and those of you who have served as panellists and assessors. Together we have been able to run successful processes to award research funding and fellowships, despite the many disruptions Covid-19 has caused.

Another challenge bearing down on us is the climate crisis. The Society is committed to supporting action to mitigate climate change and facilitate adaptation to it.

We are also committed to supporting science and the principles of freedom of speech, as well as recognising multiple knowledge domains. Later in 2022 we will be launching a new initiative in our wider work programme that will explore the interface between mātauranga and science. I am sure many of you will be keen to contribute. We are also in contact with other Academies around the world and we intend to explore together the interface between science and indigenous knowledge systems of First Nations peoples.

For the coming year, we look forward to holding another wānanga to support Early Career Researchers, extending our inclusiveness and broadening our outreach. Looking after the health and wellbeing of our kaimahi staff and membership will be paramount.

Dr Brent Clothier FRSNZ
Royal Society Te Apārangi President

Kuputaka Glossary

aronui	humanities
arotakenga	evaluation, review
awa	river
hangarau	technology
hapū	kinship group, subtribe
hau	wind
hauora	health, wellbeing
hapori	community
hui	meeting
kai	food
kaiako	teacher
kaimahi	staff
kairangahau	researcher
karakia	prayer, blessing
kapua	clouds
kaupapa Māori	way of doing things, a Māori approach
kōrero	talk, discussion
kura	school
mahi	work
manuhiri	visitors
mātauranga	knowledge, understanding, vision, wisdom
mauri	life force
mihi	greeting, acknowledge, thank
mokopuna	grandchildren, descendant
ngā matawhanui	future vision
pāngaru	mathematics
poroporoaki	farewell
pūrākau	legend, story
pūtaiao	science
rā	sun, day
rā whānau	birthday
rangatiratanga	autonomy to make decisions
rangahau	research
rangatahi	youth
rohe	region, area
rōpū	group
taiao	environment, ecosystem
taiohi	youth
tamariki	children
tangata whenua	local people, hosts
taonga	treasure
tau	year
tauanga	statistics
tauira	student
tautoko	support
te ao Māori	the Māori world
te hiranga	excellence
tikanga	customs, traditional values
tohatoha	share
tono	demand, command
torohē	discover
tūhura	explore
tupuna	ancestor, grandparent
ua	rain
wai	water
wānanga	learning seminar, discussion gathering
whakapapa	ancestry
whānau	family
whenua	land

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ISSN 2537-9283 (Print)
ISSN 2537-9291 (Digital)

Version 1.0

Published May 2022