

# Highlights Te Tau



# Arotakenga

## Our year in review

Tēna koutou katoa. He mihi tēnei ki te whānau whānui. As we reflect on 2022, we look back on a year dubbed by some as one of “fear, fire and fury”. We grappled with a new phase of COVID-19, and the news was dominated by the **Parliament protests, extreme weather, the Queen’s passing, Ukraine and the cost of living**. Once again, we were grateful to continue in our work to support New Zealanders to tūhura explore, torohē discover and tohatoha share knowledge.

In 2022, Matariki was observed as an official public holiday for the first time, formalising its place within our national identity. Matariki marks a period of reflection and remembrance, celebration and festivities, the promise of a new season and renewal.

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# Meremere-tū-ahiahi

## Evening star

Ko Kōpū, nā Māui ngā māhanga puhi-wahine āriki i tīheia Moemoeā. Ka puta, ko Tāwera, ko Meremere-tū-ahiahi. Ka puta, ko Tāwera, ko Meremere-tū-ahiahi. Ina, ka rere whakawhiti whetū, atapō atu a ia, ko Tāwera tēnā. Ina, ka rere whakawhiti rangitūahiahi mai, anō hoki, Ko Meremere-tū-ahiahi a ia.

Venus, Maui brought into existence a set of twins, Tāwera and Meremere-tū-ahiahi. When Venus rises in the morning, it is called Tāwera. When it rises in the evening, it is called Meremere-tū-ahiahi.

KUPU AND TRANSLATION: RIKKI SOLOMON



# Q1

THE STARS RISE IN THE EAST AND SET IN THE WEST, JUST LIKE THE SUN. THE SKY ALSO SHOWS A SMALL CLOCKWISE ROTATION EACH NIGHT AS WE ORBIT THE SUN. IN SUMMER, BRILLIANT VENUS IS THE 'EVENING STAR' LOW IN THE SOUTHWEST, SETTING OVER AN HOUR AFTER THE SUN.



READ MORE ON NEW ZEALAND'S NIGHT SKY  
[stardome.org.nz](http://stardome.org.nz)

# Science Media Centre

PROMOTING ACCURATE, EVIDENCE-  
BASED REPORTING ON RESEARCH,  
SCIENCE AND INNOVATION

AN INDEPENDENT UNIT OF ROYAL SOCIETY TE APĀRANGI, THE NEW ZEALAND SCIENCE MEDIA CENTRE (SMC) CONTINUED ITS ESSENTIAL ROLE IN PROVIDING TRUSTED INFORMATION AND EXPERTISE ON COMPLEX TOPICS TO THE MEDIA AND THE WIDER PUBLIC IN AOTEAROA.



A satellite image of the Tonga eruption, showing a large, circular ash plume in shades of cyan and blue, centered on the island of Tonga. The plume is surrounded by a dark, turbulent sea. The image is a composite of several satellite passes, showing the progression of the eruption and the resulting shock waves.

# Tonga eruption

## SENDS SHOCK WAVES WORLDWIDE

As the year began, the submarine volcano Hunga Tonga Hunga Ha'apai erupted, producing 20km-high ash plumes and destructive tsunami waves in Tonga. The eruption sparked a visible shock wave in satellite imagery and was heard at least as far away as New Zealand.

As the world's attention turned to the Pacific, the SMC gathered expert reaction on the event and early data. When a large global study involving Kiwi researchers came out in May, SMC responded, supporting the study as it revealed a world-first recording of an 'exceptionally rare' pressure wave. It showed this wave signal circled the whole globe at least four times in the first week after the volcano erupted.



# Strengthening Pacific engagement


SCIENCE MEDIA CENTRE (SMC) AND AUSTRALIAN SCIENCE MEDIA CENTRE (AUSSMC) ARE WORKING TOGETHER TO EXPAND THE RANGE OF PACIFIC EXPERT VOICES INCLUDED IN ITS SERVICE TO JOURNALISTS, AND TO AMPLIFY RESEARCH WITH RELEVANCE TO THE PACIFIC.

The project improves the Pacific focus of the shared research news platform Scimex.org through proactive resourcing, engagement, training and support. Pacific institutions will have free access to Scimex.org for the duration of the project, which will help connect Pacific journalists with relevant science stories, newly published research and expertise.

Pacific Engagement Lead **Fesaitu Solomon** has provided excellent guidance for this project, facilitating relationship meetings with organisations in Aotearoa and overseas. SMC attended the Pacific Data Sovereignty 2022 conference in Auckland in November at the invitation of the Pacific Cooperation Foundation, gaining many valuable insights from a diversity of perspectives in the Pacific research community.



“O le tele o sulu e mau ai figota  
Through collaboration we can  
overcome the most difficult  
challenges”

 [VIEW MORE on the work of the SMC bit.ly/2022HL-08](https://bit.ly/2022HL-08)

Scimex.org provides early (embargoed) access to research studies for registered journalists and connects them to media-facing scientists and researchers through a searchable expert directory.



# Supporting freedom in international science

The International Science Council (ISC) called on the international community to better support science systems where integrity is at risk from conflict or times of crisis.

In April, the ISC, together with the World Academy of Sciences and the InterAcademy Partnership, launched the *Science in Exile Declaration*, titled "Supporting at-risk, displaced and refugee scientists: A call to action". The Declaration outlined six key commitments necessary for both immediate and long-term support, and protection to scholars and scientists who are at-risk, displaced or have become refugees, so they can continue to make their rightful contributions to science.

The ISC and partners also published a report in August "*Conference on the Ukraine Crisis: Responses from the European Higher Education*

*and Research Sectors*". In addition, several important statements were released on crises threatening the integrity of science systems in Afghanistan, Nicaragua and Sudan.

Two podcast series gave voice to the challenges and stories behind the publications. A further podcast series, created in partnership with *Nature*, discussed the theme of 'freedom and responsibility in science' through interviews with experts. This explored topics such as building trust in science, the responsible use of emerging technologies, combatting misinformation and disinformation, and the intersections between science and politics.



READ MORE

*Science in Exile* and the Conference on the Ukraine Crisis [bit.ly/2022HL-09](https://bit.ly/2022HL-09)



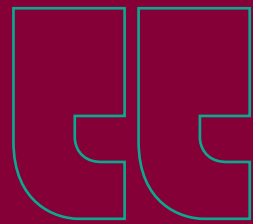
LISTEN TO THE PODCAST SERIES

[bit.ly/2022HL-09b](https://bit.ly/2022HL-09b): a six-part series on *Freedom and Responsibility in Science in the 21<sup>st</sup> century*, a six-part series on *Science in Exile*, and a five-part series on *Science in Times of Crisis*.

TAIAO ARONUI IS AN 18-MONTH PROFESSIONAL SCIENCE LEADERSHIP PROGRAMME DESIGNED AND DELIVERED IN COLLABORATION WITH RANGITĀMIRO, A COLLECTIVE OF FOUR KURA FROM NGĀTI WHAKAUE, TE ARAWA IN ROTORUA INCLUDING TE KURA KAUPAPA MĀORI O KOUTU, TE RANGIHAKAHAKA CENTRE OF SCIENCE AND TECHNOLOGY, ROTORUA PRIMARY SCHOOL AND TE KURA KAUPAPA O TE HURUNGATERANGI.

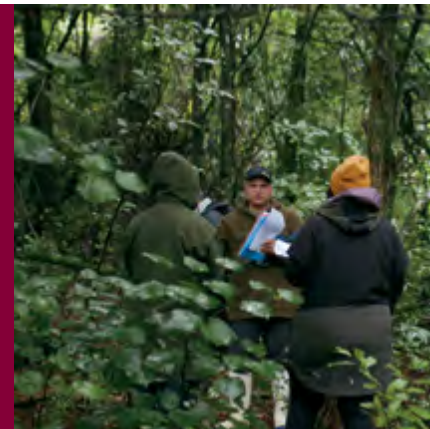


# Taiiao Aronui



“These wānanga go above and beyond, and they make me so grateful to be Māori firstly, and more so a kaiako Māori. This kaupapa enables me to be more confident in kaupapa that are taught within our kura and opens my eyes to the meaningful ways that teaching and learning can and will take place.”

KAIAKO O RANGITĀMIRO







Our inspiring Taiao Aronui programme delivered two wānanga designed to elevate the narratives and local environment of Ngāti Whakaue and Te Arawa into kura curriculum. Kaiako (teachers) are given opportunities to restore, renew and revitalise their practice, enabling them to lead within the fields of pūtaiao (science) and mātauranga Māori.

In January, the Wai Māori wānanga took kaiako on a journey with scientists and local experts to traverse the whakapapa of local water sources throughout Rotorua. They explored:

- › biosecurity techniques and applications used by Te Arawa Lakes Trust for pest eradication and traditional practices currently being trialled as a contemporary response such as uwahi (yam)
- › water testing and health indicators of waterways, as well as from a te ao Māori lens
- › the use and preparation of a mōkihi, traditional waka fashioned from bulrush and flax
- › traditional crayfishing methods readapted to monitor native kōura species.

A second wānanga, Te Wāonui ā Tāne, focused on the diversity and benefits of the local forest environment. Kaiako were encouraged to re-establish their intrinsic connection with the ngahere (forests), explore their unique ecosystem and engage in kaitiakitanga.

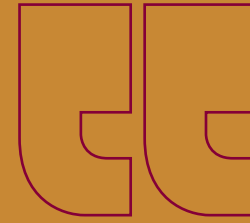
These wānanga were designed in collaboration with Māori practitioners, CRIs, universities and local experts, working alongside Rangitāmiro, to encourage connections between expertise across the sector with the local kura of Ngāti Whakaue.



# Top kairangahau elected as **Ngā Ahurei a Te Apārangī Fellows**

THIRTY NGĀ AHUREI HOU A TE APĀRANGI NEW FELLOWS AND FOUR NGĀ AHUREI HŌNORE HONORARY FELLOWS HAVE BEEN ELECTED TO THE ACADEMY OF ROYAL SOCIETY TE APĀRANGI FOR THEIR DISTINCTION IN RESEARCH AND ADVANCEMENT OF MĀTAURANGA MĀORI, HUMANITIES, TECHNOLOGY AND SCIENCE. THEY ARE WORLD LEADERS IN THEIR AREA OF RESEARCH AND SCHOLARSHIP.





"It is pleasing to see the exceptional expertise of the Fellows elected this year. They have made outstanding contributions to knowledge in their fields and across disciplinary boundaries. Their election adds to the depth of knowledge held within the Academy; they will help support the purpose of Royal Society Te Apārangi to engage with New Zealanders on topics important to all and to recognise outstanding researchers working in Aotearoa."

PROFESSOR CHARLOTTE MACDONALD FRSNZ  
CHAIR OF THE ACADEMY EXECUTIVE COMMITTEE

Being made a Fellow is an honour that recognises distinction in research, scholarship or the advancement of knowledge at the highest international standards. The Society's Academy runs the fellowship nomination and selection process.

Professor **Jennifer Adams** FRSNZ, University of Canterbury, is New Zealand's lead scientist in the IceCube collaboration, whose observatory consists of 5000 sensors distributed over a cubic kilometre under the Antarctic ice at the Amundsen-Scott South Pole Station. The sensors detect Cerenkov radiation from the decay products of very high energy neutrinos interacting with nuclei in the ice. In the past decade this research has led to notable firsts, including: (i) the first discovery of neutrinos with energies 100 times greater than particles in the Large Hadron Collider and (ii) the unambiguous association of neutrino events with gamma-ray flares in active galactic nuclei known as 'blazars'. The significance of the first result is that the energies involved require processes beyond stellar nuclear physics, at vast cosmological distances. The significance of the second result is that it sheds a unique understanding on the physics of accretion disks and jets around the supermassive black holes at the centres of galaxies.



Professor **Andrew Allan** FRSNZ, has had many leadership roles, including Director of the Joint Graduate School linking Plant & Food Research and University of Auckland, where he has a joint appointment. While contributing uniquely to the understanding of the metabolic control of pigmentation pathways, the genes he has described in publications are now used as markers in breeding apples, kiwifruit and other crops. Some thousands of seedlings continue to be screened using these markers. His research has developed plants that undergo continuous flowering (apples, kiwifruit, and others) that promises to speed-up perennial plant breeding many times, ensuring his impact will continue to grow. This work forms the basis of his current MBIE-funded programme 'The Flowering Crisis' which aims to understand the effect of warming temperatures on flowering, as well as educating the public on new technologies. His programmes have specific objectives to enable Māori to inform the development, and be early adopters, of plants developed using these tools.



Associate Professor **Mark Bolland** FRSNZ, University of Auckland, has made major contributions to the treatment of osteoporosis. He led research establishing that calcium supplements increase the risk of heart attacks, and that these harms outweigh any benefits. This research has changed clinical practice: calcium supplements previously were taken by the majority of older adults, but are no longer routinely recommended. In New Zealand, prescriptions for calcium have fallen by more than 90%, saving the country more than \$1million/year. He has also led research showing that vitamin D supplementation does not have important health benefits for otherwise healthy adults, and so is unnecessary, and that bone health is not a significant concern in HIV infection. Additionally, he developed techniques for checking the validity of research publications and exposed a major medical research fraud. In 2015, he was part of the team that won the Prime Minister's Science Prize for work on osteoporosis.



Professor **Klaus Bosselmann** FRSNZ, University of Auckland, is an internationally renowned scholar of environmental law who has significantly contributed to the discourse on environmental ethics, policy, law and governance at national and international levels. The impact of his work on ecological legal theory, rights of nature, ecological integrity, eco-constitutionalism, the Earth Charter and legal developments internationally and in New Zealand is widely acknowledged. Among his awards are the Inaugural Senior Scholarship Prize of the IUCN Academy of Environmental Law and the 2021 Carlowitz Sustainability Award. A number of his books have been translated into multiple languages including *Im Namen der Natur* (1992), *When Two Worlds Collide* (1994), *The Principle of Sustainability* (2008/2017), *National Strategies for Sustainability* (2014) and *Earth Governance* (2015).



Professor **Brendon Bradley** FRSNZ, University of Canterbury, has made significant contributions in several important areas of earthquake science and engineering. In particular, his contributions have focused on first-principles approaches to ground-motion prediction, seismic hazard analysis, and performance-based earthquake engineering. His most notable contributions have involved the development of improved methods for earthquake-induced ground motion selection, validation of empirical and simulation-based methods of ground motion prediction, and the interrogation and interpretation of ground motion observations in large earthquakes. His disciplinary research has also been acknowledged through receiving the 2016 Prime Minister's Emerging Scientist Prize, 2013 Rutherford Discovery Fellowship, and five Marsden Fund grants. As a research leader, he co-led the establishment of QuakeCoRE as a centre of research excellence, which he currently leads as its Director. As a science communicator, he has had a major role in the dissemination of lessons from the 2010–2011 Canterbury and 2016 Kaikōura earthquakes.



Professor **Virginia Braun** FRSNZ, University of Auckland, is a social and health psychologist, specialising in research related to gendered bodies, sex, sexuality, and health. Her scholarship interrogates possibilities for health and bodies looking at the intersections of societal, scientific and public policy knowledge and meaning making. Exemplifying her impactful empirical work, Braun's 2005 paper was the first to critically question the discourse, practice and implications of female genital cosmetic surgery, establishing her as a key international expert. Exemplifying her extraordinary impact is her authorship of one of the most highly-cited psychological and methodological papers ever published. She is invited to teach and present around the world, including as keynote at conferences across social, health and medical sciences, and her works have been translated into numerous languages. Braun received the Marsden Medal (2021) in recognition of her outstanding and sustained contributions to the profession of science.



Professor **Karin Bryan** FRSNZ, University of Waikato, is an internationally-recognised researcher of estuarine processes, coastal morphodynamics and climate-driven variability in waves. Focusing on climatic drivers, and using a quantitative approach and numerical modelling, she is advancing fundamental understanding of wave-energy transformation and its impact on coastal development, erosion, flooding hazards and sea-level rise. Her new theory, tested using New Zealand-based measurements, identifies how turbulence is distorted by shallow-water waves, and is widely applied in turbulence studies around the world. Her later work shows how energy is transferred between bar and shoreline on a beach, ultimately controlling their coupled behaviour. In the late 1990s, she discovered a new form of edge-wave on beaches and demonstrated its existence with field observations in North America, now confirmed globally by others.



Professor **Hallie Buckley** FRSNZ, University of Otago, is a leading bioarchaeologist in the Asia-Pacific region. Buckley's research demonstrates the role of the environment on human diet and health in the past. Her Pacific research has transformed the way we conceptualise the biomedical history of the ancestors of modern Polynesians, the Lapita, and she has made ground-breaking discoveries of ancient disease in Asia. She has applied multi-disciplinary techniques to pioneer foundational knowledge regarding the quality of lives of ancient Asian and Pacific people, and first generation European and Chinese immigrants to Aotearoa. Buckley works closely with descendant communities in all stages of her research. She has facilitated large-scale repatriation projects of kōiwi tangata to mana whenua and engages with various government agencies on forensic identification projects.



Dr **Owen Catchpole** FRSNZ, Callaghan Innovation, is a world leader in the development of solvent-based processes to extract high value bio-active chemicals from a range of feedstocks. He has enabled a major culture and business shift in the application of Chemical Process Engineering in the New Zealand Bio- and Agri-business sectors. His design of a portable containerised Supercritical Extraction plant 'SuperEx' – which can be trucked directly to an industrial test site – brought pilot plant technology directly to the industry partner, greatly 'de-risking' industry investment. The outcomes of his engineering have enabled multiple commercial enterprises to be established and succeed in New Zealand, all focused on purifying and selling tens of millions of dollars per annum of high value bio-active extracts to an international market. The industries and sectors now benefiting range from manuka honey and propolis to cosmeceuticals from wood wastes. His leadership of the technology transfer process includes extended industry secondments. His unique engineering approach is underpinned by a broad portfolio of patents and specialist engineering publications.





**Murray Close** FRSNZ, Institute of Environmental Science and Research Ltd (ESR), has led pioneering research into groundwater contamination over the last 44 years. He has led multi-agency, multi-disciplinary research teams focusing on the transport and fate of a comprehensive range of contaminants in New Zealand groundwater systems, including pesticides, heavy metals, microbes and nitrate, and has developed new methods for investigating the vadose zone. His current research interests include the impacts of land use on groundwater quality, removal of nitrate from shallow groundwater using enhanced denitrification, and understanding groundwater ecosystems. He actively engages with regional and district councils throughout New Zealand who have the responsibility to manage groundwater resources. His research has advanced groundwater management practices for the regional councils by providing them with the necessary knowledge of groundwater systems and processes.



Professor **Gillian Dobbie** FRSNZ, University of Auckland, is a world-leading computer science researcher who has made major contributions to the field of database management, particularly to the understanding of object-oriented databases, the design of semi-structured databases and the accuracy of stream data mining, all of which are fundamental technologies supporting the current 'data science revolution'. Her recent research in stream data mining has spawned several new research projects, where the characteristics of the data stream are used to adjust the algorithm in real time to provide superior results. A key concept in this research is to predict when a drift is likely to occur and make the drift detection algorithm more sensitive to it. This research can be applied to detect change in data streams, such as network traffic and the output of monitoring devices. This research has international importance, with the uptake of internet of things and data science. Her experience led naturally to her appointment as the Science Leader on the Precision Driven Health Research Partnership, an award-winning research partnership between New Zealand's health IT sector, health providers and universities. She has recently been appointed Chair of the Marsden Fund Council.



Professor **Gary Evans** MNZM FRSNZ, Ferrier Research Institute, Te Herenga Waka—Victoria University of Wellington, is a leading organic chemist with exceptional expertise in medicinal and process chemistry. His discoveries, involving national and international research collaborations, have had significant health and economic impacts. He played a leading role in a 28-year research collaboration with US biologists and clinicians, which led to fundamental advances in the understanding of the action of enzymes, a new approach to the design and synthesis of exquisitely potent enzyme inhibitors, and their development as pharmaceuticals for treatment of cancer, gout and infectious disease. He also developed the methods used by industry for their manufacture. In recognition of this world-leading research, Evans was made a Member of the New Zealand Order of Merit (2014) and awarded the MacDiarmid Medal by Royal Society Te Apārangi (2011). He was until recently assisting New Zealand Government decision making through his role as MBIE's Chief Science Advisor.



Professor **Dorian Garrick** FRSNZ, AL Rae Centre of Genetics and Breeding, Massey University, has made major research contributions to the theory and application of genetic evaluation for animal breeding. The challenge for informed selection is to obtain the best possible evaluation of a selection candidate's merit, using all the available information. Combining all available information into optimal and fully commensurate evaluations ('predictions') of genetic merit or future performance is extremely complex and demanding. Garrick has substantially refined both the algorithms and the formidable calculations involved as available information on selection candidates has increased prodigiously in recent years, with enhanced data logging and an explosion of genomic information. His work is remarkable not just for fundamental contributions to methodology but also for its national and international implementations, across a range of animal species: sheep, beef cattle, dairy cattle, pigs, poultry, and occasionally deer, horses and dogs. He has also engaged significantly with quantitative issues of plant improvement.



Professor **Bronwyn Hayward** FRSNZ, University of Canterbury, is an internationally-recognised researcher at the intersection of climate change, sustainability and youth studies. She was the first political scientist appointed to the Intergovernmental Panel on Climate Change Core Team, preparing a *Synthesis Climate Report* for UN governments' approval. She leads a study funded by the UK Economic and Social Research Council with Surrey University and five other partner institutions tracking how cities can support young people to flourish in low carbon ways and she is a co-principal-investigator of Mana Rangatahi, a Deep South funded project to support young Māori and Pacific leadership in a changing climate. Recent books include: *Sea Change: Climate Politics and New Zealand* (2017) and *Children, Citizenship and Environment #SchoolStrike Edition* (2021). She has served as a trustee for the SPARK Foundation and Give A Little and was a Kiwibank Local Hero in 2019, and the 'Supreme Winner' and winner of the Environment section in the 2021 Westpac/Stuff Woman of Influence Awards.



The contribution of Professor **Simon Holdaway** FRSNZ, University of Auckland, to the advancement of theoretical knowledge and development of innovative methodologies in Archaeology is unique. His pioneering 2014 and 2017 books challenge the archaeological orthodoxy that the last 10 millennia saw an inevitable shift from simple to complex societies with studies in Australia and Egypt. By examining in-depth case studies, he shows that changes during the last 10,000 years varied because of the local history of social and environmental interactions rather than the existence of a universal cultural historical evolution. His multidisciplinary projects continue to overturn long-accepted interpretations. His research on stone artefacts, the commonest form of archaeological material culture, has initiated major reassessments worldwide. He has pioneered large scale stone artefact analysis, writing both the current text on Australian stone artefacts and a series of innovative method and theory papers that challenge the orthodoxy related to stone artefact manufacture and typology.



Professor **Simon Keller** FRSNZ, Te Herenga Waka—Victoria University of Wellington, is a philosopher who specialises in ethics, political philosophy, and the philosophy of mental health and disorder. He has written extensively about the moral and political dimensions of relationships, examining family relationships, friendships, erotic love and patriotism. His work on mental health looks at the assumptions that lie behind our ways of dividing mental conditions into the healthy and the unhealthy, and the links between mental health and the living of a good human life. In other work, Keller explores such topics as well-being ('welfare'), political freedom, equality, the significance of death and the way we form beliefs about science. He is the author of *The Limits of Loyalty* (winner of the American Philosophical Association Book Prize) and *Partiality*, and a co-author of *The Ethics of Patriotism: A Debate*. He is Professor of Philosophy at Te Herenga Waka—Victoria University of Wellington, having worked previously at Boston University and University of Melbourne. He has held visiting fellowships at Harvard University, Rice University and LMU Munich.



Professor **Paul Kilmartin** FRSNZ, University of Auckland, is an electrochemist by training who has applied electrochemical methods to fields as diverse as wine science and electrically conducting polymers. His novel findings in oenology have assisted New Zealand companies to produce high quality sauvignon blanc wines and gained him an international reputation within the wine science community. These include findings that mechanical harvesting, juice oxidation and additives such as sulfites at harvest, play essential roles in the formation of the fruity and tropical aromas in New Zealand wines. His research on conducting polymers has resulted in new applications as sensing elements for the determination of antioxidants in beverages and biological fluids. A further novel concept has been the consideration of conducting polymers as solid antioxidant materials, and the creation of functional biopolymers from grape marc waste, for use as food packaging materials to increase product shelf-life.



Dr **Phil Lyver** (Ngāti Toarangatira ki Wairau) FRSNZ, Manaaki Whenua Landcare Research, is one of Aotearoa's leading Māori researchers, receiving international recognition for his thought leadership in conservation and ecosystem management, particularly by Indigenous peoples and local communities. His extensive and world-leading research leverages large empirical datasets, simulation modelling and mātauranga Māori to advance knowledge at the interface of ecology, conservation and social sciences. Importantly, his biocultural research incorporates Indigenous worldviews and knowledge, seeking to understand how people's connection with the environment enriches both the social and ecological components of ecosystems. His research has identified long-term impacts of climate change on biota, and cultural tipping points (such as the permanent loss of mātauranga or social structures) that can result from either environmental degradation or conservation legislation. Lyver has played a transformative role in advancing the balancing of western science and mātauranga Māori world views in pursuit of new knowledge and conservation applications.



Professor **Nancy November** FRSNZ, University of Auckland, is among the most innovative and eminent figures in the field of musicology. Combining interdisciplinarity and cultural history, her research centres on chamber music of the late eighteenth and nineteenth centuries, probing questions of historiography, canonisation and genre. Her work in historical musicology achieves impact through deepening knowledge, critical thinking and challenging the traditional view of music and its context. Through her work in critical pedagogy, she continually strives to help develop other peoples' historical perspectives, skills and awareness—not just for the maximum impact of her own research, but to develop tomorrow's 'critical beings'. Her scholarship is based on an expansion and critique of the western classical musical canon, by means of multiple lenses: historiography, theory, gender studies, performance practice and aesthetics. Her work is recognised for challenging traditional pedagogies, grounded in western worldviews, with new, culturally-sustaining ways of teaching and learning history that are empowering, especially for Indigenous students.



Professor **Suetonia Palmer** FRSNZ, University of Otago, Christchurch, has contributed to the international evidence base underpinning treatment of kidney diseases and diabetes and their direct impact on patients. Her work has drawn evidence from thousands of studies and trials to describe the evidentiary basis for common conditions including diabetes, hypertension and kidney disease. Her highly respected large-scale meta-analysis, including some of the largest recorded in the medical literature, have identified a lack of evidence to underpin diabetes and kidney disease treatment worldwide and to show when evidence of benefit is present. These findings have been incorporated into the World Health Organization guidelines and the global kidney guidelines (KDIGO). Her collaboration with leading academics in Indigenous health has strengthened research conduct and measurement of the impact of colonisation on health outcomes for Indigenous peoples. This has enabled increased focus on equity and social accountability in New Zealand health research and clinical trials. Her scholarship has transformed the evidentiary basis of kidney disease care over a 15-year period leading to recommendations for and against specific therapies.



Professor **Leonie Pihama** (Te Ātawa, Waikato, Taranaki) FRSNZ, Tū Tamawahine o Taranaki, is a pre-eminent scholar of kaupapa Māori and mana wahine. Her body of work encompasses three decades of intentional research in the areas of kaupapa Māori, mana wahine, inter-generational trauma, healing and whānau well-being. She has been an important figure in establishing these areas as legitimate and exciting ways to pursue knowledge and to include kaupapa Māori and mātauranga Māori in the wider research arena. Her body of work on inter-generational trauma and healing has stretched from exploring healing strategies, definitions and framing of issues such as sexual violence and strategies for whānau well-being. Pihama has a strong community focus in her research with collaborations with Māori social service providers and her impact is in their application of her research, the capacity of which she has developed and mentored. Leonie has directed a number of research institutes including the International Research Institute for Māori and Indigenous Education (IRI, University of Auckland) and Te Mata Punenga o Te Kotahi (Te Kotahi Research Institute, University of Waikato).





The research of Professor **Christine Rubie-Davies** FRSNZ, University of Auckland, has revolutionised the teacher expectation field and positively impacted education policy and classroom practice. Rubie-Davies advocated for a new discipline, the social psychology of education, drawing on education, social psychology, sociology and educational psychology. Accordingly, Rubie-Davies led the first-ever global conference in this discipline resulting in a Routledge international handbook *Social Psychology of Education*, now a globally recognised educational psychology sub-discipline. Rubie-Davies' transformational research identified teachers with high expectations for all students and documented their achievement-enhancing beliefs and practices. This resulted in her developing high expectation teaching theory, leading to a world-first randomised control trial that trained teachers to translate the theoretical principles into practice. Consequently, Ministry of Education curriculum guidelines changed to include high expectations as a key teaching principle. International recognition is evidenced by research collaborations in seven countries, two US fellowships and numerous invited presentations.



Professor **Brett Robinson** FRSNZ, University of Canterbury, and his research group, have made leading contributions to the understanding of fluxes of the chemical elements in the soil – water – plant continuum, and have applied this understanding to real-world challenges in agriculture and other land uses. His research has had an impact, in New Zealand and overseas, on the health of food crops, the quality of agricultural soils and the management of contaminated sites. Examples include creating value from biological wastes, the rehabilitation of degraded soils, reducing the entry of contaminants such as cadmium into food products, and ensuring that the nutrients contained in biological wastes provide economic and ecological benefits instead of exacerbating the degradation of waterways. He has developed environmental tools and technologies in collaboration with universities and research institutes throughout Europe, China and New Zealand.



Dr **Cornel de Ronde** FRSNZ, GNS Science, is a pre-eminent researcher of hydrothermal fluids and mineralization. He researches the origins of fluids, their pathways through Earth's crust, and the processes that drive and modify hydrothermal systems. He has led development of a new field of submarine geoscience that measures, samples and explains hydrothermal activity and mineralization on the seafloor using multidisciplinary data acquisition techniques. His exploration and analysis of circum-Pacific submarine volcanic systems has set global standards for similar investigations done by other nations. His comprehensive mapping of central North Island lakes over the last 10 years has hinged upon strong collaboration with the Te Arawa Lakes Trust, local iwi and the New Zealand Navy, producing new knowledge of lakebeds and their geothermal significance with broad economic and cultural implications. This knowledge is being now assimilated by local iwi and the scientific community to realise future societal and economic benefit.



Professor **Lisa Stamp** FRSNZ, University of Otago, Christchurch, is a rheumatologist and leads a research programme in gout, an arthritis of significant importance to Aotearoa New Zealand. Stamp's research has focused on individualisation of drug treatments in rheumatic conditions, particularly gout, and she is considered a world expert on the medication allopurinol and the allopurinol hypersensitivity syndrome. Her research on gout management has been translated into clinical practice at both primary and secondary healthcare level and her research in both pharmacological and non-pharmacological treatments has been incorporated into international gout management guidelines. Her research on the genetics of response to allopurinol led to her involvement in the Clinical Pharmacogenetics International Consortium guidelines group for allopurinol. Through national and international collaborations she has contributed to redefining the different stages of gout as well as understanding the genetic basis. Her research on complementary therapies including vitamin C and tart cherry concentrate for gout, which is of particular interest to people with gout, informed international recommendations on dietary management of gout.



Professor **Helen Sword** FRSNZ, University of Auckland is a world-leading expert on academic writing across the disciplines. As an international authority on modernist poetry, she has published books and articles that have expanded our understanding of the contradictory cultural and aesthetic forces at work in the poetry of twentieth-century authors including Yeats, Eliot, Lawrence, H.D. and Rilke. As a digital and performance poet, she has pushed against the boundaries of poetic convention and playfully illuminated the aesthetic spaces where print, performance and digital poetry intersect. Sword has also transformed the international landscape of academic writing. Through books, articles and websites that have reached a wide and varied international audience, she has challenged the dusty conventions of scholarly prose, exposed the myths that hinder clear communication and issued a resounding call to arms against the lure of disciplinary jargon. Her ground-breaking scholarship on academic writing has been praised by her peers for its rigorous evidence base and its skilful integration of theory and practice.



Professor **Te Maire Tau** (Ngāi Tahu) FRSNZ, Ngāi Tahu Research Centre, University of Canterbury, is a leading tribal historian. Tau has dedicated himself to the re-discovery, protection and translation of Ngāi Tahu histories and knowledge. His authorship and co-authorship of books and articles about Ngāi Tahu iwi have provided critical insights into the history of Te Waipounamu. Tau has forged new conceptual approaches to understanding Indigenous knowledge systems and their interrelationships with European intellectual traditions. His research has challenged understandings of history and knowledge systems, revealing Ngāi Tahu mātauranga as a dynamic system which actively engaged with European ideas and adapted them within te ao Māori. Tau's research is often intertwined with his duties in tribal and public life. As Upoko, he consistently champions Tiriti partnership and Indigenous knowledge in engineering solutions to contemporary issues. Governance and systems-change in education and local government has been a direct impact of Tau's advocacy, which has supported Ngāi Tahu in delivering its tribal aspirations, while significantly advancing the revitalisation of Ngāi Tahu mātauranga in thinking and practice.



MĀ TE KIMI KA KITE,  
MĀ TE KITE KA MŌHIO,  
MĀ TE MŌHIO KA MĀRAMA.

SEEK AND DISCOVER, DISCOVER AND KNOW,  
KNOW AND BECOME ENLIGHTENED.

Professor **Rachael Taylor** FRSNZ, University of Otago, has made substantial and multiple contributions to new knowledge in childhood obesity, widely acknowledged as one of the



major child health issues worldwide. Her early work illustrating the most appropriate waist circumference cut-offs for identifying children with adverse body fat patterns informed guidelines internationally. She was an instrumental member of the Otago group that was the first in the world to prove that, contrary to the prevailing view, obesity was detrimental to bone health in children. This new risk factor was subsequently incorporated into obesity textbooks. World-leading research identified the need to appropriately analyse data measuring time-use across the 24-hour day (sleep, physical activity, sedentary behaviour) in children, which has now been incorporated into new physical activity guidelines in multiple countries. Her work on the long-term impact of poor sleep on body fat in children, the ground-breaking randomised controlled trial examining the long-term potential of a brief sleep intervention in infancy to reduce obesity in childhood, along with her research on accurate sleep measurement, have been pivotal in the inclusion of sleep advice in guidelines for effective weight management in children, both nationally and internationally.

For more than thirty years, Professor **Julia Tolmie** FRSNZ, University of Auckland, has illuminated urgent legal challenges faced by women across the British



Commonwealth. These include the defence of abused women facing murder charges, the over-incarceration of Indigenous mothers in parental failure prosecutions, the over-expansion of secondary party liability and the protection of women and children in family court proceedings. Tolmie spearheaded a research programme that re-conceptualises intimate partner violence (IPV) as a form of 'social entrapment'. Revealing wider patterns of harm through agency records and trial transcripts, this work critiqued simplistic assumptions about IPV embedded in legislation, media coverage, government policy and family violence safety responses. It combined qualitative and quantitative analysis with feminist theories of violence, Indigenous scholarship, research on precarity and complexity theory to contribute a much-needed interpretative framework to the criminal justice system. Social entrapment as a concept has been recognised as providing a better way of considering the harm it creates, resulting in law reforms, improved government and judicial decision-making.

Professor **Qiao Wang** FRSNZ, Massey University, has made outstanding contributions to insect science and plant protection. His internationally renowned research on insect



behaviour and biological control has advanced understanding of sexual selection, cue-induced reproductive investment and parasitoid-host interactions, providing novel knowledge for development of behaviour-based and environmentally friendly pest management measures. Wang is a world-leading authority of longicorn beetles, reflected in his book *Cerambycidae of the World* and other works, facilitating better detection and control of longicorn pests globally. His discovery and introduction of parasitoids into the USA have successfully controlled an invasive longicorn pest there. He has also developed expert documents and identification tools on quarantine longicorns for the Ministry of Primary Industries. His expertise has made major contributions to a quarantine pest regulation for the European Union and provided scientific evidence for a World Trade Organization recommendation on international market access. His research excellence has been ranked world-class several times by the New Zealand Tertiary Education Commission and recognised by the Entomological Society of America Distinguished Scientist Award.



## NGĀ AHUREI HŌNORE A TE APĀRANGI HONORARY FELLOWS

Professor **XiaoQi Chen**, South China University of Technology, is well-recognised for outstanding contributions in the complementary arenas of autonomous robots, automation and digital manufacturing. His autonomous climbing robot led to start-up Invert Robotics (2010-), an international company acquired by EU investment/technology firms. His significant research in mobile agricultural robots developed a novel biomimetic tree-to-tree (swinging) steep terrain traversing robot. This breakthrough significantly contributes to the vision of New Zealand forestry industry: 'no worker on the slope, no hand on the chainsaw'. The technology was taken to market by Scion and Forestry Owners Association, generating direct economic benefits of more than \$50 million per annum. XiaoQi was also instrumental in innovating soft contact compliant and force controlled robots for adaptive machining of free form aerofoils. The system, considered first-of-its-kind in 1999, re-manufactures turbine aerofoils and also reduced cycle time by 40%. This breakthrough shortens aircraft ground time and creates new opportunities for robotic overhauling of aero-engine components. It has become a new benchmark for the industry and has been adopted by Rolls-Royce and major aero-engine manufacturers.



Professor **Murray Grant**, University of Warwick, is internationally recognised for his seminal contributions in the field of molecular plant pathology. He has made landmark discoveries on the molecular and hormonal mechanisms that underlie plant disease and host defence. His recent discovery of chloroplast immunity has provided new insight to how crop plants become susceptible to pathogens. This discovery opened up the new field of chloroplast immunity. A growing emphasis on translational research has provided new insights into ash dieback in UK, Phytophthora tree diseases in New Zealand and Europe and bacterial wilt disease of banana in Africa. He served as a member of the ZESPRI/KVH scientific oversight committee to assist the kiwifruit industry after the devastating incursion of Psa into New Zealand in 2010. He was an Honorary Researcher in the BioProtection Research Centre and delegate of two UK-NZ High Commission sponsored trade visits to New Zealand. These led to collaborations with a New Plymouth-based company that develops biologic formulations, and a major collaboration with Scion that stimulated the application of genomics to unravelling the origins of Phytophthora species and helped found the knowledge base that is now being applied to dieback of kauri.



Professor **Dominic O'Sullivan** (Te Rarawa), Charles Sturt University, is Professor of Political Science. O'Sullivan's education policy influence arises from his book, with Bishop and Berryman, *Scaling-up Education Reform* (New Zealand Council for Educational Research, 2010). According to the Ministry of Education, it provides the theoretical foundation for its school principals' professional development programme, and the Ministry's national Māori Education Strategy, Kia Eke Panuku. A Ministry-commissioned discussion paper on national standards for graduating teachers also uses it to justify culturally inclusive teaching practices. O'Sullivan's book *Indigenous Health* (Australian Scholarly Publications, 2015) provides an original conceptual foundation for his work and influence in health and well-being. This work has been cited in a report to the Scottish Parliament and is widely cited in Australian policy advocacy. O'Sullivan's work is the first comprehensive integration of political theory to explain Indigenous politics and also the first to explain liberal democracy's potential for culturally framed democratic citizenship – an innovative and profoundly important blending of Western and Indigenous political theories.



Professor **David Teece**, University of California, is a global science leader in his field of economics and business. His new paradigm for understanding market firms introduced the role of 'dynamic capabilities' in driving entrepreneurial innovation and commercial success. In 1937, Ronald Coase posed a foundational question in the field of economics: why do market firms exist? In that tradition, Teece introduced a new paradigm that conceptualises firms as institutions that sustain capabilities: 'operational capabilities', needed for achieving efficiencies, and (more importantly) 'dynamic capabilities', which drive innovation. He introduced key elements of his emerging theory in a series of articles in the 1980s and early 1990s that turned the neoclassical conceptualisation of the firm on its head, and identified complementary assets (including different forms of knowledge) as essential for understanding competitive success in business enterprises. Teece's major advance occurred in 1997, with 'Dynamic capabilities and strategic management', published in the *Strategic Management Journal*. This article is one of the most cited papers in economics and business. Teece has an outstanding record of science achievement, which has led to a string of global honours recognising his leadership.





# Te Aroha ki a Papatūānuku Love for our World



IN MARCH, WE HOSTED A PUBLIC DISCUSSION ON THE FINDINGS OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC) SIXTH ASSESSMENT REPORT WORKING GROUP I AND WORKING GROUP II (WGI REPORT AR6 CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS). ITS REPORT WAS RELEASED ON 9 AUGUST 2021, AND THIS EVENT WAS A DEFERMENT FROM THAT TIME DUE TO COVID-19.

The IPCC was created to provide policymakers with regular scientific assessments on climate change, its implications and potential future risks, as well as to put forward adaptations and mitigation options. The report marked a line in the sand – reviewing the current state of climate change, how humans have affected it and how it might continue to change in the future. It discussed the important advances in our understanding of the role of climate change in extreme weather events, the irreversibility of some changes and the timing of crossing the 1.5 and 2°C thresholds.

Our public discussion was split into two sessions, each with presentations and followed by facilitated Q&As with the Working Group authors. Session 1, was introduced by **Holden Hohaia** (Ngāti Maru, Taranaki Whānui ki te Upoko o te Ika), with presentations from Dr **Andy Reisinger** and Professor **James Renwick** CRSNZ. Session 2, had presentations from Professor **Bronwyn Hayward** MNZM FRSNZ and Dr **Judy Lawrence**, and from Te Reo o Te Whenua Rōpū Associate Professor **Sandy Morrison** (Ngāti Whakaue, Ngāti Maniapoto, Ngāti Rārua ki te Tau Ihu, Ngāti Tama ki te Waipounamu) and **Mike Smith** (Ngāpuhi, Ngāti Kahu). Science historian and writer Professor **Rebecca Priestley** CRSNZ provided closing remarks.

Photo: Phil Yeo



WATCH VIDEO  
[bit.ly/2022HL-21](https://bit.ly/2022HL-21)



# Mātinini whetū

## Billions of stars

Ara rā, ko Te Ikaroa.  
Te puna waitipua atua ki te ōranga tonutanga.  
Hei kaihangā rerenga ara tapuwae,  
taitimu, taipari, tainui, eke au moana.

The Milky Way.  
The source of the circle of life.  
The controller of migratory journeys  
in our ocean.

KUPU AND TRANSLATION: RIKKI SOLOMON





# Q2

THE MILKY WAY IS OUR EDGEWISE VIEW OF THE GALAXY. AROUND AUTUMN, IT IS BRIGHTEST IN THE SOUTHEAST ABOVE THE SOUTHERN CROSS, AND CAN BE TRACED TO NEARLY OVERHEAD WHERE IT FADES AND BECOMES VERY FAINT IN THE NORTHWEST.

MATARIKI IS CLEARLY VISIBLE FOR MOST OF THE YEAR, HOWEVER IT DISAPPEARS FROM VIEW TOWARDS THE END OF AUTUMN. THIS IS BECAUSE OF ITS PROXIMITY TO THE SUN, WHICH BLOCKS OUR VIEW OF THE CLUSTER DURING THIS TIME.



READ MORE ON NEW ZEALAND'S NIGHT SKY  
[www.rasnz.org.nz](http://www.rasnz.org.nz)



# Prime Minister's Science Prizes



## TE PUIAKI PŪTAIAO MATUA A TE PIRIMIA SCIENCE PRIZE

THE PREMIER AWARD FOR SCIENCE THAT IS TRANSFORMATIONAL IN ITS IMPACT WAS AWARDED TO THE **NEONATAL GLUCOSE STUDIES TEAM** FOR MULTIDISCIPLINARY RESEARCH FOR PREVENTING BRAIN DAMAGE IN NEWBORNS BY DIAGNOSING, TREATING AND PREVENTING BLOOD SUGAR IMBALANCE IN BABIES.

The Neonatal Glucose Studies Team, led by Distinguished Professor Dame **Jane Harding** FRSNZ, has spent more than twenty years researching the effects of high and low blood sugar on babies' brain development. Approximately 30% of all New Zealand newborns, or 12,000 babies a year, are born at risk of low blood sugar.

The multidisciplinary team brings together expertise in neonatal care and development, bioengineering, psychology, education and vision science. Together, they have shown that low blood sugar in newborns can lead to brain injury and have developed new,

non-invasive diagnostic and treatment methods to prevent this from occurring. Their research in this area has changed practice around the world, saving millions of healthcare dollars and leading to the development of, and investment in, new, patented commercial products. Most importantly, their research has improved the lives of mothers and babies around the world by reducing admission to intensive care, improving breastfeeding and reducing the occurrence of brain injuries in newborn babies.



The Neonatal Glucose Studies Team are: (Back L-R) Dr **Philip Weston**, Neonatologist, Waikato District Health Board; Associate Professor **Christopher McKinlay**, Neonatologist, University of Auckland; Distinguished Professor **Geoff Chase** FRSNZ, Bioengineer, University of Canterbury; **Gregory Gamble**, Statistician, University of Auckland; (Front L-R) Dr **Deborah Harris**, Neonatal Nurse Practitioner, Te Herenga Waka—Victoria University of Wellington; Professor **Trecia Wouldes**, Developmental Psychologist, University of Auckland; Distinguished Professor Dame **Jane Harding** FRSNZ, Neonatologist, University of Auckland; Dr **Jane Alsweiler**, Neonatologist, University of Auckland; **Jenny Rogers**, Follow-up Team Leader and Kaiārahi, University of Auckland. Absent from photo: Dr **Richard Edlin**, Health Economist, University of Auckland; and Professor **Benjamin Thompson**, Vision Scientist, University of Waterloo, Canada.

## TE PUIAKI KAIPŪTAIAO MAEA MACDIARMID EMERGING SCIENTIST PRIZE

Awarded to **Dr Jemma Geoghegan**, one of the scientists behind New Zealand's COVID-19 genome sequencing programme.

Jemma is a Rutherford Discovery Fellow based at the University of Otago and an Associate Scientist at the Institute of Environmental Science and Research (ESR). As a researcher who is fascinated by how viruses evolve and spread, Jemma was ideally placed to help with New Zealand's COVID-19 response. In 2020, Jemma helped to establish genome sequencing of COVID-19 cases in New Zealand through collaboration with ESR. As the result of this programme, genomic sequencing has been used as a key tool for understanding and limiting the spread of COVID-19 in New Zealand and has been critical to New Zealand's public health response.

Jemma's broader research aims to better understand why and how viruses jump to new hosts in the first place, and to expand knowledge of the true diversity of viruses that exist in nature. She has worked on various diseases infecting, for example, wildlife and domestic animals, as well as humans. Jemma's work has identified that biological features of viruses could predict human-to-human transmissibility. She has also shown that while many viruses seem to co-diverge with their hosts – overall 'host jumping' plays a much greater role in shaping virus evolution than previously thought. Jemma combines genomic and epidemiological data to uncover important insights into the spread of infectious disease within populations and her research is highly cited and influential.







## TE PUIAKI WHAKAPĀ PŪTAIAO SCIENCE COMMUNICATION PRIZE

Cartoonist and illustrator **Toby Morris** won this prize for conveying complex information about the COVID-19 pandemic and reaching a global audience.

Toby, Group Creative Director at the *Spinoff*, is a big believer in the power of illustration to convey complex messages. Toby has produced some of the most effective science communication on COVID-19 seen anywhere in the world, helping New Zealanders understand the science behind the pandemic and compelling us to look after each other.

The cartoons and animated graphics that came out of Toby's collaboration with Dr **Siouxie Wiles** MNZM have played a huge role in New Zealand's COVID-19 pandemic

response and the then Prime Minister, Rt Hon **Jacinda Ardern**, used these graphics to explain key concepts in her daily briefings, while local community health providers worked with Toby to create translations of his work into te reo Māori, Samoan, Tongan, Mandarin, Punjabi and many other languages. These graphics were all released with a Creative Commons license allowing reuse, and many went viral and were repurposed around the world. Daylight Creative, a creative studio of illustrators, animators, writers and producers Toby leads, now works with the World Health Organization and their explainer graphics and animations are reaching a truly global audience, with some of their videos watched upwards of 50 million times.

The Society is the Secretariat for the Prizes on behalf of Government.



VIEW MORE ON THE WINNERS  
[bit.ly/2022HL-29](https://bit.ly/2022HL-29)



The Prime Minister's Science Prizes recognise the impact of science on New Zealanders' lives, celebrate the achievements of current scientists and encourage scientists of the future.

There are five prizes in total with a combined value of \$975,000 NZ Dollars.



## TE PUIAKI KAIWHAKAAKO PŪTAIAO SCIENCE TEACHER PRIZE

**Bianca Woyak** is a specialist kaiako science teacher for all year levels at Burnside Primary School. In this role, she shares her passion for ecology and mātauranga Māori with students and other educators. She has led school activities in a large number of topics, including water-testing, riparian planting, flax weaving, beekeeping, citizen science projects, waste management, bird monitoring, predator trapping and tracking and growing food. In addition, the students are growing native trees to be replanted in Christchurch's redzone and with the help of 'Bug Man' **Ruud Kleinpaste** MNZM and butterfly specialist **Brian Patrick**, they created a special

habitat at their school and reintroduced the Boulder Butterfly, which is endemic to Canterbury but rare in the region due to habitat loss.

Bianca's 'hands on' approach to real-world learning is providing all students with opportunities to shine and to develop a wide range of observational, analytical and practical skills. Her teaching has led to huge improvements, not only in science learning outcomes, but also in other curriculum areas. Most importantly to Bianca, the students now feel empowered, knowing they can make a real difference to their local community and environment.



## TE PUIAKI KAIPŪTAIAO ĀNAMATA FUTURE SCIENTIST PRIZE

**Carol Khor**, a former student at Burnside High School in Christchurch, won this prize for her research into improving drug treatment for skin cancer.

Melanoma is the most deadly form of skin cancer and New Zealand leads the world in rates of skin cancer with up to 3,000 people diagnosed with melanoma each year in Aotearoa. Unfortunately, some melanomas can become resistant to the available drug treatment, so the treatment fails. Carol's research project investigated the synergistic effects of a cancer drug alongside a non-cancer therapy drug to treat melanoma. Her results show that this combination may reduce resistance to the cancer drug, and she continues to work with her mentors at the Centre for Free Radical Research at the University of Otago, Christchurch, as they work towards publishing the findings. Carol has demonstrated her understanding of the technologies used to test her ideas through problem solving and data analysis. She has had an incredible learning journey in a relatively short time, developing skills in culturing cancer cells and measuring cancer cell viability. The judges were particularly impressed with Carol's ability to respond to questions about her experimental design, statistical analysis and the background biology involved in this project.



"Science allows us to understand and define problems and then respond. Our Prize Winners are fantastic examples of people doing this."

HON DR MEGAN WOODS, THEN MINISTER OF RESEARCH, SCIENCE AND INNOVATION



# Gold CREST

FOR TĀMAKI MAKĀURAU  
AUCKLAND STUDENTS

Students from two colleges were presented with Gold CREST awards. A team from Epsom Girls' Grammar researched potential linkages between emotional intelligence and academic engagement. Another team, from Glendowie College, developed a remote-controlled ocean surveillance vessel.

**Amita Ram** and **Prisha Kadakia**, Epsom Girls' Grammar, investigated emotional intelligence and the academic engagement of students, hypothesising that increasing the Emotional Quotient (EQ) of students would cause an increase in academic engagement (AE). AE is an indicator that combines academic identification (getting along with teachers, interest in the subject matter and related behaviours and attitudes) and academic participation (students' work effort inside and outside school, hours on homework, not skipping classes or missing deadlines). They measured the AE and EQ of students

(n=76) and then ran an intervention in a group of the students (n=30) to teach emotional intelligence. While the EQ did not increase in the intervention group compared with the control group, AE did. They would like to see further studies into the role of the emotional mind in academic pathways. They consulted with Dr **Fiona Ell** and **Raj Ramanujam** on their project, and Mrs **M Ghanim** was the supervising teacher.

**Justin Chen**, **Max Davies** and **Neal Grayson** of Glendowie College decided to do a project on marine conservation. Following some interviews, they determined there was a gap





in the surveillance and policing coverage of New Zealand's marine reserves and protected fishing areas. Brainstorming options to solve this problem, and assisted by **Mike Jakowetz** and **Callum Lilley**, they designed an autonomous vessel able to travel to pre-set GPS coordinates and transmit real-time video feed to a connected device. They achieved a range of 1km, live video transmission capabilities and the ability for future upgrades and improvements. They hope their vessel can function as an extra patrolling method to supplement actions taken by the Department of Conservation and the Ministry for Primary Industries.

# Lifetime Achievement Award

RECOGNITION FOR SOCIETY FELLOW, TĀ HIRINI MOKO MEAD FRSNZ (NGĀTI AWA, NGĀTI TŪWHARETOA, TŪHOURANGI) WHO HAS BEEN AWARDED A LIFETIME ACHIEVEMENT AWARD AT THE WHAKAATA MĀORI 2022 MATARIKI AWARDS, NGĀ TOHU O MATARIKI O TE TAU.



In his 95 years, **Tā Hirini Moko Mead** FRSNZ has worked as an anthropologist, historian, artist, teacher and more. He was the first Professor of Māori Studies at Te Herenga Waka— Victoria University of Wellington, where he developed the first stand-alone Māori Studies department in Aotearoa. In 1992, he helped establish the Māori university Te Whare Wānangā o Awanuiārangī in Whakatāne. From the 1970s, Tā Hirini was instrumental in establishing

Ngāti Awa Trust Board, acting as Chief Negotiator for Ngāti Awa in settlement negotiations with the Crown. He was appointed to the Waitangi Tribunal in 2003 and has served on numerous advisory boards. He has authored more than 70 books, papers and articles, including *Ngā Pēpeha a ngā Tipuna* and *Tikanga Maori: Living by Māori Values*.

Abridged from an article first published in **Te Ao Māori News**



# Science Teaching Leadership Programme

ENHANCING THE TEACHING OF  
SCIENCE IN SCHOOLS

Gerd Banke – 2022 Royal Society Te Apārangi science teaching  
leadership programme participant

PHOTO COURTESY OF CAWTHRON INSTITUTE



The Science Teaching Leadership Programme (STLP) supports primary and secondary schools, and their nominated teachers to transform science teaching and learning within their school hapori (communities). This is achieved through in depth leadership and curriculum-focused professional development workshops and a hands-on six-month host placement experience with a local science organisation.



“The workshops run by the STLP programme facilitators have provided significant learning opportunities based on each aspect of the Nature of Science (NoS) and the Science Capabilities [New Zealand curriculum components]. These have included engaging in relevant theory about each NoS strand, the sharing of possible resources and practical activities to challenge and engage both students and teachers back at school.

I can go back to school with an over-full kete of knowledge, ideas and practicals that I can adapt to my classroom and more importantly share and inspire other science teachers at my school to do the same.”

2022 STLP PARTICIPANT



This programme is funded by the Ministry of Business, Innovation and Employment and administered by the Society.



FIND OUT MORE:  
[bit.ly/2022HL-33](https://bit.ly/2022HL-33)

## GERD'S STORY

Despite the ongoing challenges and disruption during the COVID-19 pandemic, **Gerd Banke**, a teacher from Nayland College in Nelson, maximised her time during Phase One of the Science Teaching Leadership Programme to reconnect with her passion for science.

Gerd had a six-month placement at Cawthron Institute, where she worked alongside mentors to develop a school outreach component of the Marine Biosecurity Toolbox Programme, bringing eDNA technologies into the classroom.

Since the placement, Gerd has presented at an eDNA conference in Hobart, Australia, attended a wānanga in Patuharakeke, Northland, exploring modern applications of traditional Māori concepts, and continues to work alongside her Cawthron Institute mentors on outreach programmes for the junior school at Nayland College.



“It has been wonderful to connect with local scientists and I feel I have made so many connections that I can draw upon to make my classroom science teaching relevant and real to my ākongā.”

GERD BANKE

JOURNALISM INDUSTRY CADETS

# SMC supporting the future of science in reporting



New Zealand On Air's Public Interest Journalism Fund is aligning with media industry development initiatives. As part of this, the Science Media Centre (SMC) had the privilege of providing workshops for two different media cadetship programmes: The **Next Page programme** to develop the next generation of magazine feature writers, hosted by *The Spinoff*, *North & South*, *New Zealand Geographic*, *Metro* and *Pantograph Punch*; and **Te Rito journalism programme**, hosted by *NZME*, *Whakaata Māori*, *Newshub* and the *Pacific Media Network*, which provides a year of full-time training

on the job for 25 budding news journalists from diverse backgrounds and communities – including 10 fluent te reo Māori speakers.

SMC felt honoured to be invited to support these innovative programmes. The training sessions aimed to spark interest in science reporting early in journalists' careers and provide examples of how including experts' perspectives can improve media coverage of a wide range of topics. They also covered common pitfalls and red flags to watch for when evaluating claims and misinformation.





In June 2022, SMC followed up on its initial contact with the Te Rito journalism cadets to organise field trips to Plant & Food Research in Mt Albert and a visit to Māngere mountain with DEVORA volcanologists (DEVORA is a transdisciplinary research programme that assesses volcanic hazards and risks in the Auckland metropolitan area). This partnership has developed into a long-standing commitment to support this cohort of cadets through their year of training and beyond.





RUIA TAITEA, KIA TŪ KO TAIKĀKĀ.

SHED THOSE OUTER LAYERS AND REVEAL  
YOUR INTERNAL COURAGE.

## RESPONSE TO TE ARA PAERANGI – FUTURE PATHWAYS GREEN PAPER

The Ministry of Business, Innovation and Employment launched *Te Ara Paerangi – Future Pathways Green Paper* for reforming the Research, Science and Innovation system in 2021, including a process of engagement with stakeholders.

The Society submitted a detailed response to the questions posed within Te Ara Paerangi. In this, we applauded the government's openness to hearing a wide range of perspectives in its consultation and looked forward to being part of the continuing conversation. We focused on those areas where we can add value through our independent perspective. The Society is grateful for the

opportunity to comment on this highly important piece of work, as the government considers how to reimagine and reconfigure the Research, Science and Innovation system in New Zealand.

The Society's Academy also made a submission as did the Early Career Researcher Forum.



VIEW OUR SUBMISSION  
[bit.ly/2022HL-36](https://bit.ly/2022HL-36)



# Catalyst: Seeding

## REMARKABLE OUTCOMES FOR MILK

WITH THE SUPPORT OF CATALYST: SEEDING, TWO TEAMS, ONE FROM AOTEAROA NEW ZEALAND AND ONE FROM FRANCE, HAVE COMPLETED RESEARCH MILESTONES WITH TRANSLATABLE OUTCOMES.

Infant milk is a special concoction of everything a growing child requires. Our current synthetic milk substitutes, used as supplements or full-replacements, struggle to precisely match nutrient levels in natural milk. Specifically, amino acids are key nutrients in milk, but replicating the level and concentration of amino acids in synthetic milk has proven difficult. To understand more about natural milk's amino acid content we need to study its composition. One specific amino acid, tryptophan, plays a key role in neurological development and has proven difficult to study previously.

This project – a collaboration between Aotearoa New Zealand (Riddet Institute, Massey University) and France (National Research Institute for Agriculture, Food and Environment – INRAE) and led by

Distinguished Professor **Paul Moughan** FRSNZ (Massey University) – used sophisticated techniques to generate for the first time reliable data on human milk's tryptophan content and the small intestinal absorbability of tryptophan. The researchers also demonstrated links between microbiota-gut-brain axis and milk compositions, publishing the full nutritional composition of human breast milk and its related metabolite products.

These are significant findings, allowing the production of next-generation, more natural-resembling, infant milks, with health and nutritional benefits for tamariki in Aotearoa and the wider world.

With strong bonds formed thanks to the support of Catalyst-Seeding, the teams will continue to work together in the future.









# Our financials

For the financial year to 30 June 2022, the Royal Society of New Zealand group, combining Royal Society Te Apārangi and its associated Endowment Trust Fund, generated a surplus of \$0.682m (excluding net gains on investment property, land & buildings). Total Revenue (excluding net gains on land & buildings) for the group was \$8.683m. The Endowment Trust Fund returned a deficit for the year as a result of unrealised losses on investments (which amounted to \$0.129m in 2022) – global financial markets were very challenging in the 2021-22 period.

The Total Assets of the group, however, increased by around \$6.7m during the year to a value of \$30.826m at year end. The physical land and buildings on our

Turnbull Street site were revalued at year-end and increased in value by \$5.9m to a net value of \$20.3m at 30 June.

The Society remains reliant on professional services provision to government for more than 75% of cash income. Royal Society Te Apārangi managed eight contestable funds on behalf of the Government during the year, with around \$112m being paid out in the twelve months to 30 June 2022 – approximately \$2m more than the previous, 2021, financial year. (Refer Note 14 of the Financial Statements).

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



VIEW 2022 AUDITED FINANCIAL STATEMENTS  
[bit.ly/2022HL-39](https://bit.ly/2022HL-39)



# Te Hurunga o Matariki

## Matariki rising



A HELIACAL RISE IS WHEN A STAR OR PLANET IS SEEN ON THE EASTERN HORIZON JUST BEFORE THE RISING OF THE SUN. FOR MATARIKI TO BE VISIBLE AS A HELIACAL STAR IT NEEDS TO BE AT LEAST 5° ABOVE THE HORIZON WHILE THE SUN IS AT LEAST 16° BELOW IT. ANY CLOSER AND THE LIGHT OF THE SUN WILL MAKE MATARIKI INVISIBLE.



READ MORE ON NEW ZEALAND'S NIGHT SKY  
[www.tepapa.govt.nz](http://www.tepapa.govt.nz)



Ko ngā mata-ariki o te Atua ko Tāwhirimātea he  
mea huna, e kore rā e kitea.  
Ko Matariki hei mata ohore, mataara atu ai te  
mea matakore e kore rā e tino kitea.

The eyes of the god Tāwhirimātea are hidden  
unseeing eyes. Matariki, keeping our eyes open,  
alert for those eyes, we cannot see.

KUPU AND TRANSLATION: RIKKI SOLOMON



SUPPORTING THE  
**international**  
**exchange** of  
ideas



Professor Cather Simpson FRSNZ  
(left) and Associate Professor  
Krushil Watene. (right)



## 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. In particular, the Society administers the Catalyst: Influence Fund on behalf of the Ministry of Business, Innovation and Employment. This supports New Zealand's participation in key international fora worldwide on behalf of the New Zealand research base.



In 2022, a number of key appointments were made, including:

- › Professor **Cather Simpson** FRSNZ, University of Auckland, joined the Board of Directors for the International Council of Academies of Engineering and Technological Sciences (CAETS).
- › Four Aotearoa reviewers were selected for the scientific review of the draft United Nations *2023 Global Sustainable Development Report*. There were: **John Irving**, **John Troughton** FRSNZ, Professor **Glenn Banks** of Massey University and Professor Emeritus **Stephen Haslett** of Massey University.
- › Associate Professor **Krushil Watene** (Ngāti Manu, Te Hikutu, Ngāti Whātua ō Orākei, Tonga), a Rutherford Discovery Fellow from the University of Auckland, was appointed as a Member of the Committee for Freedom and Responsibility in Science to serve from 2022 to 2025.
- › Professor **Richard Hartshorn** of University of Canterbury was appointed as Secretary General of International Union of Pure and Applied Chemistry (IUPAC), and also as Executive Committee Member to the International Science Council Committee on Data (CODATA).
- › **Aroha Mead** (Ngāti Awa, Ngāti Porou) Research Associate, Indigenous Knowledge & Biodiversity, and Chair Emeritus of International Union for the Conservation of Nature (IUCN) Commission on Environmental, Economic and Social Policy (CEESP) was nominated to attend World Intellectual Property Organization WIPO expert meetings.
- › Dr **Steven Sexton**, University of Otago, was appointed ICASE Executive Board Member and Editor of ICASE Journal *Science Education International* 2020-2023. International Council of Associations for Science Education (ICASE) is a vast network of science teacher associations, institutions, foundations and companies, working together to promote science and technology education around the world.
- › Sesquicentennial Distinguished Professor **Hamish Spencer** FRSNZ, University of Otago, was appointed as Council Member Division for the History of Science and Technology (DHST) of International Union of History and Philosophy of Science and Technology (IUHPST).
- › Professor **Barbara Burlingame**, Massey University, was appointed as a Council Member of the International Union of Nutritional Sciences (IUNS).





Latest science  
& **technology**  
information for **MPs**



In collaboration with the Speaker of the New Zealand Parliament, we ran our annual Speaker's Science Forum so that members of Parliament had the opportunity to hear presentations on topical research areas. The topics were selected in collaboration with our Forum partners Science New Zealand, Universities New Zealand and the Independent Research Association of New Zealand.

#### IN 2022, THE TOPICS PRESENTED WERE:

##### Science for sustainable fisheries

Associate Professor **Maren Wellenreuther**, University of Auckland, discussed the potential of DNA technology to understand past and present fish stocks, while Dr **Chris Cornelisen**, Cawthron Institute, discussed sustainability challenges facing fisheries in Aotearoa. Both speakers emphasised the importance of new technologies to support ecosystem-focused fisheries management and the overall health of our moana.

##### Trust, misinformation and social in(ex)clusion

Dr **Michael Daubs**, Te Herenga Waka—Victoria University of Wellington, showed how emotional responses to disinformation campaigns can lead people to base their beliefs on factually incorrect information. **Kate Hannah**, The Disinformation Project, described the impact of 'information disorders' on health and wellbeing, and the role of communities, civil society and institutions in building trust and social connection.

##### Alternative forms of governance for Te Taiao

Māori academics Dr **Shaun Awatere** (Ngāti Porou), Manaaki Whenua Landcare Research, and **Melanie Mark-Shadbolt** (Ngāti Kahungunu, Rangitane, Ngāti Porou, Te Arawa, Ngāti Raukawa, Tūwharetoa, Whakatōhea, Te Āti Awa), Te Tira Whakamātaki co-founder, co-presented on why alternative forms of environmental governance are urgently needed to address disaster, disease, climate change and the enormous social problems central to environmental degradation.

##### Alternative energy sources

Long established industrial chemical and future energy vector, hydrogen, was discussed by Professor **Sally Brooker** FRSNZ, University of Otago, as a key commodity chemical, its future, and the activities of the German-NZ green hydrogen team. Dr **Wim de Koning**, Lincoln University, explained 'Future Proof Zero Carbon' solutions, the diversity of renewable energy sources and why they should be part of New Zealand's future.



READ MORE  
[bit.ly/2022HL-45](https://bit.ly/2022HL-45)



JOURNAL SPECIAL ISSUE ON

# Hikurangi Subduction Margin



“The tantalising results from these papers reveal a margin rattled by frequent storms, floods, landslides, earthquakes and volcanic eruptions.”

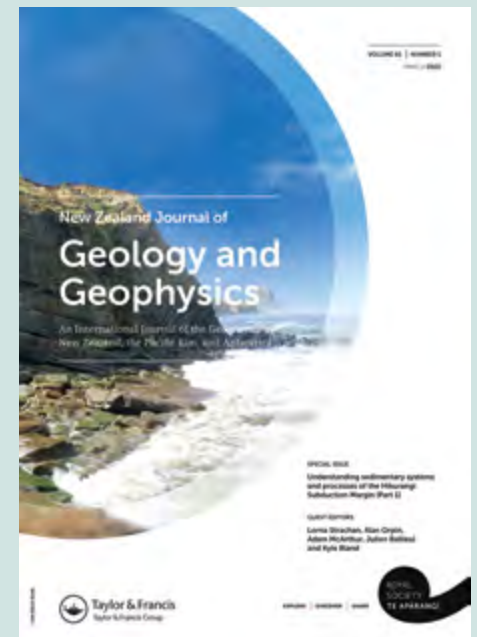
GUEST EDITORIAL


The *New Zealand Journal of Geology and Geophysics* released the first of two special issue volumes in April, dedicated to the sedimentary systems of the Hikurangi Subduction Margin.

*Understanding sedimentary systems and processes of the Hikurangi Subduction Margin, Part 1* was guest edited by Dr **Lorna Strachan**, University of Auckland, Dr **Alan Orpin**, NIWA, Dr **Adam McArthur**, University of Leeds, Associate Professor **Julien Bailleul**, UniLaSalle, and **Kyle Bland**, GNS Science.

The Hikurangi Subduction Margin is the southernmost section of the plate boundary fault where the Pacific tectonic plate is subducted beneath the Australian plate,

sinking into the Earth’s mantle. Here defined as a region at least 200 km from the Hikurangi Trench off the east coast of Te Ika-a-Māui the North Island to the Taupō Volcanic Zone. Guest editors call this young and active plate boundary ‘an accessible global laboratory for tectonic, sedimentological, and paleontological research,’ and the diverse array of international scholars included in this volume reflects the world-wide interest in this geological research hub.



 JOURNAL SPECIAL ISSUE  
[bit.ly/2022HL-30](https://bit.ly/2022HL-30)

JOURNAL SPECIAL ISSUE ON

# Wahapū: Transcending boundaries in Aotearoa New Zealand estuaries



The *New Zealand Journal of Marine and Freshwater Research* has published a new special issue on Aotearoa New Zealand estuaries.

It highlights research and viewpoints that will help Aotearoa transition towards an integrated approach to the management of these unique ecosystems. It discusses how separate, disjointed policies fail to protect these valuable environments and highlights how climate change will influence estuary management in the future. The journal provides examples of research and initiatives that address these issues and help to re-position estuaries at the centre of decision-making.



“As transition zones, [estuaries] are hotspots of energy transformation and nutrient recycling that sustain broader coastal areas.”

GUEST EDITORIAL

 [READ MORE  
bit.ly/2022HL-47](https://bit.ly/2022HL-47)



JOURNAL SPECIAL ISSUE ON

# Child health & wellbeing

Childhood and young adulthood are important stages of growing, learning and development. Yet, there are increasing pressures and challenges that children and young people face. These factors may adversely impact upon their health and wellbeing, and thereupon have long-lasting effects on our society as a whole.

On 17 July 2015, Tawatihitihī o te Rāwhitiroa Carlson Kingi was birthed at home, in Owhairaka. This was a whānau event alongside whaiāipo, kuia, tamariki and a kurī. Pictured with his whānau Maggie Kingi (left), Wiremu Kingi (middle), Okaire Lewis (right).

Photographer: Claire Humphries, North Shore, Tāmaki Makaurau.



This special issue, published in the *Journal of the Royal Society of New Zealand*, is the first of two volumes bringing together manuscripts focusing on aspects of health and welfare/wellbeing relevant to children and young people in Aotearoa.

To make space for children and young people to have their voices heard, there was rangatahi Māori representation on the guest editorial team, as well as inclusion of rangatahi Māori and

other young people as authors of its constituent manuscripts.

They focus on the critical importance of the first 1000 days, oral health and food security, mokopuna Māori perspectives of wellbeing, and adolescent health and wellbeing. Together they highlight critical issues, including inequities, and provide a clear challenge to us all to enact transformative changes for current and future generations of children and young people.



READ MORE  
[bit.ly/2022HL-48](https://bit.ly/2022HL-48)

JOURNAL SPECIAL ISSUE ON

# longitudinal research

Part one of a special issue on longitudinal research in Aotearoa New Zealand has been published in the *Journal of the Royal Society of New Zealand* and includes six papers.

As the guest editors Professor **Jonathan Broadbent**, University of Otago, and Dr **Amy Osborne**, University of Canterbury, note in their editorial, Aotearoa New Zealand has a thriving longitudinal research community.

Three of the reports are from investigators with the *Growing Up in New Zealand* study, our largest longitudinal study of child development. Other papers are based on findings from the Dunedin Multidisciplinary Health and Development Study, the Christchurch Longitudinal Study, as well as the Moe Kura study, reporting on sleep at the very beginning of life.

Some of the questions that longitudinal studies are intended to help address include: How do people live? How do we change as we grow? What happens as we get older? If an event or experience occurs during childhood, will it have an effect in later life, and how?

The guest editors also note that to continue to thrive, the longitudinal research community must both replenish and maintain an active, well-resourced and well-supported research workforce, and maintain the cohorts that are so integral to the studies. They call for national support infrastructure and to see incentives to encourage collaboration between studies.



Cover image provided by *Growing Up in New Zealand* longitudinal study, the largest contemporary longitudinal study of child development in Aotearoa New Zealand.

Photo credit: Shona Dey, 2020.



READ MORE  
[bit.ly/2022HL-49](https://bit.ly/2022HL-49)



# Māhutonga

## The Southern Cross

THE WHOLE SKY SEEMS TO ROTATE AROUND THE SOUTH CELESTIAL POLE AND OBJECTS CLOSE TO THIS POINT WILL NEVER SET – THEY ARE CALLED ‘CIRCUMPOLAR’. THE SOUTHERN CROSS DOES NOT SET IN AOTEAROA SO IS PERPETUALLY IN OUR SKIES, EVEN THOUGH IN THE VERY NORTH OF THE COUNTRY IT NEARLY TOUCHES THE SOUTHERN HORIZON.



READ MORE ON NEW ZEALAND'S NIGHT SKY  
[www.rasnz.org.nz](http://www.rasnz.org.nz)

A large white outline logo consisting of the letters 'Q' and '4' on a black rectangular background. The 'Q' is a simple circle with a short tail, and the '4' is a stylized, blocky number.

Ko Māhutonga hoki tērā  
He punga hīnātore te hirahira  
nō mua rā anō i tua whakarere iho ai,  
he tohu ake hoki, o āianeī tonu,  
hei hononga raranga whetūrangitia  
ki te wā pāhekeheke, eke panuku, Tangaroa tonu mai ai.

The Southern Cross  
an anchor to the past,  
a symbol of the present,  
and connection to the future.

KUPU AND TRANSLATION: RIKKI SOLOMON



# New Companions

The honour of being made Ngā Takahoa a Te Apārangi Companions of Royal Society Te Apārangi recognises outstanding leadership or eminent contributions to promoting and advancing humanities, science or technology in New Zealand. In 2022, two were elected.

Dr **Catherine (Jill) Stanley** CRSNZ is Science Group Leader, Fruit Crop Physiology for Plant & Food Research. She is a leader in developing science, mentoring others and transferring knowledge that has contributed to the growth of the New Zealand and global horticultural sectors. Dr Stanley's research focuses on perennial crop physiology, primarily summerfruit, to improve fruit quality and tree productivity. Jill works in close collaboration with growers and industry bodies to ensure the science is applied and benefits the New Zealand horticulture sector.

Dr **R J (George) Hooper** CRSNZ, Principal, Maidstone Associates Ltd, has shown outstanding leadership across the New Zealand energy and resource sectors and made major contributions to New Zealand's natural hazard research. His contributions are characterised by thought-leadership and communication on major engineering issues, and uniting stakeholders around new ways of doing things. His efforts have benefitted New Zealand and led to changes within the wider engineering profession.



# 2022 Research Honours Aotearoa



CONTRIBUTIONS OF INNOVATORS, KAIRANGAHAU MĀORI, RESEARCHERS AND SCHOLARS THROUGHOUT AOTEAROA NEW ZEALAND WERE RECOGNISED BY THE PRESENTATION OF THE 2022 RESEARCH HONOURS AOTEAROA MEDALS AND AWARDS. WE WERE DELIGHTED TO RESUME OUR CELEBRATORY EVENTS THIS YEAR, AFTER A HIATUS IN 2021 DUE TO COVID-19. SMALLER, REGIONAL CELEBRATIONS WERE HELD IN KIRIKIROA HAMILTON ON 9 NOVEMBER, IN ŌTEPOTI DUNEDIN ON 16 NOVEMBER, AND TE WHANGANUI-A-TARA WELLINGTON ON 22 NOVEMBER.

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.







The medals and awards we celebrate at our annual Research Honours Aotearoa events mark outstanding achievements and great discoveries in many research fields. We celebrate those we judge to have reached the pinnacle of their fields and those who are at that cusp of early career who have produced sparkling work and have much yet to give.

This year, we were delighted to present the pre-eminent Rutherford Medal to the team of researchers led by Professor **Richie Poulton** working on 'The Dunedin Study' – the long term, wide ranging and multidisciplinary study of 1000 or so people born in 1972, internationally recognised for its breadth and remarkable 94% retention rate.

The Dunedin Study illustrates the outstanding successes together with the possibilities and features of research in Aotearoa – imagination; addressing global questions in a highly local population and set of circumstances; the power of group work and the immense strengths and impact of sustained research focus and effort.

We can all learn more from these features, and build on the partnerships and longevity they demonstrate.

It is important that we recognise our top researchers with awards such as these. Recognition does several things – it extends appreciation and encouragement; it provides a moment to pause and celebrate. In much of the day-to-day, year-by-year work of questioning, testing and putting work through rigorous review, we exist in a world of contest and critique. That is necessary, but can also be wearying. At these events, we take time to stand back and admire the finished results.

Recognition is also especially important in the era of the 'non-expert' or anti-expert, of dis- and mis-information; it provides some markers of where reliable sources of information and advice might be sought. I am not underestimating the forces that drive those

deeply disquieting currents, but nor should we, or can we, shrug and do nothing to stand against them.

To argue the importance of evidence-based conclusions, of method and rigour in knowledge is only ever more important in the 2020s. In presenting these awards and medals, we are providing signals of where trusted knowledge and research can be found.

In making awards, especially to early career researchers, we are building and fostering the Academy of the future. And in recognising those at the summit of achievement, modelling the best of our work, and how we work.

The Academy makes these awards as an independent body, one comprised of scholars recognised for their eminence across a wide range of knowledge. Royal Society Te Apārangī is a multidisciplinary academy; that is a great strength, and one which will serve us even more fully into the future – we are not siloed into separate subject channels but, instead, speak to each other as historians and plant scientists, geologists and linguists, mathematicians and epidemiologists – and much more.

What work is valued – and who is valued – is a key part of that talk we have together, and what such events are about. Royal Society Te Apārangī has been on a path to expand that scope of recognition. I would like to acknowledge all those who have played, and continue to play, a role in this vital expansion.

PROFESSOR CHARLOTTE MACDONALD FRSNZ  
ACADEMY EXECUTIVE COMMITTEE CHAIR



## KIRIKIROA HAMILTON THE ATRIUM AT WINTEC

### CULTURALLY-RESPONSIVE LITERARY LEARNING

**Royal Society Te Apārangi Te Kōpūnui Māori Research Award** for early career researchers to recognise innovative Māori research was presented to Dr **Melissa Derby** (Ngāti Ranginui),

University of Waikato, for creating a culturally-responsive literacy programme. Melissa's research is aimed at strengthening bilingual preschool children's early literacy skills in te reo Māori and English. In her award-winning doctoral study, she drew from Māori oral traditions and teaching approaches to co-create a culturally-responsive literacy programme. She used her findings to co-write *Talking Together: He Kōrerorero*, an early childhood resource that strengthens kaiako and whānau practice in fostering early literacy skills.



### BIOMARKERS FOR AUTOMATICALLY IDENTIFYING BRAIN INJURY AT BIRTH

The **Cooper Award** for an emerging researcher in technology, applied sciences and engineering was presented to Dr **Hamid Abbasi**,

University of Auckland, for developing a method for automatically identifying biological markers of hypoxic-ischemic brain injury at birth. This condition results from reduced oxygen delivery and blood supply, but is challenging to diagnose partly due to a lack of robust biomarkers. Through his research, Hamid has identified promising biological signatures for diagnosis in the form of subtle electrical brain signals. These can be seen in the first 6 hours after injury, when it would be optimal to start treatment. His advanced machine-learning framework can accurately identify and quantify these subtle wave-form signatures in real-time, with accuracy of over 99.8% and could be a game-changer for treating at-risk infants.



### SOLVING HUNGER AND CLIMATE CHANGE WITH SUPERCHARGED CROPS

The **MacDiarmid Medal** for outstanding scientific research that demonstrates the potential for application to human benefit was awarded to the **AgResearch Plant Biotechnology Team** comprising of team members Dr **Greg Bryan**, Dr **Nick Roberts**, and Dr **Somrutai Winichayakul** for research on enhanced photosynthesis. This technology has the potential to increase nutrient and energy density of forages and crops, improving productivity and animal performance whilst reducing environmental impacts of agriculture. The technology produces and stores oil in the green tissue of plants via the transfer of two genes. This not only increased leaf fatty acid content, but also enhanced photosynthesis by up to 24%. If successfully applied to crops, this technology could simultaneously alleviate global hunger and slow climate change.





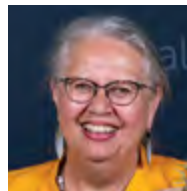
### ANSWERING LONG-STANDING QUESTIONS IN GENOME EVOLUTION

The **Hector Medal** for outstanding work in chemical, physical, mathematical or information sciences was awarded to Emeritus Professor **Murray Cox** FRSNZ, Massey University, for major advances in population genetic theory and the innovative development of associated computational methods that have delivered deep insight into genome evolution. Murray has made striking new discoveries about the biological world from vast population and genome data sets. His major breakthroughs include discovering a previously unknown species of early human living in the Pacific region; identifying the limits to which information from European genetic data sets can be transferred to Pacific communities; and identifying new mechanisms for how the 3D structure of DNA in a cell's nucleus coordinates gene expression.



### UNDERSTANDING GENDER RELATIONS IN PACIFIC COMMUNITIES

The **Metge Medal** for excellence and building relationships in the social science research community was awarded to Associate Professor **Yvonne Underhill-Sem**, University of Auckland for intellectual leadership on gendered social relations and development studies. Yvonne's research and her leadership of several major initiatives in the Pacific have deepened our understanding of the complexities of gender relations in Pacific communities, including those in Aotearoa. She highlights the intersection of gender relations with familial, generational, sociocultural, religious and political relations, which are regarded by Pacific Islanders as equally, if not more, important than gender. Her wide networks have enabled her leadership of initiatives at the interface of research and policy, integrating scholarly work with community empowerment.



### ETHICS FOR FUTURE HUMANITY

The **Humanities Aronui Medal** for research or innovative work of outstanding merit was awarded to Professor **Timothy Mulgan** FRSNZ from University of Auckland for his contributions to moral philosophy, philosophy of religion and political philosophy. Tim has developed new ways of thinking about our obligations to distant strangers and future people. He asks: "how might people inhabiting different possible futures reimagine ethics?" He defends a provocative non-human-centred account of cosmic purpose and he asks how we might find meaning at humanity's end. His work has greatly influenced scholarship in many other disciplines including theology, development studies, environmental studies, and political theory.



### INDIGENISING PSYCHOLOGY PROFESSION

**Te Puāwaitanga Research Excellence Award** for eminent and distinctive contribution to te ao Māori and indigenous knowledge was presented to Dr **Waikaremoana Waitoki** (Ngāti Hako, Ngāti Mahanga), University of Waikato, for indigenising the psychology profession. With intentional space-making for Māori and indigenous values, she has been a driving force behind curriculum development. Moana has brought mātauranga Māori, te ao Māori and kaupapa Māori approaches together as an alternative to eurocentric psychology practices. Her exceptional contribution affords psychologists opportunities to learn and to choose tikanga Māori in their practices. The Whiti te Rā and the Mauri Ora Toko models are being used to address mental health and addiction issues, intergenerational trauma, and to develop resilience and enhanced wellbeing for tamariki experiencing emotional issues.



## ŌTEPOTI DUNEDIN GLENROY AUDITORIUM

### ORPHAN RELIEF IN CHINA

Royal Society Te Apārangi **Early Career Research Excellence Award for Humanities** was awarded to Dr **Anna High**, Faculty of Law, University of Otago, for her socio-legal exploration of orphan relief efforts, child rights and charity regulation in mainland China. Anna's book *Non-Governmental Orphan Relief in China: Law, Policy and Practice* is based on extensive longitudinal, ethnographic research, drawing on interviews with NGOs and private caregivers across rural and urban China. Her book focuses on child rights and the oversight, both legal and extra-legal, of charitable endeavours, in the context of one of China's most disadvantaged groups of children – gu'er, literally the 'lonely children'. Described as "masterful and thoughtful", her book was awarded the 2020 Asian Law and Society Association Distinguished Book Award, reflecting its outstanding merit as an original piece of humanities research.



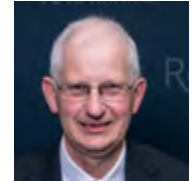
### COMPUTING THE SHORTEST PATH BETWEEN EVOLUTIONARY TREES

The **Hatherton Award** for the best scientific paper by a PhD student at any New Zealand university in chemical sciences, physical sciences, mathematical and information sciences was awarded to Dr **Lena Collienne**, Department of Computer Science, University of Otago, for identifying a biologically meaningful way to calculate distances between evolutionary histories, such as between species or variants in genomic data analysis. The number of steps needed to map one evolutionary tree onto another is described as the distance between them. To date, these distances have been complex and impractical to compute. Lena has discovered a process and an efficient algorithm to do this called Ranked Nearest Neighbour Interchange. This is the first positive result in such research in over 20 years. This algorithm has been incorporated into software widely-used for the analysis of genomic data.



### STATISTICAL TOOLS FOR GENOME-BASED LIVESTOCK BREEDING

The **Jones Medal** for a lifetime achievement award in pure or applied mathematics or statistics was awarded to Dr **Kenneth Dodds**, AgResearch, for developing and applying statistical methods for genetic data analysis that have allowed low-cost genotyping for livestock breeding. Throughout his career, Ken has been a global leader in developing and combining new statistical tools with genetic analysis. His methods and software allowed genome regions in livestock to be associated with diverse production traits. More recently, he has led the development of statistical tools for the application of low-cost DNA sequencing for genetic improvement.



### VALUING YOUNG CHILDREN'S INPUT FOR URBAN PLANNING

Royal Society Te Apārangi **Early Career Research Excellence Award for Social Sciences** was awarded to Dr **Christina Ergler**, School of Geography – Te Ihowhenua, University of Otago, for her research highlighting young children's contribution to achieving just, healthy, sustainable and inclusive cities. Christina's research demonstrates that young children are silenced on urban issues, but they deserve the right to be listened to. Young children demonstrate a logical interpretation of their environments and an awareness of risk and vulnerability, and they also care about their city, neighbourhoods and home spaces. Christina's work bridges disciplinary boundaries and is highly-regarded for subscribing to child-led methodologies and provides accessible tools for planners and urban policy makers. Many seek out her expertise on including pre-schooler voices on urban matters.





### GENOMIC MEDICINE FOR ALL

The **Hercus Medal**, a health sciences award for excellence in molecular and cellular sciences, biomedical science or clinical science and public health was awarded to Professor **Stephen**



**Robertson** FRSNZ, Laboratory for Genomic Medicine, University of Otago, for research on genetic conditions impacting children and seeking to establish equitable delivery of genomic medicine for Māori. Stephen is a clinician-scientist and an international authority on the clinical and molecular genetics of life-limiting malformations and neurocognitive disorders. He has discovered the cause of more than 30 disorders, enhancing the clinical care of people with such conditions globally. He is committed to developing accurate diagnostic genomics for Māori and is currently co-leading the assembly of a national resource to enhance genomic medicine for tangata whenua. He is involved in the leadership of multiple national and international research consortia, and is Chair of Paediatric Genetics at Cure Kids. Stephen is a clinician, translating his research findings into practice, and is committed to equity and access to care.

### LEADERSHIP FOR PHYSICS RESEARCH AND OUTREACH AND SUPPORTING EARLY CAREER RESEARCHERS



The **Thomson Medal** for outstanding contributions to the organisation, support and application of science or technology in New Zealand was awarded to Professor **David Hutchinson**, Director of Dodd-Walls Centre, University of Otago. It was presented to David for establishing and developing the Dodd-Walls Centre for Photonic and Quantum Technologies, advocating for early career researchers and developing outreach partnerships through the museum sector. From 2013, David led the Dodd-Walls Centre's bid to become a Centre of Research Excellence (CoRE) and has been the Centre's Director ever since. The Centre is a flagship for outstanding New Zealand physics research into the manipulation of light at the most fundamental, quantum level, and the control and manipulation of matter at the atomic scale. In partnership with Otago Museum, which David has also served on the board for, the Dodd-Walls Centre has delivered outreach across Aotearoa and the Pacific. In addition, David led the University of Otago's Ozone Group of early career researchers and helped form the InterAcademy Partnership's Global Young Academy, which advocates for early career researchers across the globe, especially in developing nations.



This year is the first time the Jones Medal has been awarded since the untimely death of the late Sir Vaughan Jones, winner of the prestigious Fields Medal, and Fellow of the Royal Society of London and Honorary Fellow of Royal Society Te Apārangi. Associated with this Medal is a \$5000 prize generously supported by the family of Sir Vaughan Jones and administered through the New Zealand Mathematics Research Institute.



## OUR HIGHEST HONOUR

# Rutherford Medal

### LONGITUDINAL DUNEDIN STUDY GIVES COUNTLESS INSIGHTS INTO WELLBEING, HEALTH AND DEVELOPMENT

The team behind the 50-year-old **Dunedin Study**, led by Professor **Richie Poulton** FRSNZ, University of Otago, was awarded the **Rutherford Medal**, our highest honour. It was presented for insights into the human condition and the resulting global impact on scientific theory, research, policy and best-practice from the Dunedin Multidisciplinary Health & Development Study. The Dunedin Study has followed a cohort of over 1000 study members since birth – they are arguably the most studied group of human beings in history.

The multidisciplinary study is renowned for generating new, cross-disciplinary knowledge about a range of 'big picture' issues. These include the long-term influence of childhood experience (for better or for worse) on adult function and life success; the complex interplay between nature and nurture; and why individuals age at markedly different rates, and thus vary in their susceptibility to non-communicable diseases and early mortality.

The study is also renowned for its significant discipline-specific contributions to mental, oral, respiratory, cardiovascular and sexual health as well as social and behavioural research.

Other team members include Professor **Murray Thomson** FRSNZ, University of Otago, and Professor **Terrie Moffitt** and Professor **Avshalom Caspi**, Duke University.

The Rutherford Medal is awarded for an exceptional contribution to the advancement and promotion of knowledge for the benefit of New Zealand society and comes with a prize of \$100,000 from the Government.

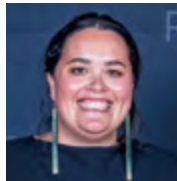




## TE WHANGANUI-A-TARA WELLINGTON BANQUET HALL, PARLIAMENT

### WHY ISN'T MY PROFESSOR MĀORI?

Royal Society Te Apārangī **Te Kōpūnui Māori Research Award** for an early career researcher to recognise innovative Māori research with a promising trajectory was presented to Dr **Tara McAllister** (Te Aitanga ā Māhaki), Centre for Science in Society, Te Herenga Waka—Victoria University of Wellington, for research into the underrepresentation and undervaluing of Māori academics. Tara's ground-breaking research has drawn national and international attention to the underserving of Māori by New Zealand's universities. Her most pivotal work *'Why isn't my professor Māori? A snapshot of the academic workforce in New Zealand universities'* showed Māori comprise only 5% of the academic workforce and this proportion has remained stagnant for at least six years.



### FORECASTING CORAL REEF STATUS UNDER CLIMATE CHANGE

The **Hamilton Award** for encouraging scientific research in New Zealand by early career researchers was presented to Dr **Chris Cornwall**, Te Herenga Waka—Victoria University of Wellington, for work on the impacts of climate change on coral reef growth globally. By amalgamating data from real world reefs and modelling, the research quantified the effects of climate change at more than 200 locations globally. The research found that even under low greenhouse gas emissions scenarios, coral reefs will suffer extensive impacts, and will cease to exist as we know them under moderate or higher emissions scenarios.



### IMPORTANCE OF HIGH COUNTRY MANAGEMENT FOR BIODIVERSITY

The **Charles Fleming Award for Environmental Achievement** for distinction in the protection, maintenance, management, improvement or understanding of the environment, in particular the sustainable management of the New Zealand environment was presented to Professor **Ann Brower**, University of Canterbury. It was presented for her pioneering interdisciplinary research that challenged the foundations of high country tenure review, and catalysed legislative reform to improve the conservation of New Zealand's unique landscapes and biodiversity. Her work has protected 5% of New Zealand's landmass and is helping to combat species loss globally by improving mechanisms for evaluating and protecting habitats.



## SKELETONS AS WINDOWS INTO THE HEALTH AND DIET OF PAST PEOPLE

The **Mason Durie Medal** for an outstanding contribution to the social sciences that while originating in a New Zealand environment, has had an international impact, was awarded to Professor **Hallie Buckley** FRSNZ, University of Otago. It was presented for transforming the way we conceptualise the biomedical history of the ancestors of modern Polynesians, and ground-breaking discoveries of ancient disease in Asia. Hallie leads numerous large scale, multi-disciplinary and multinational projects on the bioarchaeology of diet and health in the Asia-Pacific region. These projects interrogate skeletal and chemical evidence of the lived experiences of populations during major periods of change, as either initial colonisers of a region or when undergoing significant biosocial change.



## CHAMPION FOR DIGITAL HUMANITIES

The **Pou Aronui Award** for distinguished service to humanities-aronui over a sustained period was presented to Professor **Paul Millar**, School of Humanities and Creative Arts, University of Canterbury, for his commitment to growing capacity and expertise in Aotearoa New Zealand in digital humanities, which involves the intersection of digital technologies and humanities disciplines. During his career, Paul has obtained \$2.42 million funding for digital humanities projects, promoted its teaching, created nationally significant archives, championed post-disaster humanities research and served as president of the Australasian Association for Digital Humanities.



## FIT-FOR-PURPOSE HIJAB FOR MUSLIM POLICEWOMEN

The **Tahunui-a Rangi Award** for inventing or creating a unique and ingenious structure, device, product, design, system, service or artefact(s) which is significant in its economic, social, cultural, or environmental impact was presented to **Deborah Cumming** and **Nina Weaver**, Ngā Pae Māhutonga Wellington School of Design, Massey University, for creating a fit-for-purpose hijab. Operational Hijab Design supports safe and inclusive practices and changes the future of policing for Muslim women around the world. It was commissioned by New Zealand Police following the devastating 2019 Christchurch terror attack that drew attention to the lack of Muslim representation in police ranks.



## COVID-19 COMMUNICATOR FOR PUBLIC HEALTH

The **Callaghan Medal** for an outstanding contribution to science communication and raising public awareness of the value of science to human progress was awarded to Professor **Michael Baker** MNZM, University of Otago, Wellington. It was presented for science-informed commentary on the COVID-19 pandemic and other major public health issues in Aotearoa New Zealand. Michael has focused on a wide range of health issues along with evidence-informed solutions and used multiple channels to engage with the wider public, decision-makers and key groups of practitioners over his 30-year career. His work during 2020-22 has been dominated by assisting with the COVID-19 pandemic response. This work has including strong scientific advocacy for the elimination strategy.



## GLOBAL PLATE TECTONICS AND NEW ZEALAND'S ALPINE FAULT

The **Hutton Medal** for significantly advancing understanding in animal sciences, earth sciences or plant sciences was awarded to Professor **Rupert Sutherland** FRSNZ, Te Herenga Waka—Victoria University of Wellington. It was presented for fundamental discoveries in global plate tectonics, the evolution of Zealandia and the implications for active faulting and large magnitude earthquakes in New Zealand. His work on the Alpine Fault has identified its structure, slip rate and earthquake history, and he was the first to recognise that it was capable of generating magnitude 8 earthquakes.



## SUPERCONDUCTING ENGINEERING FOR ALL-ELECTRIC AIRCRAFT

The **Pickering Medal** to recognise excellence and innovation in the practical application of technology was awarded to Professor **Rod Badcock**, Robinson Research Institute, Te Herenga Waka—Victoria University of Wellington. It was presented for developing superconducting technologies that are enabling electrical machines at the leading edge of current engineering practice, such as electric aircrafts and high-speed trains. Rod's accomplishments in advancing the science and technology of high temperature superconductors have already had an important commercial impact and his work is setting the stage for widespread adoption of all-electric aircraft.





# Auckland Writers Festival

In 2022, the Society and Marsden Fund Te Pūtea Rangahau a Marsden re-established its sponsorship of the Auckland Writers Festival. We supported three events, and welcomed classes from **Aorere College** and **Tangaroa College** to experience sessions.



At the event *Truth and Lies*, defence strategist and author Dr **David Kilcullen**, researcher and author of *A Matter of Fact* Dr **Jess Berentson-Shaw**, and investigative journalist and author of *Truthteller* **Stephen Davis**, came together in conversation with **Kate Hannah** to discuss information, disinformation and misinformation, and to interrogate manipulation, unrest and the seemingly doomed quest for harnessing the truth.

Meteorologist **Lisa Murray**, MetService New Zealand's Head of Weather Communication, co-authored the book *New Zealand's Wild Weather*, and gave a presentation on some of this country's most dramatic weather and weather events.

Our third supported event was a fascinating showcase of the *He Puapua* discussion document and the plan to realise our commitments to the UN Declaration on the Rights of Indigenous Peoples. Working group members, writers and lawyers Dr **Claire Charters** (Ngāti Whakāue, Tūwharetoa, Ngāpuhi, Tainui) and Sesquicentennial Distinguished Professor **Jacinta Ruru** MNZM FRSNZ (Raukawa, Ngāti Ranginui, Ngāti Maniapoto) discussed sovereignty, mātauranga Māori and igniting the imagination with **Moana Maniapoto** (Ngāti Tūwharetoa, Te Arawa).

In addition, we attended *He Taonga te Wareware? Remembering and Forgetting Difficult Histories in Aotearoa New Zealand*. This presented a powerful discussion between sociologist Professor **Joanna Kidman** (Ngāti Maniapoto, Ngāti Raukawa) and historian Dr **Vincent O'Malley** as they spoke with **Stacey Morrison** (Te Arawa, Ngāi Tahu) about their writing, passion and collaborations. Research for their book of the same name was supported by the Marsden Fund.



The festival is one of this country's premiere cultural events and its largest and most successful literary event. Every year, it hosts world leading commentators and writers, attracting upwards of 60,000 attendees. Its extensive programme celebrates curiosity and a sense of intellectual adventure and is driven by the desire to spark ideas, to get people talking and to give them a time and place to engage with the world.



# Marsden Fund supports innovative research in *Aotearoa*





“Te Pūtea Rangahau a Marsden was created to enable our leading and early-career researchers to develop their most inspired and ambitious ideas. Support for curiosity-driven ‘blue-sky’ ideas is vital sustenance to feed the healthy, resilient and diverse research culture we have in Aotearoa. The resulting mahi can be expected to challenge accepted ways of thinking, introduce new lines of enquiry and sometimes lead to unexpected discoveries.”

PROFESSOR DAVID BILKEY  
CHAIR, MARSDEN FUND COUNCIL

**TE PŪTEA RANGAHAU A MARSDEN, THE MARSDEN FUND ALLOCATED \$77.391 MILLION (EXCLUDING GST) TO 113 RESEARCH PROJECTS LED BY RESEARCHERS IN AOTEAROA NEW ZEALAND IN THE 2022 FUNDING ROUND. THESE GRANTS SUPPORT EXCELLENT NEW ZEALAND RESEARCH IN THE HUMANITIES, SCIENCE, ENGINEERING, MĀTAURANGA, MATHS AND THE SOCIAL SCIENCES. THE GRANTS ARE DISTRIBUTED OVER THREE YEARS AND ARE FULLY COSTED, PAYING FOR SALARIES, STUDENTS AND POSTDOCTORAL POSITIONS, INSTITUTIONAL OVERHEADS AND RESEARCH CONSUMABLES.**

Established researchers and their teams were awarded 72 Marsden Fund Standard grants, for a total of \$62,631,000 (excluding GST), with a success rate of 12.4%. These research projects will address a wide range of issues of both local and international importance, including seeing if we can use ionic liquids as an alternative to harmful solvents, investigating the role of fructose in diabetic heart disease, understanding the history and future of the kūmara through Māori oral historical perspectives, and exploring the maths behind imaging technologies.

Marsden Fund continues to provide strong support for up-and-coming researchers. In 2022, 41 Fast-Start grants were awarded, for a total of \$14,760,000 (excluding GST), with a success rate of 13.0%. Fast-Start grants are

designed to encourage the development of independent research and build momentum for exceptional careers in Aotearoa. Funded projects this year cover a broad range of topics including quantifying the impact of climate change on glaciers, uncovering cultural history of the taniwha, countering resistance to antibiotics, understanding the drivers of solar cell adoption in Aotearoa, and exploring writing in vagahau Niue, the language of Niue.

The successful projects are of world-class standard, having made it through a highly-rigorous selection process, including substantial international peer review. Te Pūtea Rangahau a Marsden is managed by the Society on behalf of the New Zealand Government with funding from the Ministry of Business, Innovation and Employment.





"It is an honour to lead the Marsden Fund Council, which has a long history of funding excellent investigator-led research in Aotearoa. I am especially excited to be involved at this time when the Research, Science and Innovation System is being reformed."

PROFESSOR GILL DOBBIE FRSNZ



# Change in leadership for Marsden Fund Council

Professor **David Bilkey**, University of Otago, reached the end of his term as Chair of the Marsden Fund Council this year. The Marsden Fund Council commended Professor Bilkey's empathetic and grounded leadership. He has been involved with the Marsden Fund since 2009, when he was elected as a panellist on the Economics and Human Behavioural Sciences panel. He was appointed Convenor of that panel in 2015, and then Chair of the Marsden Fund Council in 2018.

Professor **Gillian (Gill) Dobbie** FRSNZ, University of Auckland, was appointed as Professor Bilkey's successor by the Minister for Research, Science and Innovation. Professor Dobbie has convened the Council's Mathematical and Information Sciences panel since 2015. She was one of the first women to complete a PhD in Computer Science at the University of Melbourne in 1995. Her passion is in getting the most out of data, which includes how data can be processed efficiently, and the insights we can gain from data. Her current research focuses on machine learning, in particular data stream mining and adversarial attacks.

MARSDEN FUND STANDARD GRANT

# Finding our way

## When the space around us plays by different rules

PROFESSOR RANDOLPH GRACE AND PROFESSOR SIMON KEMP, UNIVERSITY OF CANTERBURY, WILL USE IMMERSIVE VIRTUAL REALITY (VR) TO TEST THE FLEXIBILITY OF OUR PERCEPTION OF SPACE.

Humans and nonhumans alike can navigate by path integration – updating one’s current position relative to a start point. Even though there may be no features to guide you, by gut feeling you know the correct homing direction and can estimate the distance to your origin point. Path integration is remarkable because it appears to require us to mentally calculate in a way that is consistent with the geometry of the space around us. But how do our cognitive and neural systems accomplish this?

Professors Grace and Kemp have proposed that intuitions about algebraic structure are inherent to perception: We create representations of objects and shapes which have a consistent geometry and draw on these representations to perceive the spaces we navigate. In this Marsden Fund project, they will lead a team to test this by using immersive Virtual Reality (VR) at the HIT (Human Interface Technology) lab, including using cutting-edge VR technology

that allows for 3D motion sensation. They will explore whether people can learn to operate in non-Euclidean spaces – that is, spaces where, for example, the internal angles of triangles add to more, or less, than the usual 180°, but which still obey a geometry that is algebraically consistent. As a study participant for the project, you might be asked to walk around a VR space which appears distorted, with objects warping in strange ways as you move closer or further away from them, making it hard to tell how distant they are. Could you navigate back to your starting point?

If people can learn to navigate in these non-Euclidean spaces, it would suggest that we can modify our mental representations of space to fit the geometric rules we encounter. This would provide compelling evidence that our perceptual system has the flexibility to perform computations that are distinctly different than those required in the world in which we evolved.





MARSDEN FUND FAST-START GRANT

# Mapping Niue writing

IN AND BEYOND AOTEAROA



**DR JESSICA PASISI, (NIUE MUTALAU, HIKUTAVAKE, PĀLAGI, NGĀTI PIKIAO, TAHITI) FROM UNIVERSITY OF OTAGO ULTIMATELY SEEKS TO EXPLORE THE PLEASURE THAT TAU TAGATA NIUE, NIUE PEOPLE, GAIN FROM ENGAGING WITH NIUE WRITING.**

The importance of writing in vagahau Niue, the language of Niue, has yet to be fully explored and celebrated through research. The bookshelf of Niue literature is significant, yet there is currently no published work that engages with a number of these key texts.

Over the course of this Marsden Fund Fast-Start project, Dr Pasisi will catalogue and critically analyse Niue texts from throughout recorded history and examine how tau tagata Niue engage with Niue texts in contemporary repositories. This research will expand our understanding of Indigenous literary connections between Niue and

Māori, New Zealand Realm nations (Aotearoa, Niue, Tokelau and the Cook Islands), and broader global Indigenous communities. Dr Pasisi will co-lead a series of workshops with tau tagata Niue artists and writers to explore Niue texts as a wider part of cultural self-expression.

As the direction of the New Zealand school curriculum moves to be more deliberate and intentional about the inclusion of Pacific histories, knowledge and languages, there is an urgent need for this critical engagement with the wealth and abundance of Indigenous texts and thinking that is located in repositories across the country.

MARSDEN FUND FAST-START GRANT

# Oscillating prostate size

HOW THE BRUSHTAIL  
POSSUM CAN HELP  
US UNDERSTAND  
PROSTATE CANCER

**DR MELANIE LAIRD, UNIVERSITY OF OTAGO,  
WILL DETERMINE THE GENETIC MECHANISMS  
CONTROLLING PROSTATE ENLARGEMENT AND  
REGRESSION IN ANIMALS THAT BREED SEASONALLY.**

The prostate in mammals which breed seasonally undergoes a dramatic enlargement and then regression during the mating season. Rapid shifts between cell growth and death are otherwise rare in adult tissues, to prevent uncontrolled growth and cancer. The fact that the cellular changes which allow the prostates of seasonal breeders to oscillate in size is both controlled and reversible means that these species offer a unique opportunity to study the mechanisms of controlled prostate growth.

Dr Laird has been awarded a Marsden Fund Fast-Start grant to undertake an ambitious study of this phenomenon, identifying the specific genetic patterns that switch on and off mammalian prostate changes. This study will compare the gene expression in two seasonal breeders (brush-tail possums and red deer), to two animals that breed year-round (opossums and black rats). The genes they discover will then be studied, determining their specific functionality.

"I'm exploiting the strange and novel quirks of marsupial biology to answer some big biological questions...How do you undo cell-growth? How do you reverse that? It's the Holy Grail of cancer."

DR MELANIE LAIRD

This will be the first study to identify the functional roles of prostate genes involved in seasonality. It will shed light on the fundamental processes controlling cell growth and death, as well as how diverse mammalian species overcome the challenges of seasonal reproduction. Findings from this research have the potential to lead to future therapies for prostate cancers in humans.





# Research fellowships

TE RIU-A-MĀUI ZEALANDIA GEOLOGY, QUANTUM INTERNET AND UNDERSTANDING DARWINIAN EVOLUTION

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.

Dr **Nick Mortimer** FRSNZ, GNS Science, Te Pu Ao, played an important role in the discovery of the world's eighth and most-recently discovered continent, Te Riu-a-Māui Zealandia. Dr Mortimer is assembling a team that will bridge physical science and mātauranga Māori to explain the geology of our continent in an understandable way using Māori and Pākehā accounts of the exploration, history and development of Aotearoa and Te Riu-a-Māui Zealandia.

Professor **Winston Seah**, Te Herenga Waka—Victoria University of Wellington, is studying how the quantum internet will enhance internet-based

utilities by providing access to quantum computing resources. This research will incorporate the physics-based principals of quantum mechanics to develop new protocols and algorithms for connecting quantum network devices into the future quantum internet.

Distinguished Professor **Hamish Spencer** FRSNZ, University of Otago, will investigate the paradox of variation, a central problem in evolutionary biology. He will determine how evolutionary processes interact with each other and how this shapes genetic variation within living populations.



READ MORE:  
[bit.ly/2022hl-70](https://bit.ly/2022hl-70)

HIGHLY SOUGHT-AFTER

# Postdoctoral fellowships & PhD scholarships

Six Rutherford Foundation Postdoctoral Fellowships and one Cambridge-Rutherford Memorial PhD Scholarship have been awarded to excellent and passionate early career researchers.

They explore a diverse range of research topics, spanning from research aiming to speed up carbon capture in weathering silicate rocks; investigating slope stability in a changing climate; and linking up Mount John observatory with international telescopes to study exploding supernovas and learn about the history of the Universe.



READ MORE:  
[bit.ly/2022HL-71](https://bit.ly/2022HL-71)

## TWO-YEAR RUTHERFORD FOUNDATION POSTDOCTORAL FELLOWSHIPS:

Dr **Thomas Corbett**, (Ngāpuhi) University of Waikato, for research entitled: Microbially enhanced silicate weathering for CO<sub>2</sub> sequestration (returning from Uppsala University, Sweden).

Dr **Bridgette Farnworth**, Nelson Marlborough Institute of Technology, for research entitled: Exploring the hierarchical impact of artificial light at night on invertebrates: how individual behaviour leads to community change.

Dr **Daniel Gomez Isaza**, University of Canterbury, for research entitled: Thermal phenotypic plasticity of New Zealand fishes in response to increased thermal variability (returning from Murdoch University, Perth, Australia).

Dr **Ryan Ridden-Harper**, University of Canterbury, for research entitled: Revealing the mysteries of exploding stars with Ōtehiwai Mt John Observatory.

Dr **Leena Riekkola**, University of Auckland, for research entitled: Tohorā – southern right whales as a sentinel for ocean change: the past, the present and the future (returning from National Oceanic and Atmospheric Administration – Northwest Fisheries Science Center, Seattle, USA).

Dr **Katherine Yates**, University of Canterbury, for research entitled: Seismic slope stability in a changing climate: quantifying the future stability of New Zealand's loess slopes.

## THREE-YEAR CAMBRIDGE RUTHERFORD MEMORIAL PHD SCHOLARSHIP:

**Mr Ben Roberts**, Te Herenga Waka—Victoria University of Wellington, for research entitled: Leveraging epigenetics for healthy ageing.

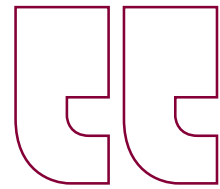




# New Senior Editor

OF THE NEW ZEALAND JOURNAL OF BOTANY





"I'm honoured to take over the role of Senior Editor for the *New Zealand Journal of Botany*. I look forward to working with the editorial team to continue to invigorate the journal, which has a vital role serving the botanical research community, particularly in New Zealand and the southern hemisphere."

DR LARA SHEPHERD



The *New Zealand Journal of Botany's* long serving Senior Editor, Associate Professor **Chris Lusk**, University of Waikato, completed his remarkable eight-year tenure at the end of 2022. Dr **Lara Shepherd**, Te Papa, is his successor.

Dr Lusk took on this demanding role in 2015 with a clear strategy and bold vision, raising the journal's profile as a key plant science journal in the southern hemisphere. NZJB and the community have benefited enormously under his tenure, and his professionalism, enthusiasm, and passion will be missed.

Coming out of the galleries, libraries, archives and museums (GLAM) sector, Dr Shepherd is one of the most prolific authors in NZJB, contributing a total of 29 papers to the journal as well as other Royal Society Te Apārangi journals throughout her research career. Her ongoing contribution to NZJB in various roles clearly demonstrates her longstanding commitment to the journal. Her areas of expertise on the evolution of New Zealand's biota fit well with NZJB's core subject matter, as do her current and past roles for the New Zealand Botanical Society, Wellington Botanical Society and the Association for Women in the Sciences.



READ MORE:  
[bit.ly/2022HL-73](https://bit.ly/2022HL-73)



# Powering Potential 2022





**OUR POWERING POTENTIAL PROGRAMME SEEKS TO GIVE STUDENTS VALUABLE SKILLS AND EXPERIENCE, AND DEMONSTRATE TO THEM THE BENEFITS OF FOLLOWING A CAREER IN RESEARCH. IN DECEMBER, 58 SENIOR SECONDARY SCHOOL STUDENTS WERE SELECTED FROM AS FAR AFIELD AS KERIKERI AND INVERCARGILL TO SPEND THREE INTENSE DAYS IN WELLINGTON GETTING A TASTE OF BEING A RESEARCHER.**

The cohort was larger than in previous years, making up for opportunities lost to COVID-19. The students worked in teams, mentored by academics, and were tasked with responding to a posed question. At the culmination of the programme, the teams presented their findings to a public audience. Not only did they have the opportunity to make new friends, but they also honed their skills in collaboration, listening to their peers, time management and learning to present their research in a succinct and effective way. In addition to the hard work, they also enjoyed plenty of social activities in the evenings.

A special thank you to Freemasons New Zealand, Marsden Fund Te Pūtea Rangahau a Marsden and the Ministry of Business, Innovation and Employment for their support of this inspiring event.



READ MORE:  
[bit.ly/2022HL-75](https://bit.ly/2022HL-75)







“This is an exciting opportunity for joint research projects on global challenges, such as climate change, the food-water-energy nexus and global health.”

DR BRENT CLOTHIER FRSNZ  
PRESIDENT, ROYAL SOCIETY TE APĀRANGI

# European Union delegation

IN DECEMBER, THE SOCIETY WELCOMED MEMBERS OF THE DELEGATION FROM THE EUROPEAN UNION, LED BY MS **SIGNE RATSO**, ACTING DIRECTOR-GENERAL FOR RESEARCH AND INNOVATION OF THE EUROPEAN COMMISSION AND CHIEF NEGOTIATOR FOR THE HORIZON EUROPE ASSOCIATION.

The delegation was in the country for formal negotiations for New Zealand to become an Associate Member to Pillar Two of Horizon Europe, the European Union’s largest ever global research and innovation programme. This global fund totals € 95.5 billion over 7 years. Association gives Aotearoa New Zealand scientists the same opportunities to lead major research programmes and contribute to Horizon Europe-funded projects as European scientists. It is the closest level of cooperation available to non-EU countries.

NEW EXPERT ADVICE

# factsheet on radiation

Radiation is ever-present in our daily lives — in both natural and generated forms. Scientists have identified various risks and benefits from the use of, and exposure to, different kinds of radiation. This knowledge allows us to safely use radiation while mitigating the possible risks to our health and wellbeing, for example in communication technologies, and medical diagnostics and treatment.

The factsheet, titled *Radiation: Harnessing it safely to benefit our daily lives*, discusses the radiation we encounter and explains how we harness it safely. We have selected examples to illustrate where radiation — from radio waves to gamma rays — may be commonly encountered.



READ MORE:  
[bit.ly/2022HL-77](https://bit.ly/2022HL-77)





# Nō te huri huringa

## On reflection

LOOKING BACK, 2022 WAS A YEAR OF CONTINUED AND ADDITIONAL CHALLENGES, WITH COVID IN THE COMMUNITY, LARGE COST-OF-LIVING INCREASES, THE DISRUPTION OUTSIDE PARLIAMENT, MIS-INFORMATION AND DIS-INFORMATION AND INTERNATIONAL CONCERN FOR THE SITUATION IN UKRAINE TO NAME BUT A FEW. IT HAS ALSO BEEN A YEAR WITH MANY SUCCESSES. THE MOST NOTABLE ASPECT FOR ME WAS BEING ABLE TO CONNECT WITH PEOPLE FACE-TO-FACE ONCE AGAIN. AS WONDERFUL AS DIGITAL TECHNOLOGIES CAN BE IN ALLOWING US TO MEET 'VIRTUALLY', THERE IS A SPECIAL SENSE OF SHARING THAT ACCOMPANIES SHARING A PHYSICAL SPACE.



"It is my belief that this community and diversity of disciplines and interests is our real strength and brings with it convening power. It will serve us well as we review our long term strategy, and ensure we are relevant to all our stakeholders and the wider public over the next twenty years and beyond."

DR BRENT CLOTHIER

We were delighted to host our Research Honours Aotearoa awards and medals as events this year. It was wonderful to be able to gather in person, to marvel at the immense difference these researchers have made, and to take the time to celebrate success, excellence and achievement at the highest level. My congratulations to all the winners.

In another highlight, I had the privilege of attending the presentation evening of Powering Potential, where 58 secondary students shared their take on solving some of the 'wicked problems' set them by their mentors. These mentors were drawn from our Early Career Researcher Forum. We were unable to run this programme last year due to the pandemic – so it was a great buzz to have so many rangatahi in the whare, sharing their energy and ideas. As many of the ECR mentors said, if the future is in their hands, then it is in safe hands. Many thanks to all involved to make this programme such a success, especially Freemasons New Zealand for their continuing support.

We have heard a wide range of perspectives this year.

In addition to our special meeting with Fellows in April, the Society's Chief Executive Paul Atkins and I have been able to travel overseas and meet with academies and umbrella organisations, often representing a single discipline. Many of the people from these organisations expressed enthusiasm for the model of our Society, which brings together different disciplines into one academy and encompasses a broad range of functions. Through our work, we support public engagement, expert advice, research funding and our broad membership.

It is my belief that this community and diversity of disciplines and interests is our real strength and brings with it convening power. It will serve us well as we review our long term strategy, and ensure we are relevant to all our stakeholders and the wider public over the next twenty years and beyond.

I see this long term planning process, involving surveys, stakeholder meetings and workshops, as an exciting opportunity for the Society to ensure we are future-proofing ourselves in a world that is ever

changing, and that has been changed irrevocably by the pandemic.

My sincere thanks go to the Society's Council, the Academy Executive Committee, staff and the many individuals who support the funds we administer and activities we pursue. Notable thanks go to Professor David Bilkey, outgoing Chair of the Marsden Fund Te Pūtea Rangahau a Marsden for the leadership and guidance he has provided over his almost fifteen-year involvement with the fund.

2022 was the first year we as a nation celebrated Matariki, a time for collective remembrance and reflection, and for us to gather our thoughts for the seasons ahead. We look forward with renewed determination to meet our challenges, and with fresh resolve to rebuild loosened bonds and reconnect.

Mauri ora!

**Dr Brent Clothier FRSNZ**  
**Royal Society Te Apārangi President**



# Kuputaka Glossary

<b>ahurei</b>	chief, prominent, distinguished, noted
<b>ākonga</b>	student
<b>aroha</b>	love
<b>aronui</b>	humanities
<b>arotakenga</b>	evaluation, review, critique
<b>hāpai</b>	support, elevate
<b>hou</b>	new
<b>Hunga</b>	Tonga Hunga Ha'apai submarine volcano in the South Pacific
<b>kaiako</b>	teacher
<b>kaimahi</b>	staff
<b>kairangahau</b>	researcher
<b>kaitiakitanga</b>	guardianship
<b>kaupapa Māori</b>	way of doing things, a Māori approach
<b>kete</b>	basket
<b>kōiwi tangata</b>	ancestral remains
<b>kōura</b>	crayfish
<b>kuia</b>	grandmother, female elder
<b>kupu</b>	word
<b>kura</b>	school
<b>kuri</b>	dog
<b>mihi</b>	welcome
<b>mōkihi</b>	traditional waka fashioned from bulrush and flax
<b>mokopuna</b>	grandchildren

<b>ngahere</b>	bush, forest
<b>Papatūānuku</b>	Earth, Mother-Earth
<b>pūtaiao</b>	science
<b>rangahau</b>	research
<b>rārangi upoko</b>	contents
<b>rōpū</b>	group
<b>taiao</b>	environment, ecosystem
<b>tamariki</b>	children
<b>taniwha</b>	water spirit, powerful creature
<b>te ao Māori</b>	Māori worldview
<b>te Rā</b>	the sun
<b>tikanga</b>	customs, traditional values
<b>tohatoha</b>	share
<b>torohē</b>	discover
<b>tūhura</b>	explore
<b>waka</b>	canoe, vehicle
<b>wānanga</b>	forum, meeting
<b>whaiāipo</b>	sweetheart, boyfriend, girlfriend
<b>whakapapa</b>	ancestry
<b>whānau</b>	family
<b>whānui</b>	breadth, range
<b>upoko</b>	head
<b>uwhi</b>	yam





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