Office of the Prime Minister's Chief Science Advisor
Kaitohutohu Mātanga Pūtaiao Matua ki te Pirimia

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ANNUAL REPORT 2021

Mahi Tahi 3

Office of the Prime Minister's Chief Science Advisor
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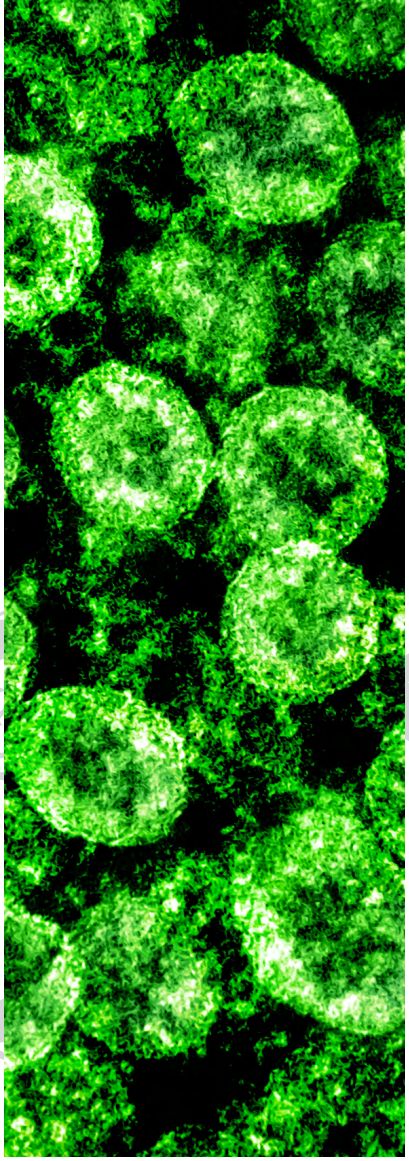


He moana pukepuke e ekengia e te waka

TE KARERE A TE PIRIMIA

Opening remarks

From the Rt Hon Jacinda Ardern

The Prime Minister and Juliet received the first dose of their COVID-19 vaccines at the Manurewa Marae in June 2021.

The role of science, scientists, and science communicators has continued to be critical over the past year in the New Zealand Government's response to COVID-19.

We continuously refined and improved our public health measures and border response to keep New Zealanders safe, while there was also increasing focus here and overseas on the development and roll-out of vaccines.

Throughout this, Juliet has consistently explained the science, not only to me and other Ministers, but to New Zealanders grappling with the complexities of a pandemic and what it means for them. She has provided enormously valuable advice about the way forward and utilised her extensive network of relationships to help inform our thinking. New Zealand's response has benefited tremendously from the advice of a wide and ever expanding virtual network of scientific experts and communicators, here and internationally, that Juliet drew together as we were confronted by new challenges.

> "Juliet's contribution, along with her leadership of science advisors across government agencies, continues to demonstrate **the critical role of science and technology to society and to support robust decision making.**"
>
> - Rt Hon Jacinda Ardern, press release, Beehive website, 3 June 2021

Alongside the ongoing and demanding response to COVID-19, Juliet and her team have delivered another significant and extensive report 'The future of commercial fisheries in Aotearoa New Zealand'. This report brought together the evidence and the wide range of views from across the sector to identify ways to fill knowledge gaps, increase our understanding of the marine environment, and take a more holistic approach to fisheries management over the longer term.

Other significant work has included providing up-to-date summaries which provide an accessible view of the evidence base for topics of high public interest such as cannabis, vaccines and fluoride in drinking water.

It is important for me to acknowledge and thank all of the science community who have continued to support the Government's response to COVID-19 over the past year. The fact that we are already vaccinating New Zealand and the world in the year following the emergence of the pandemic is an enormous credit to the global scientific community. And thank you in particular to Juliet – for agreeing to another three-year term as my Chief Science Advisor and for all your advice and support, including joining me for my first Pfizer vaccine.

Rt Hon Jacinda Ardern
Prime Minister

Contents

Right: Chatham Island forget-me-not (*Myosotidium hortensia*).

FOREWORD

Ka mua, ka muri

Beginning a second term as Kaitohutohu Mātanga Pūtaiao Matua ki te Pirimia, Juliet looks back on the past year of science advice, evidence, communication and conversation.

Tēnā koutou katoa, ngā mihi o te wā ki a tātou.

Ahakoa ngā ārai, ahakoa ngā aupiki me ngā auheke, mā te āta wānanga me te mahi tahi e whai rongoā, e whai rautaki kia anga whakamua ai tātou katoa.

Kei te ao hurihuri tātou e noho nei engari mā te titiro ki ngā rā o mua me ngā kōrero o nehe, kei reira kitea ai he oranga mō tātou.

Nā reira, anei ētahi pitopito kōrero.

This is our third annual report and brings us to the end of my first term as the Prime Minister's Chief Science Advisor, Kaitohutohu Mātanga Pūtaiao Matua ki te Pirimia. I'm very proud of the team who kept up a gruelling pace to continue to support the COVID-19 response, as well as deliver our second major report – *The future of commercial fisheries in Aotearoa New Zealand*, craft public-facing explainers on cannabis and fluoridation of water supplies, and kick off this year's major project on infectious diseases and antimicrobial resistance. It was also very exciting to see our *Rethinking plastics* report get a mention in the Speech from the Throne – with the recommendations now well on their way to implementation. Mā te mahi tahi ka ea ngā mahi katoa.

Governor General Dame Patsy Reddy delivers the Speech from the Throne. Image credit: Robert Kitchin/ Stuff via Government House (CC BY 4.0).

I'm also very proud of the science community who continued to support the COVID-19 response both behind the scenes and in front of the media. The pace has been demanding, but they have risen to the challenge. Ngā mihi nui e hoa. It was really gratifying to see so many of those individuals and teams recognised with an array of awards and prizes this year – more of which later in the report. And, of course, the wider Chief Science Advisor Forum who have continued to work steadfastly to bring evidence to policy in their home ministries, especially Professor Ian Town, our Chief Science Advisor to the Ministry of Health – Mānatu Hauora, who expanded his remit this year to include not only COVID-19 management but also the vaccine roll out. Tino pai e hoa.

I'm delighted to have recently accepted a second term in this role. It is a huge privilege to support the Prime Minister and synthesise the voices of so many talented scientists in Aotearoa and beyond. We are giving some thought to our focus for

Top right: Juliet delivers an address, kanohi ki te kanohi, to a crowd at the University of Canterbury science graduation ceremony. Image credit: Corey Blackburn, University of Canterbury photographer.
Bottom right: Juliet's view from the stage.

"It is a huge privilege to support the Prime Minister and synthesise the voices of **so many talented scientists** in Aotearoa and beyond."

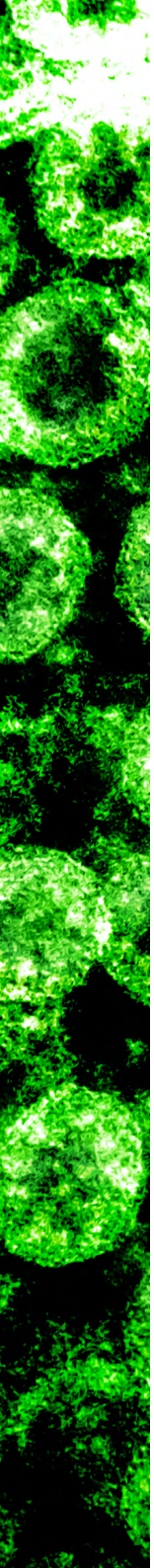
2021–2024 and, as well as our business as usual advising, will increase our focus on women in science and connection to emerging researchers. This latter workstream kicks off before this report goes to print, with a hui where emerging researchers are invited to meet a collection of government advisors to extend their networks and help frame their research directions in a way that can make a difference. We are very open to ideas for future projects to put up to the Prime Minister for consideration – so if you have ideas on this score, please get in touch.

In the pages to follow you will find a taste of the rest of our activity. Despite the challenge of an Auckland lockdown or two, the team has been out and about enjoying kōrero with researchers and stakeholders and experiencing the breadth and depth of research activity across the country and internationally – and how it might make a difference to government policy. Throughout, we stuck to our four principles: transparency, accessibility, inclusivity and rigour – which have kept us grounded and on track in difficult times.

Although there has been no opportunity to travel overseas, our international connectivity has been nurtured significantly with deep relationships between international chief science advisors growing throughout the COVID-19 response. Aotearoa has been in the spotlight as we chartered our own path to keep our people healthy, and this has led to invitations to engage on the virtual world stage. I'm looking forward to reconnecting with some of my international colleagues who have been hugely supportive throughout the pandemic kanohi ki te kanohi, hopefully in the not-too-distant future. Back home it has been fantastic to once again enjoy the privilege of crowded events, speak to large audiences and connect in person – our overseas colleagues continue to marvel that we can do this, and I am constantly reminded that we need to stay vigilant as we navigate out of a global pandemic.

Ngā manaakitanga,

Juliet



IN BRIEF

The year in numbers

17.3k
followers

8
new publications including our second major report

111k+
unique web visitors

36+
talks and presentations

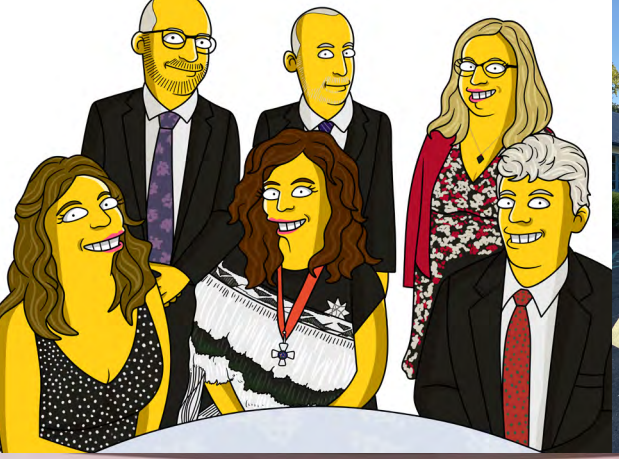
3.9k
followers

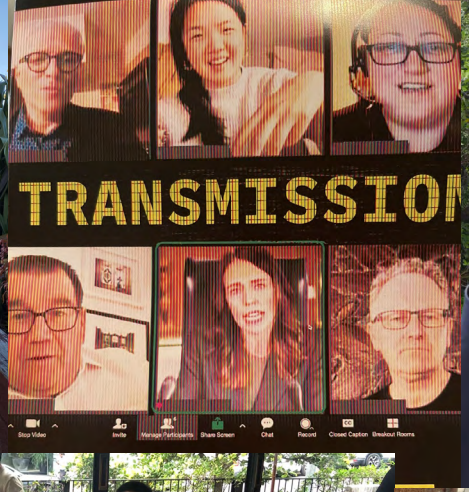
16+
media interviews

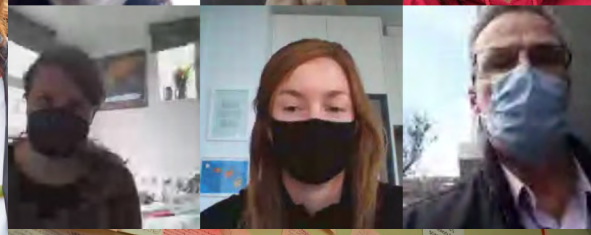
13
interns and fellows

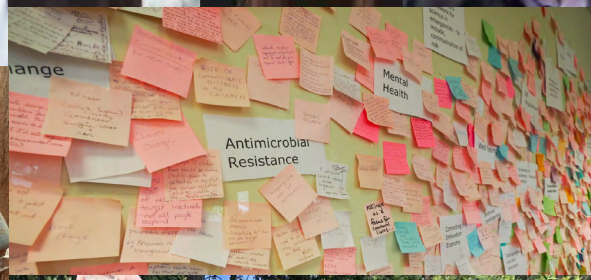
10
blog posts

4
weeks working remotely from our bubbles




TRANSMISSION




Mental Health
Antimicrobial Resistance


SEAFOOD SUSTAINABILITY AWARDS 2020

WHO WE ARE

The team

Te amorangi ki mua, te hapai o ki muri.

The Office of the Prime Minister's Chief Science Advisor (PMCSA), based at the University of Auckland, is independent of government and provides nonpartisan advice directly to the Prime Minister.

The PMCSA advises the Prime Minister on scientific evidence, acts as a conduit of alerts between the research community and government, and engages in activities to raise the profile of science in Aotearoa.

Read more about the team

Professor Dame Juliet Gerrard DNZM FRSNZ HonFRSC has held the position of PMCSA since June 2018. She is seconded from her role as a Professor at the University of Auckland. Juliet provides advice to the Prime Minister and convenes the Chief Science Advisor (CSA) forum. She aims to build a trusted bridge between science, society and government. Juliet develops wide networks among scientists and science advisors nationally and internationally to enable this.

Over the last year, she has continued to build and strengthen this bridge, while also having a major focus on supporting the COVID-19 response and diving deep into the world of commercial fisheries.

Dr Susie Meade is the principal advisor to Juliet. Her role also supports the CSA forum and she splits her time between Auckland, Christchurch and Wellington. Susie was raised on the family farm, has a PhD in chemistry and more than 20 years' experience in research and science management in Aotearoa – most recently at QuakeCoRE, the NZ Centre for Earthquake Resilience.

Over the last year, Susie has been chief CSA forum wrangler, and Juliet's wing woman across all the Office's diverse mahi.

Dr George Slim, based in Wellington, provides policy advice to the Office as a consultant. George has more than 30 years' experience across academia, government, small business and the government research sector as both a scientist and a bureaucrat. He is ably assisted by chief cat-napper and office mascot Wallace.

In the last year, George has worked on rapid COVID-19 briefings and has been out and about keeping the Office connected to folks in the capital.

Dr Rachel Chiaroni-Clarke is a senior research and policy analyst. She completed her PhD in medical genetics at the University of Melbourne and Murdoch Children's Research Institute. Prior to joining the team, Rachel worked as a writer at a healthcare communications agency in Melbourne.

The past year, Rachel has completed the cannabis project, contributed to the fisheries report and kicked off our major project on infectious diseases and antimicrobial resistance.

Sadly for us, Rachel will be leaving us soon to take up an exciting new position at Callaghan Innovation. We will miss you Rachel.

Celia Cunningham is a research analyst and writer. Prior to joining the office, Celia spent six years in risk management consulting. She has also worked as a policy analyst for the Ministry for Primary Industries, as well as undertaking a variety of internships across the government and private sectors.

In the last year, Celia has led the fisheries project – taking her from Rēkohu Wharekauri the Chatham Islands to Lee Fish in Leigh, north of Tāmaki Makaurau Auckland. She has also produced an evidence update on fluoride in drinking water.

Ellen Rykers is a research analyst and writer. An award-winning science writer, Ellen has written for *New Zealand Geographic* and *The Spinoff*, among other publications. Previously, she worked in communications and outreach at the Australian Academy of Science.

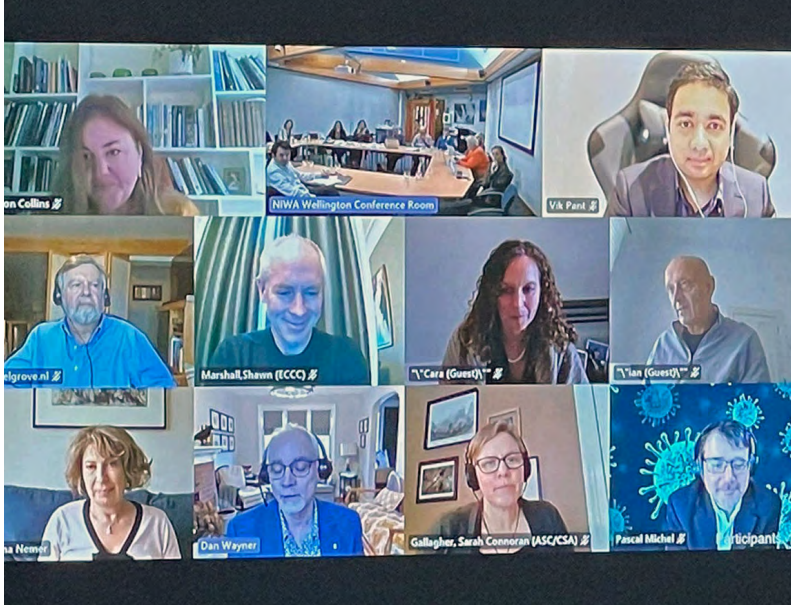
Ellen has been working on the infectious diseases and antimicrobial resistance project, while also dipping her toes into COVID-19 vaccines and artificial intelligence, and managing the Office's web presence.

Above: Team members enjoy the view from the top of Ōtata Island, part of the Noises Group in the Hauraki Gulf.
Below: Ahead of an office decor refresh for Juliet's second three-year term, the team removes the post-it wall of science topics crowdsourced in 2018.

WHO WE ARE

Chief Science Advisor Forum

He Rauhinga Tohu Pūtaiao. Ehara taku toa i te toa takitahi, engari he toa takitini.



Above: Chief Science Advisors from Canada Zoomed into a CSA Forum meeting in early 2021, providing a great opportunity to share lessons and experiences.

The Prime Minister's Chief Science Advisor convenes a forum of chief science advisors (CSAs) from across government departments, ministries and agencies. The forum receives additional support from co-opted members and connects widely with the research community to ensure it can provide comprehensive advice and an extensive range of expert contacts. The Forum meets around ten times a year, and has honed its Zoom skills in 2020 – a practice which will be adopted for half our meetings from now on. Sub-groups of the Forum also come together periodically to provide specific advice on cross-sector issues.

This year we said haere rā to Tim Ng, who has taken sabbatical leave from his role at The Treasury to focus on his Master's degree. We welcomed Diana Cook (right), Deputy Chief Economic Adviser, as the new Treasury representative on the Forum. Diana is manager of the Economic Capability team at the New Zealand Treasury, a role that includes responsibility for strengthening the Treasury's economic capability, with a current focus on developing the Treasury's Living Standards Framework.

Below: Ian Lambie, Chief Science Advisor for Justice, was honoured at a University of Auckland Recognition Dinner in March 2021. Tino pai e hoa!

Meet the CSA Forum

Professor Dame Juliet Gerrard DNZM FRSNZ HonFRSC – PMCSA, Kaitohutohu Mātanga Pūtaiao Matua ki te Pirimia

Professor Michael Bunce – Chief Scientist, Environmental Protection Authority (EPA)|Te Mana Rauhī Taiao

Dr Alison Collins – Departmental Chief Science Advisor, Ministry for the Environment (MfE)|Manatū Mō Te Taiao

Diana Cook – Deputy Chief Economic Adviser, The Treasury|Te Tai Ōhanga

Professor Gary Evans MNZM – Chief Science Advisor, Ministry of Business, Innovation and Employment (MBIE)|Hīkina Whakatutuki

Vince Galvin – Chief Methodologist, Statistics New Zealand|Tatauranga Aotearoa

Professor Ken Hughey – Chief Science Advisor, Department of Conservation (DOC)|Te Papa Atawhai

Dr Gill Jolly – co-opted CSA forum member, Earth Structure and Processes Manager, GNS Science|Te Pū Ao

Professor Simon Kingham – Chief Science Advisor, Ministry of Transport (MoT)|Te Manatū Waka

Professor Tahu Kukutai (Ngāti Tiipa, Ngāti Kinohaku, Te Aupōuri) – co-opted CSA forum member, Professor of Demography at the National Institute of Demographic and Economic Analysis (NIDEA)|Te Rūnanga Tātari Tatauranga

Professor Ian Lambie ONZM – Chief Science Advisor, Ministry of Justice (MoJ) | Tāhū o te Ture

Professor Tracey McIntosh MNZM (Ngāi Tūhoe) – Chief Science Advisor, Ministry of Social Development (MSD)|Te Manatū Whakahiato Ora

Professor Stuart McNaughton ONZM – Chief Education Scientific Advisor, Ministry of Education (MoE)|Te Tāhuhu o Te Mātauranga

Rob Murdoch – Departmental Science Advisor, Ministry of Business, Innovation and Employment (MBIE)|Hīkina Whakatutuki

Professor Richie Poulton CNZM FRSNZ – Chief Science Advisor, Social Wellbeing Agency|Toi Hau Tāngata & to the Minister for Child Poverty

Dr John Roche – Chief Science Advisor, Ministry for Primary Industries (MPI)|Manatū Ahu Matua

Dr Kay Saville-Smith MNZM – Chief Science Advisor, Ministry of Housing and Urban Development (HUD) | Te Tūāpapa Kura Kāinga

Hamish Spencer – Departmental Science Advisor, Ministry of Business, Innovation and Employment (MBIE)|Hīkina Whakatutuki

Hema Sridhar – Chief Advisor Industry and Science, New Zealand Ministry of Defence (MoD)|Manatū Kaupapa Waonga

Professor Ian Town FRACP – Chief Science Advisor, Ministry of Health (MoH)|Manatū Hauora

Read more about the CSA Forum on our website

A Tiriti-led science-policy approach

A team of Māori researchers led by Tracey McIntosh and Tahu Kukutai outline a science-policy approach that honours Te Tiriti and Mātauranga Māori.

Mātauranga Māori and Te Tiriti are unique features of Aotearoa New Zealand's science, research and innovation sector, but both are undervalued, according to a report published in April 2021.

Titled *Te Pūtanhitanga: A Tiriti-led science-policy approach for Aotearoa New Zealand*, the report calls for greater inclusion of Māori and Pacific voices within science advice to government, and an approach to evidence-based policy led by Te Tiriti o Waitangi.

Professor Tahu Kukutai and Professor Tracey McIntosh from the CSA Forum co-authored the paper alongside other eminent Māori researchers.

"The report interrogates, from an unapologetically Māori vantage point, how science and evidence shapes policymaking… It argues for a Tiriti-led approach that is equity focused, unrelenting in its drive for positive Māori outcomes, more 'bottom up' than 'top down', and that draws on Māori community knowledge and expertise in far more timely and connected ways," Tahu and co-author Professor Jacinta Ruru explained in an article for *The Spinoff*.

Read the report on the Ngā Pae o te Maramatanga website

TE PŪTAHITANGA

Addressing Aotearoa's dropping literacy levels

A report from the Chief Education Scientific Advisor, Stuart McNaughton, outlines evidence-based action to tackle declining literacy.

Interventions across primary and secondary education are needed to address declining literacy levels and persistent inequity, according to a report by Professor Stuart McNaughton, Chief Education Scientific Advisor at the Ministry of Education.

The evidence summary, titled *The literacy landscape in Aotearoa New Zealand* was released in August 2020 through our Office.

Literacy, mathematics and science levels – as measured in standard international assessments at 15 years old – have been declining in Aotearoa New Zealand over many years. In addition, disparities between students from low socioeconomic status communities, Māori and Pasifika students, and other students, remain unchanged.

"We see disparities in Years 4-8 – for example, Māori students in English medium schooling typically have reading comprehension one to two years lower than Pākehā students," says Stuart. "But the differences don't start there. They emerge before school."

The report identified several evidence-backed actions and interventions across a child's school life that could make a difference to literacy development.

These include simple everyday activities, such as reading and telling stories to preschool-aged children, alongside systems-level processes, such as implementing literacy progress measures in early learning services.

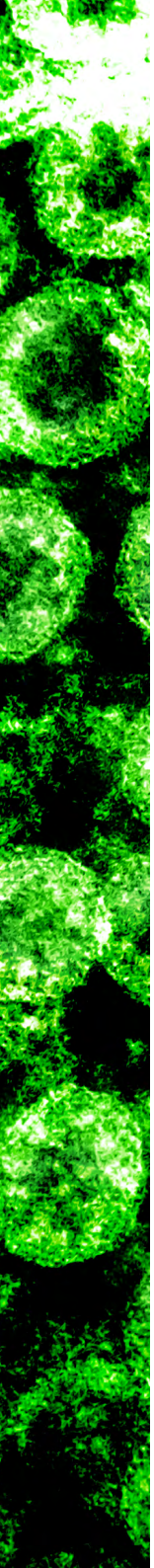
"There are strengths in our system to build upon," says Stuart. "For example, fostering strong Māori identity, culture and language, as well as attending Māori medium schools or simply having Māori teachers, can increase achievement at secondary school for Māori students."

"Given the importance of language, culture and identity to achievement, it is concerning that about one quarter of Year 8 students say they have never had the opportunity to read books that reflect their identities," he adds.

The effectiveness of these recommendations can be enhanced by better teacher preparation and further research in educational science, according to Stuart.

"Structural inequalities and discrimination also contribute to our challenges in equity and excellence," he says. "The recommendations of the report would be more powerful if these encompassing conditions were addressed too."

Read the literacy landscape report on our website



WHAT WE DO

COVID-19 response

Mā mua ka kite a muri, mā muri ka ora a mua.

Over the course of 2020, Aotearoa New Zealand's COVID-19 response ramped up. Dedicated teams were introduced to replace the ad hoc groups of officials and experts who scrambled to manage the first wave. Official communication lines and structures were put in place to ensure that information was reaching decision makers – drawing on many of the experts we identified and boosted early in the response. Our team's role shifted from 'urgent mode' to ensuring that connections were maintained, while also supporting Juliet in her discussions with the Prime Minister about unfolding events. Professor Ian Town has done the heavy lifting in terms of science advice on COVID-19 in his role as Chief Science Advisor to the Ministry of Health (MoH).

By late 2020, the COVID-19 directorate of the MoH was managing the health aspects of COVID-19, with the Ministry of Business, Innovation and Employment handling the Managed Isolation and Quarantine Facilities.

> "It is important that good information encourages good public health practices – especially vaccine uptake, if Aotearoa New Zealand is to fully reopen to the international community."

Juliet has continued to keep in touch with the international community of science advisors, allowing us to keep abreast of measures introduced by other countries as the situation evolved. We were often asked how Aotearoa New Zealand had kept its response so close to the science and Juliet has taken up several invitations to discuss the response on international panels.

We have also continued assembling rapid evidence summaries, including on mask wearing, an update on vaccine development, and a curated webpage of vaccine explainers.

Spotlight on genome sequencing

A focus for the team in late 2020 was ensuring that Aotearoa New Zealand got the best out of our genomics capability. With relatively small numbers of cases, we were able to sequence the virus (that is, read the genetic code) for almost every infection, and use the changes in the sequences to help contact tracing. This also allowed us to watch for more infectious variants coming into the country.

Professor Mike Bunce, Chief Scientist for the Environmental Protection Agency and global expert on genomics, prepared a report on the potential for genomics to combat the pandemic. He was subsequently seconded to the MoH to help Ian make sure that the expertise in sequencing at ESR was fully integrated into MoH systems.

The information from whole genome sequencing

has proved invaluable in a number of cases where there were missing links in the contact tracing. For more of the inside story on using genomics in the pandemic response, check out the video from independent filmmaker Shirley Horrocks, part of her 'Science in emergencies' series.

A future focus

There is still a lot of misinformation circulating about COVID-19. It is important that good information encourages good public health practices – especially vaccine uptake, if Aotearoa New Zealand is to fully reopen to the international community. It is great to see local researchers working on this issue, with cultural historian Kate Hannah leading a project on disinformation at Te Pūnaha Matatini.

Looking to the future, Aotearoa New Zealand has put in place strong, science-based institutions to manage the pandemic and the Office will continue to support and work with them to ensure we remain the best place to be in a pandemic.

Explore our COVID-19 content on our website

Above left: Ian answers questions about SARS-CoV-2 variants for the Ministry of Health's 'Ask an expert' video series.

Above right: Juliet prepares to speak at the APEC meeting.

Previous page: This graphic shows the number of new COVID-19 cases per day in Taiwan (grey) and Aotearoa New Zealand (green), from 1 January 2020 to 23 June 2021. Taiwan has experienced a recent outbreak as shown by the large grey peak. With new variants circulating, Aotearoa New Zealand must remain vigilant to prevent a similar outbreak occurring here.

MĪHARO!

Science efforts recognised

The past year has seen researchers honoured for their stellar contributions to the COVID-19 pandemic response.

Below left: Siouxsie Wiles receives the 2021 New Zealander of the Year award from the Rt Hon Jacinda Ardern, Prime Minister.

Below right: Siouxsie with family, friends and fellow researchers at the 2021 New Zealander of the Year awards. Image credit: Kiwibank New Zealander of the Year Awards Ngā Tohu Pou Kōhure o Aotearoa.

We congratulate and thank everyone who has helped to get the best evidence in front of decision makers, the media, and the public. Ngā mihi nui.

2021 New Zealander of the Year and 2020 Women of Influence supreme winner: **Associate Professor Siouxsie Wiles**

Siouxsie, a microbiologist at the University of Auckland, was propelled into the national spotlight thanks to her clear and calm science communication throughout the COVID-19 pandemic. She partnered with cartoonist Toby Morris at *The Spinoff* to produce engaging, evidence-based animations and explainers that gained global recognition.

Siouxsie was named winner in both the Supreme, and Innovation, science and health categories at the Women of Influence 2020 awards. Her leadership and tireless mahi were further recognised with the honour of 2021 New Zealander of the Year.

Right: The Te Pūnaha Matatini team with the PM and the Hon Dr Megan Woods, Minister for Science, Research and Innovation.

Far right: Te Pūnaha Matatini director Shaun Hendy poses with the gong for the 2020 Prime Minister's Science Prize.

"Her work provided support, strength and clarity across New Zealand and beyond, representing our country on a world stage and helping to keep us safe… Siouxsie's continued to respond to one of the greatest challenges of our time with empathy, innovation and courage, and her work has been seen by millions and even used by governments and organisations as part of their official pandemic communications," said Miriama Kamo, patron of the awards.

Prime Minister's Science Prize 2020: **Te Pūnaha Matatini**

The multidisciplinary research team and centre of research excellence Te Pūnaha Matatini (TPM) was selected as the 2020 winner of the Prime Minister's Science Prize for their COVID-19 modelling work.

The TPM team rapidly developed new mathematical models to analyse potential scenarios as the COVID-19 pandemic progressed. These models were instrumental in informing Aotearoa New Zealand's policy response to COVID-19.

Professor Shaun Hendy, Director of Te Pūnaha Matatini, was also recognised in the 2021 New Year Honours List, being appointed a Member of the New Zealand Order of Merit for services to science.

"Te Pūnaha Matatini has been instrumental in New Zealand's COVID-19 strategy. They have worked with policymakers to make a difference and also put an emphasis on communication and a transdisciplinary approach to science."

Above: Michael Baker with the PM and Megan Woods.

Prime Minister's Science Communication Prize, 2020 Wellingtonian of the Year and Member of the New Zealand Order of Merit: **Professor Michael Baker**

Epidemiologist and public health expert Michael Baker won the 2020 Prime Minister's Science Communication Prize for his expert commentary during the COVID-19 pandemic. Michael emerged as a strong voice for Aotearoa New Zealand's 'go hard, go early' approach and gave more than 2,000 media interviews across radio, television, online and print.

In March, Michael took out the supreme title at the Welly Awards, becoming the 2020 Wellingtonian of the Year. In the 2021 New Year Honours, Michael was appointed as a Member of the New Zealand Order of Merit for services to public health science.

Science New Zealand's Supreme Award: **ESR COVID-19 team**

From Aotearoa New Zealand's first COVID-19 test, to wastewater surveillance, to carrying out genome sequencing on every positive case in the country: the ESR team have been the backbone of Aotearoa New Zealand's COVID-19 response. For their efforts, the team were recognised as the Supreme winner at the Science New Zealand Awards 2020, a celebration of achievements at Crown Research Institutes.

The ESR team also contributed significantly to data and advice to policy makers, for example through developing a COVID-19 dashboard.

"ESR was immediately able to pull together a team with multiple experts and national and international networks. ESR people and processes are trusted by colleagues and officials in various departments, and by the public. They had to deliver data and advice under tremendous pressure and be rigorous on quality," said Science New Zealand Chief Executive Anthony Scott.

Dame Companion of the New Zealand Order of Merit: **Professor Juliet Gerrard**

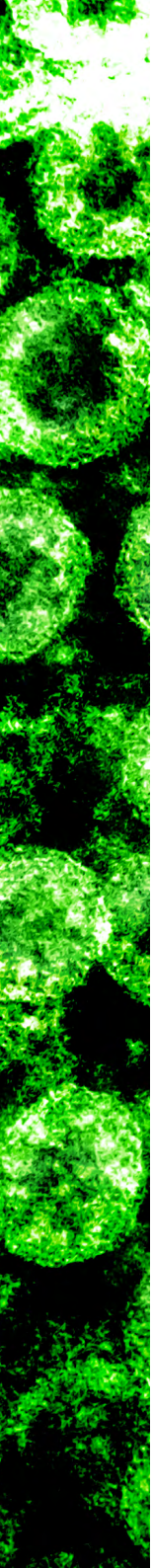
In the 2021 New Year Honours, Juliet was appointed a Dame Companion of the New Zealand Order of Merit for services to science. She was chuffed as mustard.

Above middle: Juliet with family and friends at her investiture ceremony.

Above right: Juliet with her daughter Lee and the Governor General, Dame Patsy Reddy.

"From our first COVID-19 test, to wastewater surveillance, to carrying out genome sequencing on every positive case: **the ESR team have been the backbone of Aotearoa New Zealand's COVID-19 response**."

Above: The ESR COVID-19 team receive the Supreme Award at the Science New Zealand awards.



WHAT WE DO

The future of commercial fisheries

Ka pū te ruha, ka hao te rangatahi.

For our major project in 2020, we took a deep dive and trawled through the tangled evidence on commercial fisheries, at the request of the Prime Minister. With our scope defined, we set out to find ideas and innovations that could help us fish smarter in the future, within the framework of the Fisheries Act 1996.

Throughout the process, we engaged with more than 100 different stakeholders across research, NGOs, industry and government. Celia and Juliet jetted across to Rēkohu Wharekauri the Chatham Islands, to get a first-hand look at pāua and rock lobster fishing and talk to stakeholders from industry, MPI, and the local community. Juliet got a behind-the-scenes tour of Talley's in Motueka, while Celia and Ellen visited Lee Fish north of Auckland to see the processing of kaimoana destined for plates in some of the world's best restaurants. The whole team were hosted by the Neureuter family and mana whenua for a day on the beautiful Noises Islands in Tīkapa Moana the Hauraki Gulf to see the enormous challenge of restoring the marine environment in the Gulf.

We didn't find any silver bullets, but we did fish up enough content to fill more than 400 pages of our comprehensive report, *The future of commercial fishing in Aotearoa New Zealand,* and accompanying recommendations. Not all the ideas in the report are new, and not all the new ideas will be successful. But we think they offer hope: challenging current thinking about how, where, and when we fish can move the conversation forward to create a future that is better than the past.

We found that science advice on commercial fisheries won't solve all of the many issues we are facing in an increasingly challenged marine environment, globally and locally. Solving these problems will need people to work together on a system change, as partners not adversaries. Such a system change needs to address not just commercial

Right: Celia and Juliet visited Rēkohu Wharekauri the Chatham Islands to see pāua diving in action.

"Challenging current thinking about how, where, and when we fish can move the conversation forward to create **a future that is better than the past."**

fishing, but recreational fishing too. It needs to address not just fishing, but the many other environmental stressors on the marine environment – climate change, land-based impacts such as sedimentation, and pollution. Nearly every stakeholder we talked to agreed we could do better in at least some areas.

One of the biggest challenges in the fisheries sector is the need to make decisions with limited – and contested – evidence: the ocean is deep, dark and complicated, so it's tricky to know what's going on down there. Lack of data is used by many to excuse lack of action, and the data we do have is poorly integrated across different stakeholders. Transparency in what we don't know, our levels of uncertainty, and how we manage this, is as important as sharing what we do know.

Although beyond the bounds of science advice, the need for leadership across the many different strands of oceans governance was clear. Science can support the journey, but oceans governance needs to provide a framework in which to do so. We were delighted to see the Oceans and Fisheries Minister and Under-Secretary appointed after the 2020 election.

We would like to give heartfelt thanks to our hard-working panel. Particular thanks to the panel co-chair Dr Craig Ellison for his deep knowledge, enthusiasm for science, patient expertise, and for connecting us to the sector.

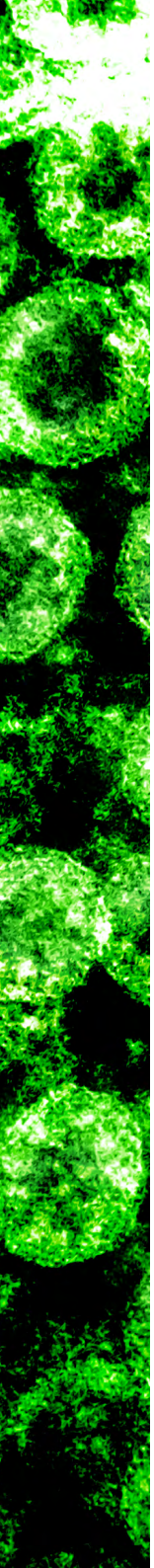
Thanks to the fishing industry for sharing their thinking and expertise, introducing us to their members, and hosting us on vessels, in factories and in boardrooms. Thanks to the many researchers, officials, fishers and environmentalists who supported our kaupapa. At the time of writing, we await the formal government response.

Explore our report and other fisheries content

Clockwise from top left:

1. Ōtata Island, part of the Noises in the Hauraki Gulf.
2. The panel and OPMCSA staff at a meeting.
3. Crayfish catch on Rēkohu Wharekauri the Chatham Islands.
4. Juliet with NIWA staff onboard the *RV Tangaroa*.
5. Celia visits Lee Fish in Leigh, north of Auckland.
6. Freshly caught snapper at Lee Fish.
7. Fish bones from a midden on Ōtata Island.

Clockwise from top left:
1. The team on Ōtata Island with the Neureuter family, mana whenua and Auckland Museum staff.
2. Panel member Dr Rosie Hurst receives the inaugural Minister of Fisheries Award at the 2020 Seafood Sustainability Awards, presented by the Hon Stuart Nash.
3. Juliet tries her hand at filleting at Talley's.
4. Crayfish pots on Rēkohu Wharekauri the Chatham Islands.
5. Snapper at Cape Rodney-Okakari Marine Reserve north of Auckland.



WHAT WE DO

Legalising cannabis: What does the evidence say?

Thousands of New Zealanders accessed our evidence summary on cannabis legalisation ahead of the 2020 referendum.

At our 2020 election, New Zealanders only just voted against legalising cannabis for recreational use by a fraction, with 50.7% voting no and 48.4% voting yes.

As shown by how close the final result was, the decision wasn't simple. Many people sought information to help them decide which way to vote. That's where our evidence synthesis came in: we published a website detailing the available evidence and explaining the uncertainties, along with a simplified summary on what might happen if you vote yes or no.

Published in July 2020, after an expert panel process that was co-chaired by Professor Tracey McIntosh, the website was well-received as a trusted source and was viewed more than 84,000 times, with the summary viewed more than 23,000 times. Media coverage of our website and interviews with Juliet and other panel members helped this website to reach more people. We also heard from people working in media that they used the resource to help inform their reporting, and the team were invited to fact check the documentary *Patrick Gower: On Weed.*

Ngā mihi nui to our expert panel and others who were involved in this mahi.

Right: Tracey features in a short documentary about the cannabis project made by independent filmmaker Shirley Horrocks.

View the cannabis evidence summary

WHAT WE DO

Fluoride

Our office examined new evidence on water fluoridation published since the Royal Society Te Apārangi report in 2014.

In Aotearoa New Zealand, many of our water supplies have added fluoride to help strengthen our teeth and prevent tooth cavities.

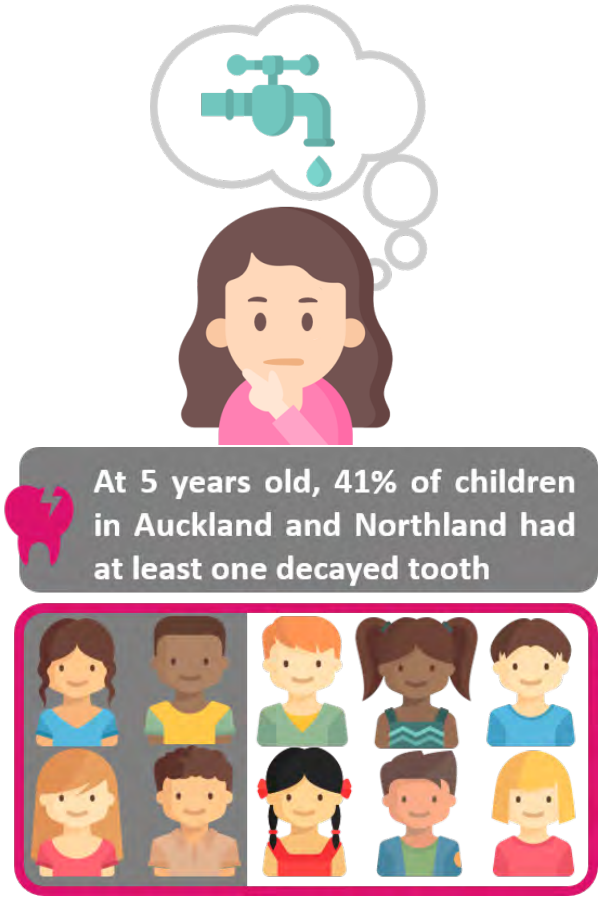
In 2014, the Royal Society Te Apārangi published a comprehensive review looking at the health effects of water fluoridation. The review found that there were no adverse effects of fluoride of any significance arising from fluoridation at the levels used in Aotearoa New Zealand.

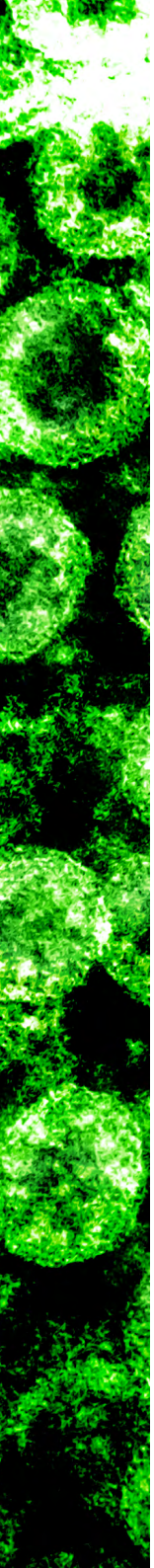
This year we considered reviews and research on fluoridation that have been published subsequently, as fluoride in drinking water remains a topic of public interest and concern.

Through our research we have found the conclusions of the Royal Society Te Apārangi remain appropriate: there are no adverse effects of any significance arising from fluoridation at the levels used here. Adding fluoride to water continues to have a positive impact by reducing the incidence of dental cavities in Aotearoa New Zealand and is particularly important in reducing socioeconomic health inequities.

Thank you to our expert reviewers for contributing their time and efforts to this evidence update.

Sink your teeth into our fluoride evidence update





WHAT WE DO

Infectious diseases and antimicrobial resistance

Our major project for 2021 springboards off our COVID-19 success to tackle infectious diseases and the slow-burning pandemic of drug-resistant infections.

In 2020, the COVID-19 experience showed us how a pandemic could turn from an 'abstract threat' to reality. We felt the time was right to take a deeper look at a slower moving pandemic – antimicrobial-resistant infectious diseases – and how we can implement appropriate measures to prepare for the future.

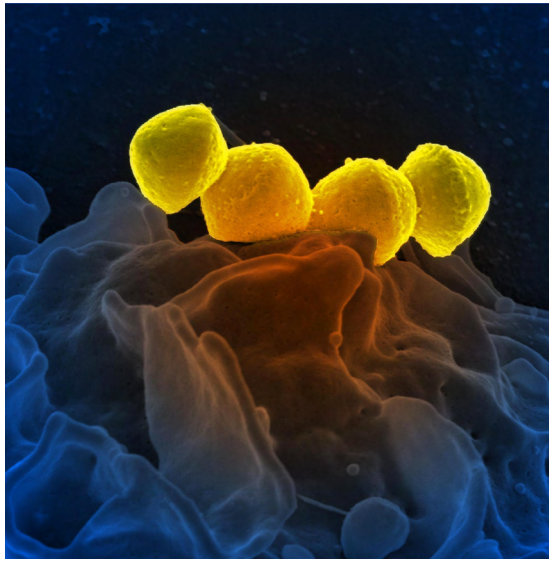
Overseas, we are still seeing the devastation caused by the current COVID-19 pandemic, in part due to the absence of effective treatment. At the same time, the treatments (e.g. antibiotics) we have for controlling common everyday infections are becoming useless as microbes evolve to resist them. This growing problem of drug-resistant infections exacerbates the emerging infectious disease challenges we face, as a country and globally.

Guided by an expert panel, we are producing a comprehensive evidence synthesis and recommendations to mitigate the threat of drug-resistant infections and infectious disease more widely. After a broad sweep of the global context, our project will shine a spotlight on infectious diseases of relevance in Aotearoa New Zealand, including:

- group A *Streptococcus* infection, which leads to high use of penicillin over a long period of time for those infected to avoid major complications of rheumatic fever and rheumatic heart disease;
- *Campylobacter*; and
- drug-resistant infections that are becoming common on our shores, such as gonorrhoea, methicillin-resistant *Staphylococcus aureus* (MRSA) infection, and urinary tract infections.

These spotlight workstreams will help us to better understand the holistic approaches needed to tackle infectious diseases and antimicrobial resistance.

We are lucky to have Dr Matire Harwood co-chair this work, as well as the enthusiasm and



Group A *Streptococcus* bacteria on human neutrophil. Image credit: NIAID/Flickr (CC BY 2.0).

I ore ate tuatara ka patu ki waho

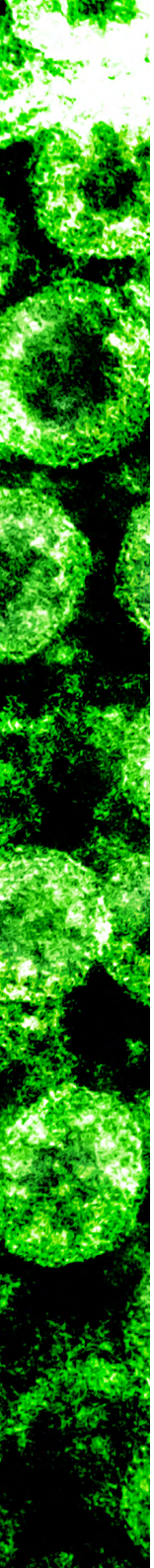
expertise of a panel who are already working hard on this important kaupapa. We've also drawn on the significant expertise of our broader reference group through many meetings, Zooms and emails, in addition to four dedicated workshops. These workshops provided the opportunity to dig deeper on important issues including inequities in medicine access and health outcomes, infection prevention and control, animal health, and the role of the environment in infectious disease.

We have been engaging widely on this work, talking to officials in various government agencies, healthcare workers, researchers, and people in the agriculture industry, among others. We're looking forward to attending the 2021 Infectious Disease Satellite Meeting at Queenstown Research Week, where Juliet will lead a session with an open conversation to guide our report and recommendations. Ngā mihi nui to the more than 175 people already engaged in this project. For anyone who would like to be involved, please get in touch!

Meet the panel

- Dr Matire Harwood (Ngāpuhi) (co-chair), University of Auckland and Papakura Marae Health Clinic
- Dr Anneka Anderson (Kāi Tahu, Kāti Māmoe), University of Auckland
- Professor David Murdoch, University of Otago
- Dr Dianne Sika-Paotonu, University of Otago
- Professor Jack Heinemann, University of Canterbury
- Dr Kristin Dyet, ESR
- Associate Professor Mark Thomas, University of Auckland and Auckland DHB
- Distinguished Professor Nigel French, Massey University
- Dr Sharon Gardiner, Canterbury DHB
- Associate Professor Siouxsie Wiles, University of Auckland

Keep up with the latest on this project on our website



WHAT WE DO

Internship and fellowship programme

Building links between science, research and policy.

Our internship and fellowship programme has continued to flourish, with a total of 24 interns and seconded fellows working with us over the last three years. From nanotechnology to citizen science to cellular agriculture, interns and fellows have contributed across diverse topics at the science-policy interface.

We gratefully acknowledge the MacDiarmid Institute for Advanced Materials and Nanotechnology for funding eight internship placements.

We also thank the Dodd-Walls Centre for Photonic and Quantum Technologies for funding three internship placements.

Two Tairāwhiti internship placements (yet to be commenced) have also been supported through the Prime Minister's Emerging Priorities Fund.

This support is instrumental in our mission to strengthen the links between science, research and policy in Aotearoa New Zealand.

Read about our 2020–2021 cohort over the following pages.

The MacDiarmid Institute for Advanced Materials and Nanotechnology

Dodd-Walls Centre for Photonic and Quantum Technologies

"It is one thing to write papers, give talks and interviews, but I really want to know if I can **use my knowledge to the benefit of others**. So, I came to the OPMCSA to learn how I can help."

- Justin O'Sullivan, Visiting Fellow

Read more about our internships and fellowships

Dr Anne-Gaelle Ausseil is a senior researcher at Manaaki Whenua – Landcare Research. Her research focuses on land-use and climate change impacts on biodiversity and ecosystem services. She has been an active expert with the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), participating as a coordinating lead author and as a member of the New Zealand delegation in 2019. Working with Alison Collins (Chief Science Advisor for the Ministry for the Environment), as well as experts in several other government agencies, Anne-Gaelle explored the different frameworks used for understanding the environment and its relationship to well-being. The intended impact of the project was to stimulate conversation on how to move towards more robust, relevant, and integrative data and indicators for the environment.

Read more about Anne-Gaelle's work on page 33.

Jacques de Satgé is doing his PhD in conservation biology at Massey University and has a background in urban ecology and human-wildlife conflict studies. His current research in the field of mangrove ecology examines the relationships between Aotearoa New Zealand's mangrove forests and native birds, with a focus on the banded rail, moho pererū.

Working with the OPMCSA, Jacques is producing a synthesis of the types and extent of legal mangrove removal in Aotearoa New Zealand, the socio-ecological drivers of this removal, and how removal practices may affect native birds. To do so, Jacques is using data associated with resource consents from regional councils whose coastlines are home to mangrove forests.

Dr Shinji Kihara has a PhD in physical chemistry from the University of Auckland. His internship in 2020 looked into the regulatory framework on nanomaterials safety in Aotearoa New Zealand, assessing the strengths and weaknesses from a scientific point of view. He also undertook some work on artificial intelligence and COVID-19 for the Office.

Read Shinji's report 'Nanotechnology regulation in Aotearoa New Zealand: Current developments and comparison with overseas regulations'

Professor Duncan McGillivray is a Professor in physical chemistry at the University of Auckland, whose current research is focused on materials science. His research group is looking at wide range of challenges, including developing low-waste surface coating methods, improving antimicrobial materials, understanding the impacts of nanoplastics, developing surfaces that can be used for spintronic devices, and novel functional food encapsulation. Duncan is a visiting fellow with the PMCSA investigating nanoplastics.

Dr Olivia Ogilvie completed her studies at the University of Auckland with a PhD in food biochemistry. She is interested in using science to innovate and improve our food production system, leading her to undertake a postdoctoral fellowship aligned with the OPMCSA. She is focusing on cellular agriculture – an alternative farming method to produce meat, milk and other raw ingredients – and future protein sources, with a lens on the regulatory, policy and ethical implications within an Aotearoa New Zealand context. Her work is part of a larger research project in this area, in conjunction with researchers at the University of Canterbury, the University of Auckland and Massey University. Olivia has assembled a brief summary of cellular agriculture and a resource portal to learn more about this emerging technology.

Explore Olivia's webpage on cellular agriculture

Professor Justin O'Sullivan is a Professor in the Liggins Institute at the University of Auckland. His current research focuses on a holistic approach to understand genomes and cell structure formation, function, and inheritance. He also has a work programme about the microbiome and the potential use of microbes as therapeutic treatments. Justin was a visiting fellow with the OPMCSA and produced a brief on genomics for top policy officials.

Dr David Pomeroy has a background in high school mathematics teaching and is now a lecturer in mathematics education at the University of Canterbury. David is piloting a model for building closer links between research and policy professionals. Working under the guidance of Professor Stuart McNaughton (Chief Education Scientific Advisor for the Ministry of Education) he is producing a synthesis of research about achieving equity and excellence in mathematics education. He has also written an article for The Conversation on the practice of 'streaming' in schools.

Read David's article 'Could academic streaming in New Zealand schools be on the way out? The evidence suggests it should be' on *The Conversation*

Cate Roy is a senior policy analyst in the Office of Research Strategy and Integrity at the University of Auckland. She works with colleagues across the university sector and more broadly to develop and implement policies, strategy and related initiatives that aim to strengthen and support our research ecosystem. Working with the Department of Prime Minister and Cabinet and Universities New Zealand, Cate is exploring the research-policy interface. Her project aims to expand knowledge on potential approaches to strengthening the two-way flow of knowledge between academia and policy makers.

Dr Abi Thampi has a PhD in physics from the University of Auckland. Abi's work with the Office in 2020 looked at citizen science platforms around the world.

Explore Abi's collated resources in 'Citizen science: The international landscape'

Dr Odile Smits obtained her PhD in computational physics/chemistry. Her intern project in 2020 was about minimising carbon footprints through efficient electricity distribution and storage.

Read Odile's report on CO_2 emissions and energy consumption

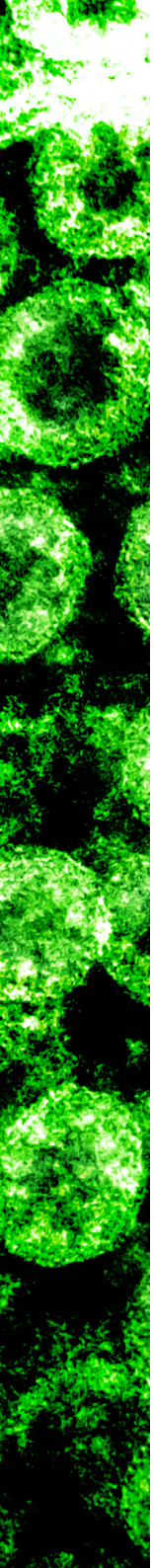
Read Odile's report on electric vehicles

Tom Saunders has a background in entomology, chemical ecology, and biological control, and he joined the OPMCSA after submitting his PhD. Tom is passionate about open research practices and is using his internship to explore the topic of public access to taxpayer-funded research in Aotearoa New Zealand.

Dr Cherie Tollemache has a PhD from the School of Chemical Sciences at the University of Auckland. Cherie worked most recently with the Office in 2021 as a MacDiarmid-funded research assistant investigating new technologies to reduce waste. She previously worked with the Office on COVID-19 during the 2020 lockdown, preparing a report on COVID-19 severity and vitamin D status.

See Cherie's work 'Evaluation of new technologies to reduce plastic waste in Aotearoa New Zealand'

Dr Simone Weyand was a Sir Henry Dale Fellow and Group Leader at the University of Cambridge, where she is now an independent scientist. Her research interests are in the structure determination of membrane proteins from pathogenic organisms in order to understand their molecular mechanism. Simone is currently on sabbatical leave and working with the OPMCSA as a visiting fellow. Initially, Simone is undertaking a survey of international antimicrobial resistance policy responses, feeding into the Office's larger project on infectious disease and antimicrobial resistance.



Codifying the relationship between nature and people

Our well-being is dependent on a healthy environment. Codifying this relationship helps us to appreciate and manage it better.

How can we make the 'invisible visible' in the complex relationship between nature and people? Manaaki Whenua senior researcher Dr Anne-Gaelle Ausseil and the Ministry for the Environment's Chief Science Advisor, Dr Alison Collins, have developed an approach to this tricky question as part of an OPMCSA-supported project.

Anne-Gaelle and Alison have developed and tested a structured, systematic, transparent, and repeatable process to represent the links between nature and people. The process is outlined in the report 'Environmental stewardship and well-being', published in February 2021.

In recognition of the International Day for Biological Diversity on 22 May, Anne-Gaelle and Alison released an accessible summary of their work, available on the MfE website.

"To ensure the decisions we make do not have unintended consequences, either on nature or on our own wellbeing, it is important to build a more tangible and evidential understanding of this relationship," write Anne-Gaelle and Alison.

"Some quantification or measure of the connection between nature and people is required to prioritise budgetary spending, formulate good decisions, and measure and evaluate impact and performance."

The report includes a stock-take of both national and international frameworks, before proposing, testing and applying a process to identify indicators that describe the people-environment relationship. These indicators could allow agencies such as MfE and Stats NZ to measure and report on the state of this critical connection.

"While codifying the relationship between nature and people is difficult, it is a necessary step to ensure our decisions both acknowledge and protect nature and our wellbeing," write Anne-Gaelle and Alison.

Access the report and summary on our website

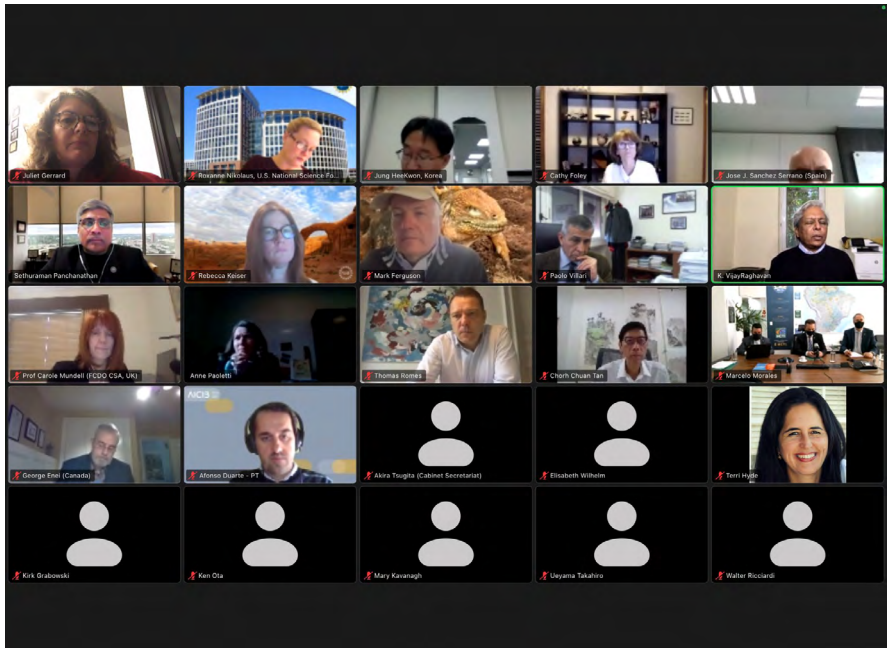
Anne-Gaelle (**top**) and Alison (**below**).

Next page: Wētāpunga/giant wētā (*Deinacrida heteracantha*) on Ōtata Island.

WHAT WE DO

Out and about

In between a few Auckland lockdowns, the team has been out and about, enjoying interesting kōrero. We've also kept connected with international colleagues through the power of online video calls. Here's a small selection of our activities from the past year.



Strengthened by COVID-19, the international Chief Science Advisor community continues to meet regularly and share the latest data on various aspects of the pandemic.

Juliet and Susie visited Lanaco to see their wool mask production line in Auckland in July 2020.

Above: Juliet and Susie have tuned into regular calls with the Forum of Australian Chief Scientists. Australia welcomed a new Chief Scientist in 2021, Dr Cathy Foley. Haere mai to Cathy and ngā mihi nui to Dr Alan Finkel, outgoing Chief Scientist.

Top right: Early-career researchers gathered in June 2021 for He Pito Mata, organised by the Royal Society Te Apārangi. We ran a session – part musical chairs, part speed dating – where researchers could meet government advisors.

Bottom right: While on Rēkohu Wharekauri the Chatham Islands, Juliet connected with the Hokiteki Moriori Trust and visited Kōpinga Marae. The statue is of Tame Horomona Rehe (Tommy Solomon), believed to be the last Moriori person of unmixed ancestry.

Top left: Juliet attends the launch of Ngā Kete Mātauranga: Māori scholars at the research interface, a book featuring 24 amazing academics sharing their journeys. Writing about the book, Juliet says:

"These deeply personal stories provide a portal into the te ao Māori world, which many outside it seek to understand, but struggle to find a frame in which to do so.
The abstract concept of decolonising the tertiary workforce is brought to life and given meaning by these kōrero of strength, where the authors display courage and vision from within an environment so often hostile to Indigenous ways of knowing.

Read it, be inspired, and welcome this refreshingly written challenge to embrace mātauranga Māori and build a stronger academy."

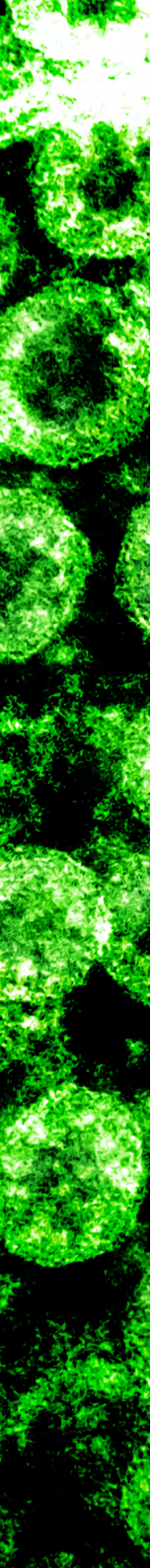
Bottom left: Women in Science dinner hosted by the Hon Dr Ayesha Verrall and the Hon Dr Megan Woods.

Left: Juliet attends many international meetings virtually, talking about how science was used in our COVID response, including contributing to Aotearoa's hosting of the APEC conference, along with Tahu Kukutai.

Second column from left: Juliet has connected with the Climate Commission (top) and enjoyed reading their advice to Government in the lock-up (bottom).

Third column from left: The Office engages with many researchers across Aotearoa's science community. Juliet and a selection of award-winning scientists (top) at the 2020 Prime Minister's Science Prizes. George, Rachel and Ellen meet with ESR scientists (bottom) to chat about infectious diseases and antimicrobial resistance.

Right column: A selection of snaps from He Pito Mata. Rachel and Ellen with fellow Dr David Pomeroy and former intern Dr Tara McAllister (top). George chats to early-career researchers as part of 'Meet the Advisors' (middle). Juliet introduces the 'Meet the Advisors' session (bottom). Top and bottom image credit: Royal Society Te Apārangi.



FINANCES

2020–2021

Budget estimates plus in-kind contributions.

The activities of the Office of the Prime Minister's Chief Science Advisor are funded under a Memorandum of Understanding (MoU) between the University of Auckland and the Department of Prime Minister and Cabinet (DPMC) and Ministry of Business, Innovation and Employment (MBIE). The forecasted expenditure from this contract is included here, for transparency. These are budget estimates, not financial statements.

The University of Auckland continues to support the activities of the Office by providing institutional support, meeting facilities, and access to financial and administrative services. We would like to particularly acknowledge the following key individuals within the University for their support: Louise Brewster and Nikki Andrews, who keep an eye on our finances; and Ranmali Mada in the Office of the Vice Chancellor, who provides a vital link to administrative services. We also thank the DPMC for providing hot desk facilities and general support, in particular Sacha O'Dea, John Scott, Hayden Glass, Ben McBride and Chris O'Gorman.

	1 July 2020 – 30 June 2021
Funding received from DPMC for operations of the Office under the MoU	795,000
Funding received from MBIE for operations of the Office under the MoU	500,000
Breakdown of MoU funding	
Salaries/people costs	1,040,000
Research costs	120,000
Operational costs	50,000
Domestic travel, Wellington	35,000
Other domestic travel	30,000
International travel	20,000
Total expenses	1,295,000

Honorarium to Juliet Gerrard (this is a direct payment outside the MoU)	50,000

Kotahi te aho ka whati, ki te kāpuia e kore e whati

- Tāwhiao

Click here for information on the whakataukī/whakatauakī in Mahi Tahi 3

Ngā mihi nui
ki a koutou katoa

Annual Report 1 July 2020 – 30 June 2021

The Office of the Prime Minister's Chief Science Advisor, Kaitohutohu Mātanga Pūtaiao Matua ki te Pirimia.
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