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

Title:

ANNUAL REPORT: Annual report 2019 - Mahi Tahi 1

Author:

OPMCSA

Output type: PDF				
Pages: 36 pp				
Date: Jul-19				
Language: English				
Review: -				
Versions				
Record number:	*Version:*	*Date V1 created:*	*Date:*	*Printed version*
PMCSA-19-3	V1	08-Jul-19	08-Jul-19	Y
Archive page link: https://dpmc.govt.nz/our-programmes/special-programmes/prime-ministers-chief-science-advisor-archives/archive/gerrard-2018-2021				
Notes: -				

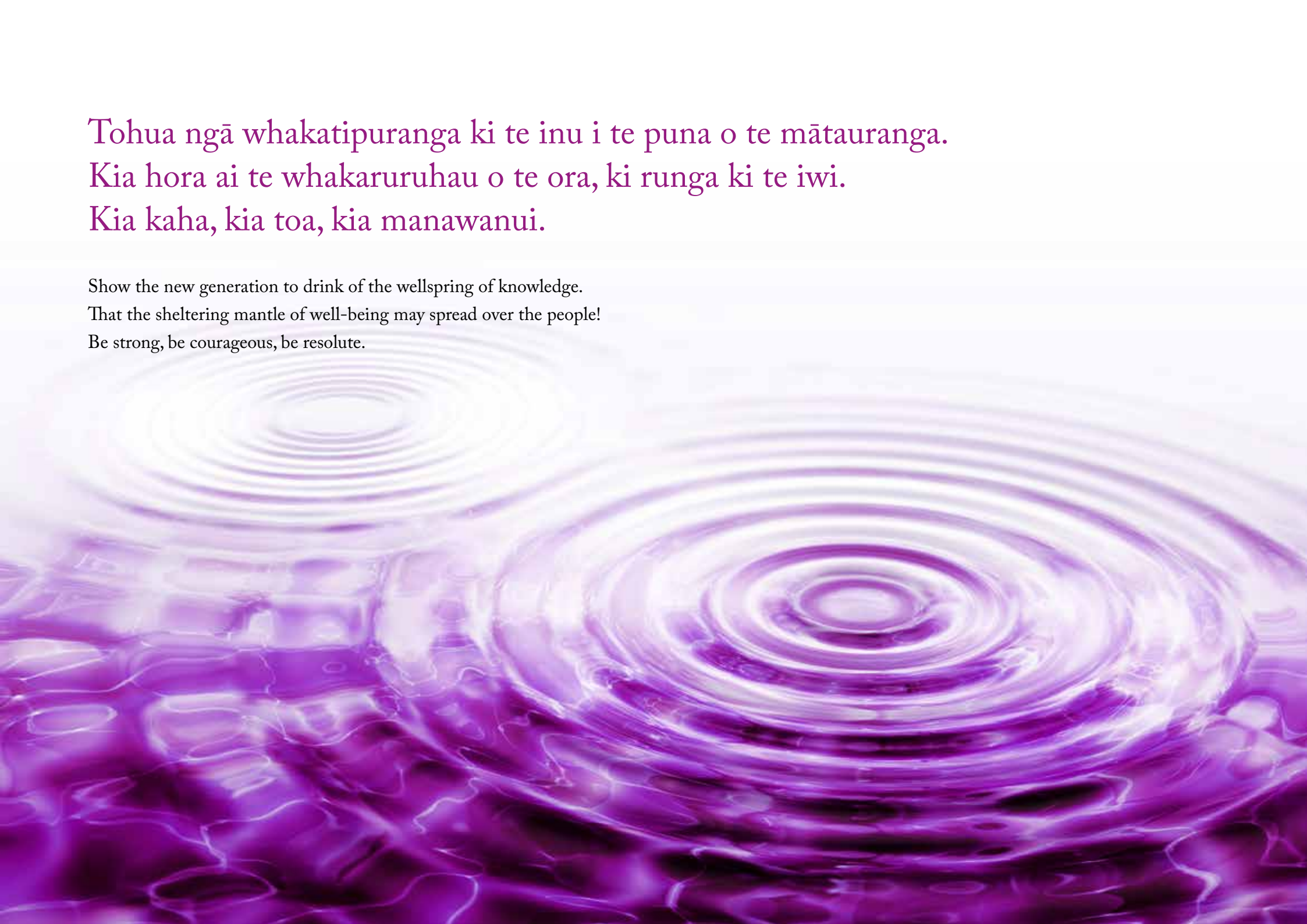
ANNUAL REPORT 2019

Mahi Tahi 1

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

Tohua ngā whakatipuranga ki te inu i te puna o te mātauranga.
Kia hora ai te whakaruruhau o te ora, ki runga ki te iwi.
Kia kaha, kia toa, kia manawanui.

Show the new generation to drink of the wellspring of knowledge.
That the sheltering mantle of well-being may spread over the people!
Be strong, be courageous, be resolute.



PRIME MINISTER'S MESSAGE

Opening remarks

From the Rt Hon Jacinda Ardern.

Research, science and innovation are core to what we as a Government want to achieve – a just transition to a low emissions economy and a measurable increase in the wellbeing of all New Zealanders. That is why we celebrate excellence and why we want to continue to lift investment in science.

My Chief Science Advisor and the team of Chief Science Advisors support me, ministers and government agencies to make the best decisions on how to tackle our long-term challenges by connecting us to the relevant science and network of scientists, both here and overseas.

The range of topics that our network of advisors have produced work on is impressive. A particular highlight for me is the 'Rethinking Plastics' project. I enjoyed reading about the talented interns and their research, with some fantastic topics such as equity in primary school mathematics and solar electricity. I also received an important brief about evidence-based interventions following the March 15 Terror Attack.

To make science more accessible for New Zealanders, Juliet and her team have been using Twitter and Instagram to encourage young people to take part in the sciences. They've also been presenting in lots of forums, using blogs and developing their first accessible science factsheet about antimicrobial resistance. No easy task.

I look forward to enjoying more science-led debate about tackling the issues that we've made a good start on, informed by the work of Juliet, her team, and scientists across New Zealand and the world.

Rt Hon Jacinda Ardern
Prime Minister

Rt Hon Jacinda Ardern arrives to announce her new Chief Science Advisor, with Lee Gerrard and Stuart McCutcheon *photocredit: University of Auckland.*

"Science is at the frontline of the issues that face our society ... what better way to equip our people to decipher information than through our scientific community"

Rt Hon Jacinda Ardern speaking at the Prime Minister's Science Prizes, March 2019.

Contents

Right: Images from a record breaking kākāpō breeding season, *photo from Andrew Digby @takapodigs Department of Conservation.*

Cover Image: Magnificent Dusky Sound taken from aboard the Southern Winds, with the Department of Conservation en route to see the kākāpō recovery programme.

FOREWARD

It has been a whirlwind year

Tēnā koutou katoa, ngā mihi o te wā ki a tātou. He pūrongo tēnei hei whakamōhio atu ki ētahi kaupapa o te ao, he kaupapa anō hoki e taea ai e mātau te torotoro atu ki a koutou. Nā reira, anei ētahi pitopito kōrero.

I'm delighted to introduce this annual report, which marks the end of my first year in the position of Prime Minister's Chief Science Advisor, Kaitohutohu Mātanga Pūtaiao Matua ki te Pirimia. It has been a whirlwind year: building the team, setting up new offices, listening to researchers and policy makers, agreeing a work plan with the Prime Minister, and delivering our first briefings and advice to the Prime Minister and Cabinet.

It is now ten years since this position was first established in Aotearoa New Zealand, making it a good time to reflect on the role and the science advisory network more widely, to build on the solid platform of Sir Peter Gluckman's legacy, and set the course and culture for the years ahead. I decided early on to embed four principles deeply into all our activities: rigour, accessibility, transparency and inclusivity. With these front of mind, I invested a lot of time travelling around the country in my first 100 days, listening keenly both to the research community and to government, to see how best to position the Office as a trusted, accessible bridge between the two in the years ahead. It was clear that these four principles, adopted from a Nature paper in June last year would connect well to the international community but needed particular interpretation in the context of Aotearoa New Zealand.

'Inclusive' is perhaps the principle that has generated the most energy. Being the first woman in any role adds a certain additional responsibility to carry the gender flag, which I am more than happy to do. Beyond this though, I am passionate about reflecting on what we have learned along the 'Women in Science' pathway and use this knowledge as we broaden the agenda to focus on increasing equity, diversity and inclusion for all underrepresented groups. To this end, I am hugely grateful to the very many people who have supported me in ensuring that our work is as inclusive as possible – especially those from the Māori community who have connected with our efforts in this space, and been patient with me as I embarked on my te reo journey. There is a harder, longer path ahead to build a working partnership around science advice that is truly bicultural, but I have enjoyed and valued the many kōrero this year as we begin this mahi. I hope that we have made some sound first steps as we learn to weave different ways of knowing and understanding together and embrace the strength that comes from each world view. Mā te mahi tahi ka ea ngā mahi katoa.

My listening tour surfaced many ideas, and a surprising consensus in terms of the main themes where government policy could be strengthened by a sound evidence base. These ideas were discussed and prioritised with the Prime Minister in October, and the first cab off the rank is a major commissioned report on plastics. Our #rethinkplastic project is now well underway, and the first part has been delivered in draft form to the Prime Minister

“ There is a harder, longer path ahead to build a working partnership around science advice that is truly bicultural, but I have enjoyed and valued the many kōrero this year as we begin this mahi.”

Chief Science Advisor, Professor Juliet Gerrard *photocredit: simonyoungphotographer.com/WomanKind*

and Min Sage, in order to meet the policy timeline. This has been a very satisfying topic to work on, with so many people keen to engage from within and beyond the research community, and we look forward to delivering the final comprehensive report later this year.

It is always dangerous to choose highlights, especially so in a year where I have been enormously privileged to meet scientists doing amazing work in some spectacular settings. One of the most memorable was a trip aboard the NASA SOFIA flight, to see the infrared telescope at work in the stratosphere (and a fortuitous Aurora Australis). I also went to Antarctica, along with Min James Shaw, as the guest of Antarctica New Zealand. This was definitely a ‘bucket list’ moment, but also an opportunity to connect with some Kiwi scientists doing extraordinary work in some of the most remote locations on earth. I have huge admiration for their tenacity and resilience, working hard to understand the ice and the ecosystem, and to understand how our changing climate will impact on this incredible landscape. Another hat tip to the conservation work done by the Department of Conservation, who were generous enough to let me accompany them on a kākāpo release in Fiordland. It has been a record-breaking year for this unique bird, and it would not have been possible without the tireless staff and volunteers nurturing each chick to maturity.

Finally, I’d like to acknowledge all the warm support I’ve received from researchers, government officials and the wider public as we have embarked on our work, and the Prime Minister for giving me this amazing opportunity.

Ngā mihi nui

Juliet

THIS YEAR

In a nutshell

he titiro whakamuri

Major focus on equity, diversity, inclusion

New **website**

10 blog posts

Twitter followers up nearly 50% to over **7600**

Improved the process for science evidence to be included in the Standards process

New PMCSA
New Office
New Team

100 plus talks/ speeches/ events/ media

Continued citizen science through the participatory science programme

New Instagram account with 1250 followers

Established an intern programme

Rigorous, Accessible, Transparent, Inclusive.

Quite a few Post-it Notes

Major project - **#rethinkplastic** underway and first section delivered

Established a Chief Science Advisor Forum
He Rauhinga Tohu Pūtaiao

Mā whero, mā pango ka oti te mahi

Began a te reo journey **Ko tōku reo tōku ohooho. Ko tōku reo tōku māpihi maurea.**

A year of listening

Delivered a briefing to inform recovery after the Christchurch attacks

Regular behind the scenes advice

Delivered advice on antimicrobial resistance

Collaborative look at the science advice system in NZ published

New friends

WHO WE ARE

The Team

The Office of the Prime Minister's Chief Science Advisor (PMCSA) is independent of government and currently based out of the University of Auckland.

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

Te amorangi ki mua, te hapai o ki muri.

Professor Juliet Gerrard, is the PMCSA, seconded from her role as Professor of Biochemistry at the University of Auckland, for 80% of her time. Juliet is responsible for providing advice to the Prime Minister, convenes the Chief Science Advisor's Forum, and is a high profile point of connection between the research community and government.

Chris Price is Juliet's incomparable Office Manager and EA. Chris brings experience from both the university and private sectors here in Aotearoa New Zealand and the UK.

Dr Ben Jeffares is the Director of the Office. Ben has a background in the history and philosophy of science, social sciences, and some fine arts training and has had roles at the Royal Society Te Apārangi and in the Institutes of Technology and Polytechnics sector.

Dr George Slim is part time with the Office, and based in Wellington. With a broad background as both a chemist and a bureaucrat, George is a valuable point of connection to the policy world.

Dr Rachel Chiaroni-Clarke is our Research Analyst and Writer. Rachel is a graduate of Otago University and after her studies headed to Rockefeller University as a Research Assistant before completing a PhD in Medical Genetics at the University of Melbourne and Murdoch Children's Research Institute. After that, she worked as a writer for a healthcare communications agency in Melbourne, honing her communications expertise.

Dr Victoria Metcalf is the longest serving member of the Office, having started under Sir Peter Gluckman's tenure. Victoria works from Christchurch as the National Co-ordinator for the Participatory Science Platform (PSP), a citizen science initiative funded by the Ministry for Business Innovation and Employment. Victoria has a background as a marine biologist, and is a committed, passionate science communicator.

You can read all about us on our website: https://www.pmcsa.ac.nz/

WHO WE ARE

Chief Science Advisor Forum

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

Beyond the Auckland based team, there is also a network of Chief Science Advisors based in different Departments, Ministries and Agencies across government. A priority for Juliet on taking up the role was to give this group more form and a higher profile, establishing a community of practice for science advice across government. Respecting the independence and reporting lines of each of the individual roles, the Chief Science Advisor Forum provides a sounding board for the PMCSA, and allows for a more coordinated whole-of-government view of science advice. The introduction of co-opted members has enabled us to fill skills gaps and start to address the legacy demographic.

The Forum was delighted to co-opt Tahu Kukutai (Ngāti Tiipa, Ngāti Kinohaku, Te Aupōuri). Tahu brings to the Forum a wealth of experience as an academic, has undertaken research with and for numerous iwi, Māori communities, and Government agencies, and provided strategic advice across a range of sectors. She is a founding member of the Māori Data Sovereignty Network, Te Mana Raraunga, that advocates for Māori rights and interests in data in an increasingly open data environment. As a Professor of Demography, her insights are of great value across many Ministries, in particular those in the Social Sector. Tahu also provides a much needed voice around the table to ensure that the Forum begins to connect effectively to the strengthening network of Māori advisors. These include the recently appointed Melanie Mark-Shadbolt in the Ministry for Environment, the recently advertised Executive Advisor, Matauranga Māori reporting to the Deputy General of Department of Conservation, and the team of innovation and research advisors to the Federation of Māori Authorities (FOMA) led by Te Horipo Kairaitiana.

> " A priority for Juliet on taking up the role was to give this group more form and a higher profile, establishing a community of practice for science advice across government."

The Forum was also pleased to welcome Dr Gill Jolly, from Geological and Nuclear Sciences (GNS Science), who brings to the table a depth of expertise in volcanology and a breadth of experience in natural hazards. She also has experience in advising the government on a range of science issues connected to risk, disaster preparedness and response. You can find out more about the forum here.

You can read more about us here:
https://www.pmcsa.ac.nz/our-community/departmental-science-advisors/

Chief Science Advisor Forum comprises;

Juliet Gerrard - PMCSA, Convenor.

Michael Bunce – incoming Chief Scientist for the Environmental Protection Agency.

Alison Collins – Chief Scientist for the Ministry for the Environment.

Gary Evans – Chief Science Advisor for the Ministry of Business, Innovation and Employment, and Professor at the Victoria University of Wellington's Ferrier Institute.

Vince Galvin – Chief Methodologist at Statistics New Zealand.

Ken Hughey – Chief Science Advisor for the Department of Conservation, and Professor of Environmental Management at Lincoln University.

Gill Jolly – Co-opted forum member, General Manager Strategy at GNS Science.

Simon Kingham – Chief Science Advisor at the Ministry of Transport, and Professor of Geography at the University of Canterbury.

Tahu Kukutai (Ngāti Tiipa, Ngāti Kinohaku, Te Aupōuri) –Professor of Demography at the National Institute of Demographic and Economic Analysis, at the University of Waikato.

Ian Lambie – Chief Science Advisor to the Justice Sector, and Associate Professor of Clinical Psychology at the University of Auckland.

Stuart McNaughton – Chief Science Advisor for the Ministry of Education, and Professor of Education and Director of the Woolf Fisher Research Centre at the University of Auckland.

Rob Murdoch – Science Advisor at the Ministry of Business, Innovation and Employment, and NIWA's General Manager of Research.

Tim Ng – Chief Economist to the Treasury.

Richie Poulton – Chief Science Advisor to the Minister of Poverty Reduction, and Director of the Dunedin Multidisciplinary Health and Development Research Unit.

John Roche – Chief Science Advisor to the Ministry for Primary Industries, and Managing Director of Down to Earth Advice Ltd.

Hamish Spencer – Science Advisor at the Ministry of Business, Innovation and Employment, and Professor of Population Genetics at the University of Otago.

Hema Sridhar – Chief Science Advisor for the Ministry of Defence.

Ian Town – Chief Science Advisor for the Ministry of Health.

Tahu Kukutai

Gill Jolly

WHAT WE DO

Independent science advice

Developing the science advice ecosystem in Aotearoa New Zealand.

One of the questions that was often asked of Juliet when she took up the role was how independent her role was, compared to say the Parliamentary Commissioner to the Environment. This inspired a conversation with other key voices in the science advisory system, which led to a working consensus on ways to develop the science advice ecosystem in Aotearoa New Zealand, recently published in Policy Quarterly. You can read it here. It also led us to reflect on the types of advice that the Office can provide in response to requests. Essentially this happens in three different ways.

Firstly, in response to an informal request to provide verbal advice, to provide explanation of a debate amongst scientists, or summarise a piece of evidence synthesis from overseas in context for Aotearoa New Zealand. This was the case for the Carbon Zero Bill, where there was a large recent collection of international and national reports. No further formal evidence synthesis was needed, but informal discussions, clarification and contextualisation was requested. Juliet read all the reports and discussed key issues with experts and opinion leaders in the research community to provide clarity on the consensus and understand the points of difference. Secondly, the Prime Minister or another Minister may request a small piece of work, which might simply resolve an issue or act as a precursor to a more comprehensive piece of advice. This was the case for the work commissioned by Min Faafoi on Standards (page 14).

Thirdly, the Office may be commissioned to provide a full and comprehensive report on a well-scoped topic as part of the core work plan agreed with the Prime Minister, or commissioned by a Minister. Our first one is on plastics (page 15).

As an independent advisor to the Prime Minister, Juliet also proactively highlights areas of opportunity and concern that bubble up through the scientific community. For example, she captured some of the recent concerns around mining on Foulden Maar in a Spinoff article which you can read here.

We also, with endorsement from lead experts in the field around the country and the Chief Science Advisor Forum, released an information sheet on Anti-Microbial Resistance: An imminent threat to Aotearoa, New Zealand. This was sent to the Prime Minister and key Ministers to raise awareness of this emerging international threat and place it in a local context.

Working with Standards NZ

Strengthening the provision of independent science advice into the Standards NZ process

In May 2018 when Juliet's predecessor put out the now famous "Meth report" – perhaps the best example of the value of science advice that the NZ public had seen. Sir Peter, supported by his very experienced researcher Anne Bardsley, had looked at the evidence base for the threshold set for methamphetamine testing in houses, and found it wanting. It was far lower than the evidence supported. This highlighted a general issue about ensuring independent science advice was included in the Standards setting process.

In September, Min Faafoi requested the Office assist the Ministry of Business Innovation and Employment (MBIE) in providing reassurance that independent science evidence was being used in the Standards setting process. With Chief Science Advisor to MBIE Gary Evans, we have now completed this piece of work and set up a process where the Standards New Zealand Board have direct connection to the MBIE Chief Science Advisor Forum. There are established points in the Standards setting process where independent scrutiny of new or unsettled science occurs. These developments will make the process more robust, and science advice more accessible to the standards board in the future. You can read more about it here.

"Given the impact the meth standard had – the tremendous effect on families removed from their homes and the economic impacts on property owners – I am taking this step to ensure we can have full confidence in the standards system."

Minister Hon Kris Faafoi

Shards of pure methamphetamine hydrochloride. *Wikipedia - Radspunk.*

Rethinking plastics in Aotearoa New Zealand

We are now well into Rethinking Plastics – the main project for the office this year. #RethinkPlastic

Plastics was chosen as our major focus because Aotearoa New Zealand is at a pivotal point where change is urgent, but the evidence base to guide change is lacking.

The public is increasingly concerned about the way we use and dispose of plastic and how that impacts our health and the environment. In fact, the Colmar Brunton Better Futures 2018 report cited that 72% of New Zealanders have plastic as a top concern. The government has begun to address issues related to plastic pollution by banning single-use plastic bags and microbeads and initiating a work programme to take action on waste. Industry are also beginning to respond to concerns, with several New Zealand businesses, along with the New Zealand Government, signing declarations committing to making all plastic packaging reusable, recyclable or compostable by 2025.

The issue is current and wide-reaching, so we saw it as an opportunity to provide science advice based on available evidence and expert opinion that could support policy decisions in an effort to reduce the negative impacts of plastic, without losing out on its many benefits.

Photocredit; Olga Pantos.

Scoping the project with the expert panel

The project kicked off late last year with a scoping exercise to better understand the biggest issues, key stakeholders, international experience and local workstreams to build upon. It quickly became clear that rethinking plastics would require a system-wide approach that considered the whole plastics value chain, rather than a particular focus on one issue such as single-use packaging.

It also became clear that there is plenty of work to draw on, from both local and international sources, but there's no central resource that brings it all together. In response, we've developed a portal on our

"...the Colmar Brunton Better Futures 2018 report cited that 72% of New Zealanders have plastic as a top concern."

website that houses key reports. It is evolving as the project progresses and can be found here.

During the scoping phase, we also established an expert panel to help guide the project and accompanying recommendations. There was a large pool of volunteers for the panel and we managed to narrow it down 11 people who each bring unique expertise and together cover the key areas we need to address.

We also have a broader reference group of experts and stakeholders who are supporting our team and panel through consultation and peer review. The reference group includes a diverse group of people from research, local and central government, industry, iwi and community groups, whose expertise and experience is really crucial in ensuring that our report is robust and that our recommendations are practical for the Aotearoa New Zealand context. We are very grateful to everyone who has contributed to our project so far. From the start, the level of engagement

The panel members and OPMCSA staff at the first panel meeting. From left to right: George Slim, Sarah McLaren, Bethanna Jackson, Olga Pantos, James Wright, Elspeth MacRae, Juliet Gerrard, Abbie Reynolds, Niki Harre, Mark Staiger, Diane Ruwhiu, Stephen Harris, Rachel Chiaroni-Clarke. Absent; Melanie Mark-Shadbolt

on this project has been fantastic and it reiterates the mounting enthusiasm to take action on plastics. If you are keen to help – get in touch!

Project progress

We held the first panel meeting for Rethinking Plastics in February and have had two further meetings in March and June. At the first meeting, the panel agreed to a broad scope for the project across four work streams. The subsequent meetings have been based around assessing the evidence for the report, and have also included engaging discussions with guest speakers from the Sustainable Business Network, Plastics New Zealand, WasteMINZ, Auckland Council and Nelson City Council.

The first work stream 'To what extent can we quantify Aotearoa's plastic? New Zealand's data challenge' provides a current snapshot of the available data for

Key resources and reflections published throughout the project can be found at https://www.pmcsa.ac.nz/our-projects/plastics/

The plastics panel:

- Juliet Gerrard, PMCSA
- Abbie Reynolds, Sustainable Business Council
- Bethanna Jackson, Victoria University of Wellington
- Diane Ruwhiu, University of Otago
- Elspeth MacRae, Scion
- James Wright, University of Auckland
- Mark Staiger, University of Canterbury
- Melanie Mark-Shadbolt, Ministry for the Environment
- Niki Harre, University of Auckland
- Olga Pantos, ESR
- Sarah McLaren, Massey University
- Stephen Harris, Special Representative, Commonwealth Clean Oceans Alliance

plastic material flow through Aotearoa New Zealand. This body of work is near completion and has primarily identified key knowledge gaps and places where we need to collect data in order to make responsible choices. This will be made available to policy makers, ahead of the final project, to assist in their work.

Consultation and research on the three other work streams are well under way and will continue over the coming months. These workstreams cover:

- Life cycle assessment of product systems: to explain the role of life cycle assessment in measuring the environmental impacts of plastics and summarise the currently available evidence through case studies.
- Innovation solutions: to synthesise and prioritise the opportunities available to mitigate our overuse and waste of plastics, including materials recovery, bio-plastics, alternative materials, logistics innovation and system redesign.

• Changing our relationship with plastics: to identify the methods that will be most effective to galvanise change at different levels, from individuals to communities, businesses, local and central government.

So far during the project, Rachel has attended the Ōhanga Āmiomio: Ellen MacArthur Foundation Pacific Summit in Rotorua in April and Rachel and George attended the Plastics NZ Conference in Queenstown in May. Both have been invaluable in engaging with stakeholders and building up the evidence base for our report.

Keep track of our progress

We have a dedicated webpage to share progress on Rethinking Plastics project that includes documentation from panel meetings, key resources and reflections published throughout the project, which is available here.

Photocredit; Raquelle de Vine (Agaleta South Pacific).

BRIEFING THE PM

Responding to Christchurch

After the Ōtautahi Christchurch Mosque Shootings, there were many responses and offers to assist from researchers, both internationally and domestically.

After the Christchurch Mosque Shootings, there were many responses and offers to assist from researchers, both internationally and domestically. Once the immediate shock had passed, the science community began to reflect on the issues that this tragedy had surfaced and look at the evidence for how we can change things for the better. How do we deal with hate speech in the era of social media? What is the best way to teach children how to think critically in a digital age? How do we start respectful conversations across cultures and disciplines?

Marc Wilson from Victoria University of Wellington led an editorial team to produce a Rapid Response Issue (RRI) of the New Zealand Journal of Psychology that responded to events in Christchurch. The RRI brought together local experts and opinion leaders and – mindful of the low Muslim population in Aotearoa New Zealand and our (thankfully) limited experience with acts of terror – solicited expert views from Australia, the UK and the US to add to our own voices. Obviously this represents the voice of a single discipline – psychology – and other disciplines will bring other lenses with time.

"Marc Wilson from Victoria University of Wellington led an editorial team to produce a Rapid Response Issue (RRI) of the New Zealand Journal of Psychology that responded to events in Christchurch."

Juliet then worked with Marc Wilson, Stuart McNaughton and Ian Lambie to synthesise the document into an accessible briefing for the Prime Minister. The briefing was prepared at pace and may inform more complete pieces of evidence synthesis across the Chief Science Advisor Forum and government.

Reflecting on this activity, it is worth noting that these academic commentaries and research notes were produced efficiently and effectively – much more rapidly than is normal in academia – and, as a result, were not destined to solely sit on dusty shelves in a library, read only by future specialist commentators.

This is a single briefing on a particular volume of published scholarship – not a full piece of evidence synthesis claiming to be a comprehensive analysis. However, it did provide a valuable resource on a time scale that was useful to inform the Prime

Minister and her officials ahead of a hard deadline in Paris. It shows that in 2019, the research community can respond rapidly and usefully, and strengthen the research-policy interface on a timeframe that is helpful to government. I think this serves as a useful model for future pieces of work from my Office and encourage more researchers across the academic spectrum to engage with the Chief Science Advisors and strengthen the researcher-policy interface.

More importantly, a collection of researchers who had thought deeply about issues relevant to the support of a traumatised community was able to offer support to that community. We are very grateful to Marc for his contribution.

You can read the briefing and access the Rapid Response Issue here.

Flag flies half mast at the Beehive, March 2019.

INTERN PROGRAM

Piloting an internship programme

Strengthening the research-policy interface.

Recognising the need to strengthen the research-policy interface, the Office has been piloting an internship programme this year. We trialled this with a researcher from the University of Canterbury, Akshita Wason, in 2018, who provided some of the initial scoping and background work on the #rethinkplastic project and encouraged by this early success, added a project in collaboration with the Ministry of Education Chief Science Advisor Stuart McNaughton supporting a secondment of David Pomeroy from the University of Canterbury.

The programme gained a considerable boost with support from the MacDiarmid Institute who are supporting six finishing PhD students to spend three months with us, developing skills at the interface of research and policy.

Equity in primary school mathematics

David Pomeroy has a background in high school mathematics teaching (Tawa and Onslow Colleges) and is now a Lecturer in mathematics education at the University of Canterbury.

He attended Cambridge University on a Woolf Fisher scholarship, where he earned his PhD researching socio-economic, ethnic and gender inequalities in the mathematics learning of New Zealand Year Nine students. He was a member of the inaugural Science Policy Exchange and recently published a comparative analysis of UK and Aotearoa New Zealand education policies in Critical Studies in Education. He is interested in building stronger connections between research, policy and practice in education.

Scoping Plastics

Akshita Wason worked as research analyst during her internship. With a background in biotechnology and science commercialisation, she worked across a broad range of topics, including background research for our #rethinkplastic project, our diversity in education work stream, and miscellaneous enquiries from the public. For the plastics work, she pulled together key international reports, identifed Aotearoa New Zealand peak industry bodies, reports, organisations and other crucial information that allowed the project start from firm foundations.

Quantum Computing

With a background of maths and physics, Wayne Crump undertook his PhD in the field of superconductivity. His research investigated the relationship between the maximum electric current a superconductor can pass, and its superconducting properties.

His project at the OPMCSA has focussed on potential impacts of quantum computing technology. It also assessed potential timelines for its impact on Aotearoa New Zealand industry and society and

The programme gained a considerable boost with support from the MacDiarmid Institute who are supporting six finishing PhD students to spend three months with us, developing skills at the interface of research and policy.

Akshita, Kyle, Wayne, Ankita, David, Odile, Georgina, Jono.

identified international standards and developments that should be monitored to ensure quantum computing safe encryptions standards.

Artificial Intelligence

Kyle Webster joined us with a research background in protein nanotechnology. His focus for the internship has been scoping the long-term impacts of Artificial Intelligence (AI) development on Aotearoa New Zealand society and policy. AI incorporates both 'intelligent life' like phenomena and also learning algorithms and systems that use sophisticated algorithms, often over large data sets.

Such systems exist now, and shape online advertising, face-recognition technology, and a host of other daily activities. Kyle is bringing together educational resources, policy resources, and identifying key researchers, industry players, and industry impacts relevant to New Zealand's economy and wellbeing.

Energy Storage Systems

Odile Smits has an educational background in theoretical physics and obtained her PhD in computational physics/chemistry. She is now a postdoctoral researcher in nuclear physics, studying the physics and chemistry of the heavy elements, and is seconded to the Office one day per week. Besides her interest in understanding the fundamental laws of nature, she is interested in applying her knowledge to environmentally related issues. Her project is on the subject of minimizing the carbon footprint by efficient electricity distribution and storage. Specifically, Odile is focussing on the environmental costs of various battery solutions. While an energy storage solution might have zero emissions, its manufacture and storage might have real costs. This project will attempt to identify energy storage solutions that fit in a circular economy, and have real life time low emissions that are relevant to the Aotearoa New Zealand economy and supply system.

Solar electricity

Georgina Shillito did her PhD in chemistry at the University of Otago looking into how transition metal complexes interact with light.

Understanding the photophysical properties of such materials allows us to understand their potential for application in areas of technology, such as solar energy conversion. Georgina's internship project will involve examination of current solar energy use in Aotearoa New Zealand and will also evaluate new, emerging technologies and assess their potential impact on energy use and policy.

The Insect Apocalypse?

Jono Barnsley has a background in physical chemistry and recently finished his PhD involving the study of highly coloured materials. He will work on an analysis of insect decline and the potential impacts it has for Aotearoa New Zealand industry

"There is a need for a more intersectional approach, which looks at improving not just the participation of women in STEM, but also the Māori, Pasifika and LGBTI communities, among others."

and biodiversity. Working alongside John Roche at MPI and Ken Hughey at Department of Conservation, Jono will conduct research into the trends and the state of monitoring efforts both nationally and internationally.

Gender Diversity Programmes: Fit for a NZ purpose?

Born in India, Ankita Gangotra moved to the UK in 2011 to do electronics engineering at the University of York. After graduating with an MEng Electronics with Nanotechnology in 2015, she moved to Aotearoa New Zealand and is currently finishing a PhD in the Department of Physics at the University of Auckland.

Ankita is working closely with the MBIE diversity team for her internship project which review various diversity schemes and charters around the world with the aim of identifying advantages and shortfalls of some of the most visible initiatives. Setting benchmarks for representation in science and science education systems is a complex challenge. There are diversity accreditation charters around the world, such as Athena SWAN (UK) and SAGE (Australia), which ask informed question and set standards for participating organisations to achieve.

However, there is no one-size-fits-all solution for Aotearoa New Zealand. There is a need for a more intersectional approach, which looks at improving not just the participation of women in STEM, but also the Māori, Pasifika and LGBTI communities, among others.

Weta preparing for possible apocalypse, Aotea, Great Barrier Island.

We would like to thank the MacDiarmid Institute for Advanced Materials and Nanotechnology for supporting our Intern Programme.

IAN LAMBIE REPORT

Every Four Minutes

There were 121,747 family harm investigations by New Zealand Police in 2017, which equates to one every 4 minutes.

In December 2018 the office released the report "Every 4 minutes: A discussion paper on preventing family violence in New Zealand" by Ministry of Justice Chief Science Advisor, Dr Ian Lambie. You can read it here.

The report is the latest in a series on the criminal-justice system that Dr Lambie has written through the Office of the Prime Minister's Chief Science Advisor. The title refers to the fact that there were 121,747 family harm investigations by New Zealand Police in 2017, which equates to one every 4 minutes.

The report was presented to the Parliamentary Undersecretary of Justice, Jan Logie MP at a function at Parliament on December 11th.

The report received wide media coverage, and its impact is ongoing, with Ian's research being referenced in May's budget announcement, and his role being increasingly recognised and referenced by policy practitioners, researchers, and politicians.

Ian Lambie presents his report in parliament.

IN THE COMMUNITY

Participatory Science Platform

We inherited the Participatory Science Platform (PSP) from Sir Peter Gluckman, and it is run on behalf of the Office of the Prime Minister's Chief Science Advisor by Dr Victoria Metcalf, who is based in Christchurch.

The programme runs in three regions: South Auckland, Taranaki, and Otago. It is part of "A Nation of Curious Minds - He Whenua Hihiri I Te Mahara" and has championed a method of undertaking scientific research where volunteers are meaningfully involved in the development and progression of locally relevant scientific research projects with science professionals.

The PSP goes beyond the idea of scientists' crowd-sourcing their data, and builds a true partnership between the scientists and the broader community, with co-designed research projects that have scientific value, pedagogical rigour and resonate with the community.

The PSP model allows for the inclusion of other sources of knowledge, especially Mātauranga Māori and tikanga; they also include intergenerational involvement, with elders imparting lived wisdom and young people challenging paradigms and approaches. Projects offer a transformational and empowering learning model for student engagement and educators.

Reef Life

The 'Taranaki Reef Life Project' received PSP funding in 2015 and 2016, and now with multi-year TSB Community Trust funding, is an exemplar, highly successful and awarded project led by the South Taranaki Underwater Club. The Reef Life team took an ethereal concept, biodiversity of a region several km offshore in the South Taranaki Bight, and has taken the community on a journey of better understanding their marine environment. It has won a Taranaki Regional Council environmental award, as well as a Ministry for the Environment/Department of Conservation Green Ribbon Award following nomination by their iwi partners, Ngā Rauru and Te Rūnanga o Ngāti Ruanui Trust.

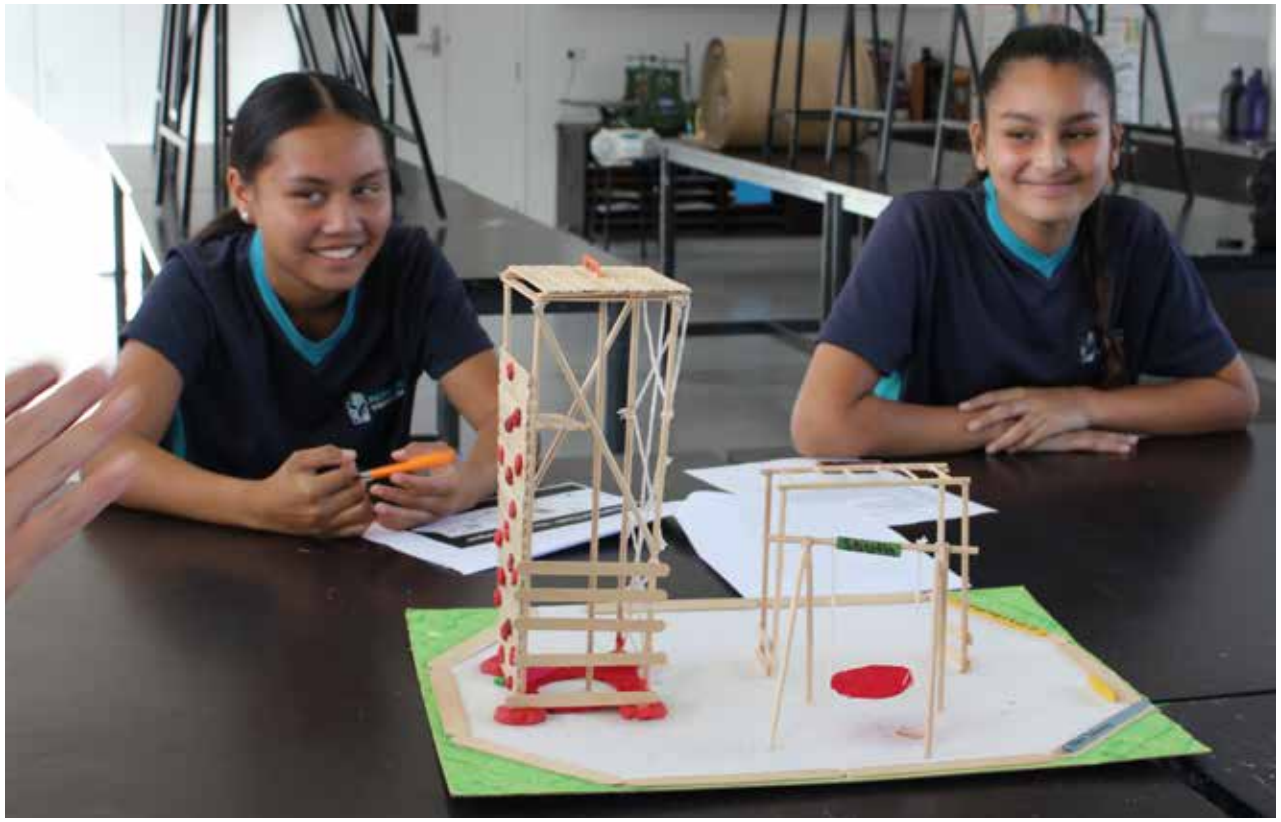
PSP 2018
facts and figures

56 schools involved with 13 tertiary institutions, 10 Crown Research Institutes and consultants, 25 businesses, 11 iwi trusts, 16 Councils, 4 government departments, 2 museums, 34 community groups and not-for-profits

29 full projects funded
Total investment $457,796.21

Plus 10 seed projects
Total investment $18,424

"The PSP model allows for the inclusion of other sources of knowledge, especially Mātauranga Māori and tikanga; they also include intergenerational involvement, with elders imparting lived wisdom and young people challenging paradigms and approaches."



The project has involved significant technical challenge and innovation, with a camera mounted to the reef and taking still and video footage every few seconds year-round. Students assist in analysing the data. Divers also do underwater surveys and some of the high school students have headed to the reef for fishing hook and line and acoustic surveys. Hawera High School has been a part of the project since it started and has embedded it into the 2019 curriculum for a group of Year 9 students. Students previously involved started their own lunchtime marine studies group to continue their contribution and have visited their local primary school as project ambassadors. Project Reef Life features in the 2019 NZ School Journal for Level 4 (ages 10-13). The project held a photographic exhibition in 2017 in Hawera Museum, and is now a part of the new permanent Taranaki Naturally exhibition at Puke Ariki Museum in New Plymouth, with VR footage contributed in partnership with New Zealand Geographic. Reef Life secured Creative Community Funding for a large mural to be created by a local artist on a Patea building.

Reef Life has also had an impact on policy, with the reef explicitly referenced in the TRC Coastal Plan. Project members (project leads and students from Patea Area School and Hawera High School) presented at a 2017 select committee hearing by invitation of (now retired) Whanganui MP Chester Burrows – who said "It's great to see a kid who is 14, 15, 16 standing up and speaking to politicians… "It wasn't a school project, this is a project with serious grunt."

Astronomically aligned playground

Papakura Intermediate students, with the assistance of Fisher & Paykel Healthcare engineers, have been planning, designing and creating prototypes for an astronomical playground, 'Te Papa Tākaro Hiringa Whakaea - The Science & Innovation Playground', that connects them to the environment

(utilising the stars, sun and trees) using scientific and Te Ao Māori concepts. They are also intertwining their cultural representations of Tongan, Maori, Samoan, Indian, Middle-eastern heritage into the design. The school board has approved $80,000 to build the finished design. Principal Bec Kaukau said in a Herald feature "We are steering away from subjects…We still teach the NZ curriculum, but the emphasis should be more on the dispositions that we need to develop in our learners - the ability to enquire, to problem-solve, to collaborate. We have used inquiry and technology learning to localise the curriculum and transform our school, and we have established a relationship with Mana Whenua to relate to Te Ao Māori."

Flip the Fleet

'Flip the Fleet', run by Ecosystems Consultants Ltd is a thrice-PSP funded (2016 seed-funding, 2017 and 2018 full funding) Otago project looking at how to accelerate electric vehicle uptake through gathering data on Electric Vehicle (EV) use, efficiency and charging infrastructure from EV users, with c. 10% of EV users from around New Zealand enrolled in the project. Foodstuffs have enrolled all 28 of their eNV200 vans in Flip the Fleet. The use of regular short 1-click surveys to enrolled participants, with results then openly shared, helps to shape what other data they need to collect.

This PSP project has had sustained national and international media attention owing to their interesting findings, along with their 2018 Cromwell event "The Hare & The Turtle", which saw a Tesla X and a Ferrari raced by professional drivers (the Tesla won 3-0). A potential rapid battery degradation fault they discovered in newer models of the popular Nissan Leaf led to a worldwide software upgrade being issued by Nissan. In 2018, the Flip the Fleet team uncovered 60 reported failures of the e-ACT Electrically-driven Intelligent Brake Control Unit in Nissan Leafs manufactured between November 2012 and February 2016. The project findings demonstrate the value of community based science. Project lead Henrik Moller won the Sustainability Award in the 2018 Otago Community Science Awards and the project won the Smarter Transport award in the 2017 Sustainable Business Network Awards.

Right: Budding scientists at Island Bay School on a recent visit by Juliet.


I am a
Scientist,
can't you
see?
exercisebook
JWB

CULTURE

Equity, inclusivity and diversity

Nāu te rourou, nāku te rourou ka ora ai te iwi.

The Prime Minister, Min Woods and Juliet all place a high priority on equity, diversity and inclusion and championing these initiatives has been a major focus for the Office this year. It is still sufficiently unusual for a woman to be appointed as Prime Minister's Chief Science Advisor for Juliet's appointment to be featured in Nature inexplicably featuring a photograph from when she was about twelve.

On her travels around the country, Juliet has often been invited to address different forums for Women in Leadership, and has taken a particular interest in engaging with early career researchers everywhere she visited. Beyond public engagement, the Office is supporting efforts within MBIE to operationalise their diversity statement, with two interns collaborating in this space (pages 21-23).

Juliet, supported in particular by Tahu Kukutai, Stuart McNaughton and Gary Evans from the Chief Science Advisor Forum, is actively working with a variety of groups to gain their wisdom on building a pipeline for Māori and Pasifika into STE(A)M.

Juliet meets with Te Rauika Māngai.

We are grateful for engagement from many passionate researchers including Te Kotahi Research Insitute, University of Waikato; the Federation of Māori Authorities (FOMA) the Pūhuro STEM programme and Robopa programme.

The National Science Challenge - Science for Technological Innovation Challenge – are investing in the role of Chief Advisor Innovation and Research, Te Horipo Kairaitiana.

Te Rauika Māngai which works across the National Science Challenges to bring Te Ao Māori wisdom and capability to bear on Aotearoa's challenges. The Office is also strengthening its engagement with the Centre of Research Excellence, Ngā Pae o te Māramatanga and the Te Aro Pūtaiao group of Science New Zealand.

There is great energy in these kōrero and we look forward to deepening engagement in the years ahead. Ka pai.

A beautiful kete, part of the FOMA tradition, photographed at the Federation of Maori Authorities 31st Conference is Gisborne.

International engagement

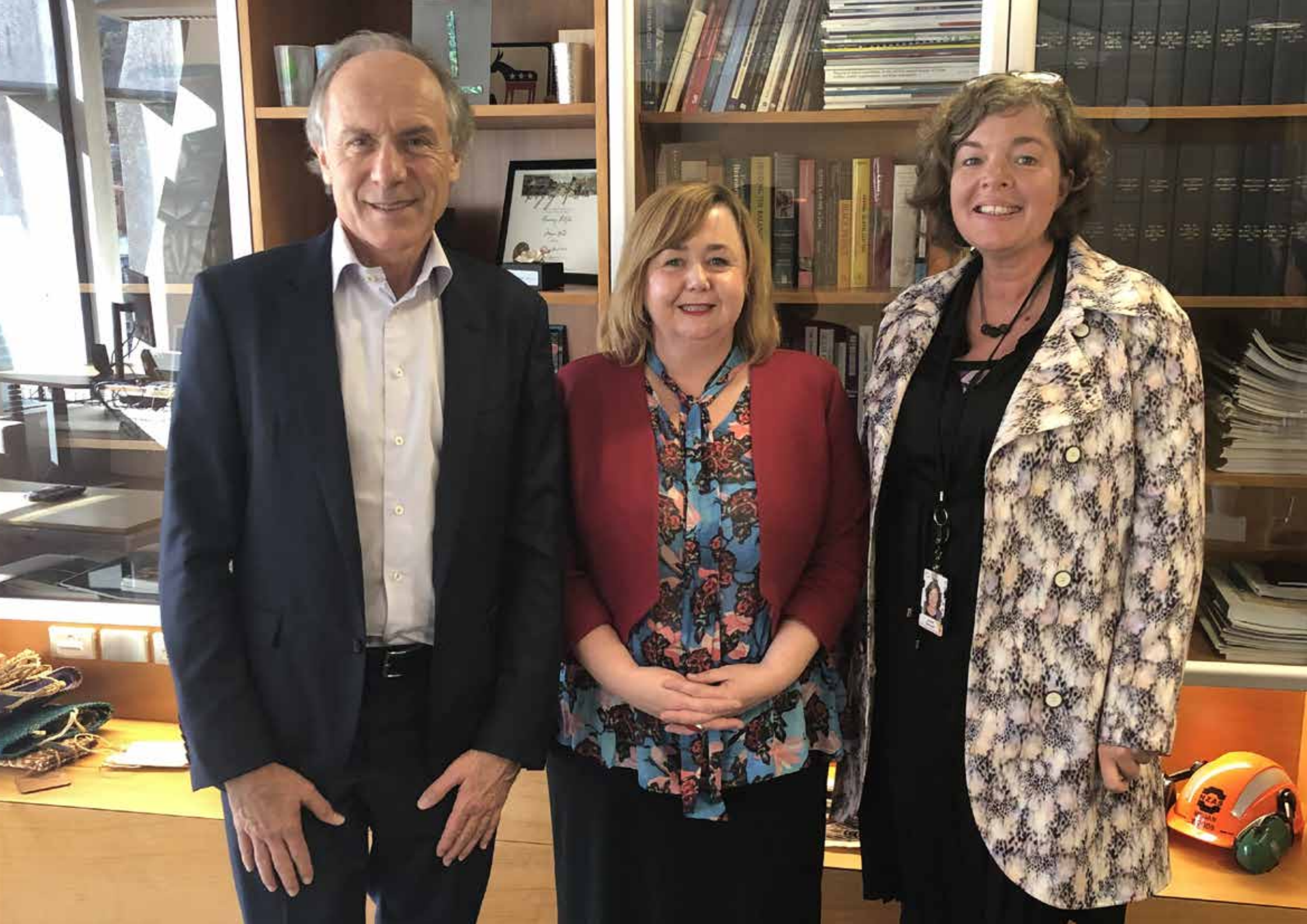
Aotearoa New Zealand is well connected to the international science advisory community.

The role of Prime Minister's Chief Science Advisor has a national focus, but science in Aotearoa New Zealand very much takes place in an international context, with our researchers often punching well above our weight. To shout out just a few examples, this last year has seen: Dame Professor Margaret Brimble elected as a Fellow of the Royal Society of London; Emeritus Professor Roy Kerr win the Crafoord Prize for fundamental work on black holes and their astrophysical consequences; Professor Linda Tuhiwai Smith be awarded the inaugural Te Puāwaitanga Award - for her significant contribution to Te Ao Māori, and to Māori and indigenous knowledge and the team from ESR scoop the Prime Minister's top Science Prize for internationally acclaimed and internationally connected work on crime-solving DNA software.

Similarly, Aotearoa New Zealand is well connected to the international science advisory community, and Juliet inherited a strong network of international relationships when she attended the International Network of Government Science Advisors conference in Tokyo and the APEC Chief Science Advisor and Equivalent and Women in STEM meetings in Brisbane late last year. This strong platform has allowed Juliet to concentrate on deepening strategic relationships with key international advisors. In particular, Juliet has met regularly with the Australian Chief Scientist, Professor Alan Finkel, and will take the opportunity to attend his Forum of Australian Chief Scientists. This has representatives from each state in Australia, and their agenda has aligns across many issues relevant to Aotearoa, including space, clean energy, citizen science, Women in STEM and the value of indigenous research.

Juliet is also looking forward to connecting in person with Canadian Chief Adviser, Dr Mona Nemer, and key members of the US and UK science advice system, including the current Chief Scientist, Dr Patrick Vallance, at the Government Office for Science, later this year.

Juliet meets the Chief Scientist of Australia Alan Finkel and Min Woods.



FINANCES

2018 -2019

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 between the University of Auckland and the Department of Prime Minister and Cabinet (DPMC). The forecasted expenditure from this contract is included below, for transparency. These are budget estimates, not financial statements.

The University of Auckland (UoA) 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 keeps an eye on our finances; Ranmali Mada in the VC's office provides a vital link to administrative services; and Rebecca Adams of Uniservices has been key to supporting our intern and forum activities in the Wellington office of the University of Auckland.

We also thank the Department of Prime Minister and Cabinet for providing hot desk facilities and general support, in particular Sacha O'Dea and Chris O'Gormon.

	"July 1 2018 - June 30 2019"	"July 1 2019 – June 30 2020"	"July 1 2020 – June 30 2021"	TOTAL
Honorarium to Juliet Gerrard (this is a direct payment outside the MoU)	50,000	50,000	50,000	150,000
Funding received from DPMC for operations of the Office under the MoU	795,000	795,000	795,000	2,385,000
Breakdown of Funding from MoU				
Salaries/people costs	506, 209	598, 790	636,844	1,741,843
Research costs	50,000	165,000	145,000	360,000
Office support costs	25,904	14,568	16,026	56,498
Domestic travel, Wellington	25,000	30,000	30,000	85,000
Other domestic travel	25,737	23,640	25,520	74,897
International travel	22,412	18,733	25,617	66,762
Total expenses	655,262	850,731	879,007	2,385,000
Contribution to overheads/deficit	139,738	-55,731	-84,007	-
UoA overheads funded in kind	582,140	688,609	732,371	2,003,120

The Participatory Science Programme is funded under a separate contract from MBIE and is run in collaboration with MBIE and the broader Curious Minds programme at the Royal Society Te Apārangi. The finances for the Participatory Science Programme programme are not included in under the MoU and are not included in the totals.

Kia hora te marino
Kia whakapapa pounamu te moana
Kia tere te Karohiroho.

May the calm be widespread
May the sea glisten like pounamu
And may the shimmering haze of summer
Dance across your pathway.

For more information about the whakatauki in this document, click here.

Ngā mihi nui ki a koutou katoa.

Annual Report 1st July 2018 - June 30 2019 The Office of the Prime Minister's Chief Science Advisor, Kaitohutohu Mātanga Pūtaiao Matua ki te Pirimia.
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