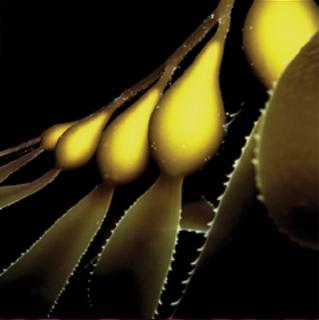
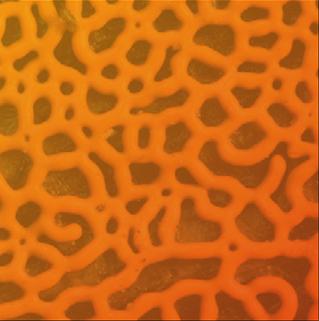
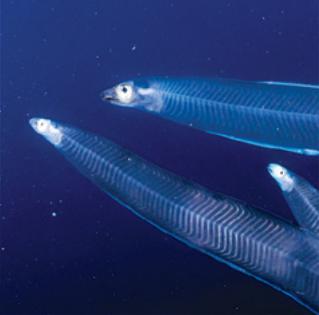




the ROYAL
SOCIETY of
NEW ZEALAND
TE APĀRANGI

Annual Review



Highlights of 2015





From the President

The Royal Society of New Zealand is taking on new challenges as we move towards our 150th anniversary in 2017. We are exploring how we can support the research and scholarly community more comprehensively, how we encourage and recognise diversity, and how we reach a wider audience across the sciences (including the social sciences), technology and the humanities. We are building on the major achievements of my predecessor, Sir David Skegg KNZM OBE FRSNZ, who led the Society for three years until 30 June 2015. Sir David gained significant support for our role in providing expert advice on major issues facing New Zealand.

In 2015 our Council and senior staff finalised a new strategic plan, which sets out our vision of 'A New Zealand enriched by fostering science, technology and the humanities'. The plan is available on the Society's website and it indicates that we are embracing diversity across everything we do and enhancing our international reach whenever we can.

In December 2015 I had the opportunity to strengthen our international relationships during a visit to Europe with our Chief Executive where we met with office holders and staff in national academies in the UK, Ireland and France.

In 2016 Council is looking forward to finalising the researcher guidelines for public engagement and more widely disseminating the findings from expert panels working on understanding the implications of climate change and the mitigation options for New Zealand.

I would like to thank my colleagues on Council, the staff in Wellington and our supporters who generously give their time and expertise to support the wide-ranging and varied work that we do to promote the sciences, technology and the humanities in New Zealand and in our neighbouring region.

Emeritus Professor Richard Bedford
QSO FRSNZ
President

Facing image: Specimens in the Marine Invertebrate Collection held by NIWA, one of 29 national taxonomic collections



From the Chief Executive

The Society continues to play an important role in the New Zealand research community, but also in fulfilling its wider functions to advance and promote science, technology and the humanities.

During the year we have undertaken considerable development of programmes in science and technology education. Our longstanding CREST programme in schools works best when students are partnered with working scientists, engineers or technologists from industry, often influencing future career choice. We welcomed the Institute of IT Professionals and WelTec's School of Engineering as new partners in parallel to the continuing partnership with the New Zealand Institute of Food Science and Technology. We also launched a new personal development programme, Powering Potential, for senior secondary school science students, which drew interest from a diverse group of schools and students.

Competition remains high for the research investment and research fellowship schemes we manage for the Government, and we were pleased to undertake important additional programmes in 2015 including evaluation of Centres of Research Excellence bids and pilots for a Teachers in Industry scheme. The latter is supported by the Government's 'Science in Society' programme in which we are seeking to play an increasing role.

We are committed to providing a range of services that are valued by the research and scholarly communities and beyond. Increasing the scale of our operations enables us to extend our reach. During the year we enlarged the size of hireable space in our main building and are pleased to host an increasing variety of events and meetings.

Reflecting on my first full year in the role, I remain delighted to lead a team of committed and skilled staff. Their efforts are pivotal to building the relevance and visibility of the Society for the benefit of all New Zealanders.

Dr Andrew Cleland
FRSNZ
Chief Executive

Highlights of our year

Our purpose is to advance and promote science, technology and humanities in New Zealand. In 2015 we continued our work on five goals set in 2012. Here's an introduction to our main activities to achieve our goals and some of the year's highlights.

1

Goal 1: Meet New Zealand's need for information on challenging issues

Each year we give New Zealanders the opportunity to hear the latest about issues facing society. We do this in a number of ways such as providing expert advice reports, forums, workshops and public talks and events.

In 2015 we released a report on the state of taxonomy in New Zealand which called for a coordinated approach to safeguard this important discipline that delivers many benefits to New Zealand, from supporting economic growth to protecting human health.

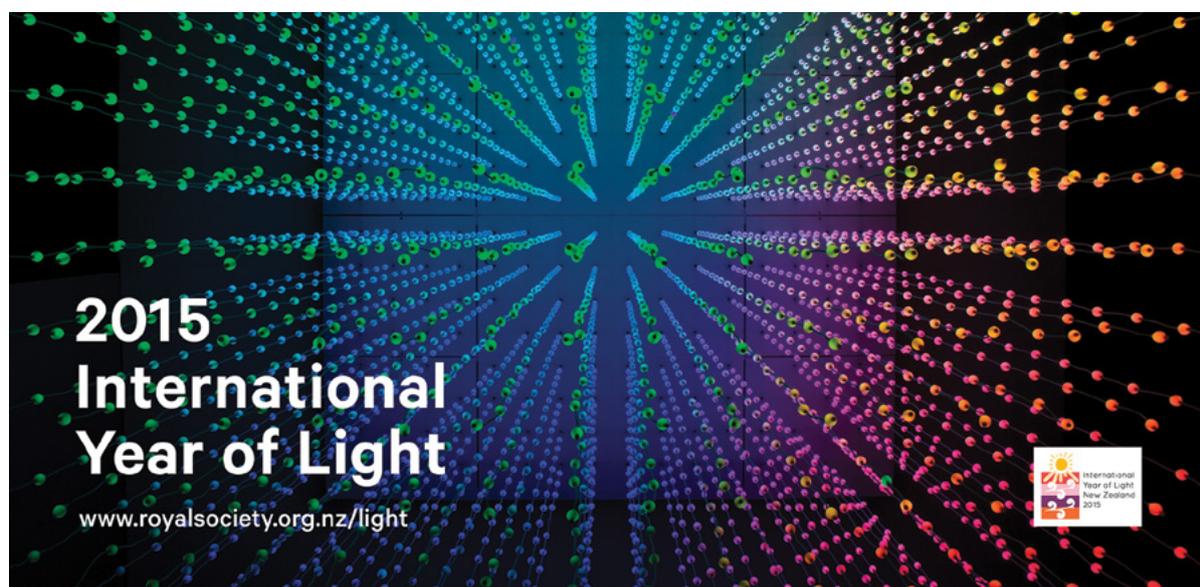
2015 was the International Year of Light. Events included Dr Peter Wothers' audience-wowing 'Chemistry of Light' demonstrations and the Ten by Ten series of talks in which ten New Zealanders spoke in ten centres on ten different aspects of light, from lasers through to light's role in literature.

2

Goal 2: Raise awareness of New Zealand research and scholarship

Each year we celebrate research and scholarship by awarding medals and prizes to New Zealand's top researchers and scholars at the Royal Society of New Zealand Research Honours event. We also produce eight peer-reviewed journals, providing a platform for publishing New Zealand research and research relevant to our region. We support the New Zealand Science Media Centre, which fosters relationships between the media and scientists to improve the coverage of science in New Zealand.

In 2015 we saw a strong increase in readership of the journals, while the Science Media Centre initiated a number of new activities including an online portal for embargoed news and listings of science experts for journalists to access.



3

Goal 3: Nurture talented people to support research and scholarship

We nurture talented people from school students to professional researchers. We foster science education in schools by giving secondary students the opportunity to pursue scientific and technological projects and travel overseas to fairs and science camps. We also assist teachers of science to become science leaders in their schools and communities. The Society supports researchers with fellowships and awards for PhD candidates, postdoctoral fellows and established researchers. We award research grants for New Zealand's most prestigious investigator-led research fund: the Marsden Fund.

Powering Potential was launched in 2015 as a development programme for outstanding secondary students with a passion for science, and we remodelled a programme for science teachers to enable them to lead improvements in science learning in their schools and wider communities.

We were pleased that the Marsden Fund round showed excellent success rates from preliminary proposal to funded contracts for female and Māori researchers, two groups that are underrepresented in many of our research awards and honours. An independent external review found that Marsden grants lead to increased research outputs.

4

Goal 4: Engage with the international research community

The Society manages New Zealand's representation in numerous international scientific unions and administers a number of funds for international research collaborations, such as research exchanges and visits.

Highlights for 2015 were the celebration of 10 years of the Dumont d'Urville programme, which fosters linkages between New Zealand and French researchers in the Pacific region, and the launch of the new Catalyst Fund for advancing global science partnerships for New Zealand.

5

Goal 5: Create an enduring organisation with effective resource management

The Society works to maintain its membership by electing leading researchers and scholars to our Academy and by supporting individual members. We seek to maintain strong links with our branches, constituent organisations and affiliate organisations and prudently manage our financial resources.

We improved our financial equity in 2015 and strengthened consultation mechanisms with our branches, constituent organisations and affiliate organisations.

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Royal Society of New Zealand Council

The following were members of the Royal Society of New Zealand Council during 2015.

Professor Sir David Skegg KNZM OBE FRSNZ, President (until 30 June 2015)

Emeritus Professor Richard Bedford QSO FRSNZ, Councillor (until 30 June 2015), President (from 1 July 2015)

Professor Gaven Martin FRSNZ, Vice President – Physical Sciences, Mathematical Sciences, Technology and Engineering

Dr John Caradus FRSNZ, Vice President – Biological and Life Sciences (until 30 June 2015), Councillor (from 1 July 2015)

Professor Barry Scott FRSNZ, Vice President – Biological and Life Sciences (from 1 July 2015)

Professor Richard Le Heron FRSNZ, Vice President – Humanities and Social Sciences

Professor Stephen Goldson ONZM FRSNZ CRSNZ, Councillor (until 30 June 2015)

Dr Liz Gordon MRSNZ, Constituent Organisation Representative

Associate Professor Christine Jasoni MRSNZ, Regional Constituent Organisation Representative

Dr David McNamara MRSNZ, Co-opted Councillor

Professor Caroline Saunders ONZM, Councillor

Professor Margaret Tennant FRSNZ, Co-opted Councillor

Professor Linda Tuhiwai Smith CNZM, Co-opted Councillor

Dr Siouxsie Wiles MRSNZ, Councillor (from 1 July 2015)

Goal 1

1

Meet New Zealand's need for information on challenging issues

Speaker's Science Forum: from pandemics to earthquake strengthening

At the Speaker's Science Forum researchers presented the latest research to MPs, providing an evidence base to resolve complex issues. Topics covered were pandemic preparedness; engaging the next generation of kids in learning; future demand for services; added-value food; housing and health; irrigation and ecosystems and innovations in earthquake strengthening.

The presenters were Professor Nigel French FRSNZ, Dr Sue Huang, Distinguished Professor Niki Davis, Derek Wenmoth, Distinguished Professor Paul Spoonley FRSNZ, Dr Tahu Kukutai, Professor Philippa Howden-Chapman FRSNZ, Greg Overton, Dr Alexander Herzig, Dr John Bright, Professor Jason Ingham, Graeme Beattie, Dr Bruce Campbell and Professor Richard Archer.

History of tangata whenua wins 2015 Science Book Prize

The biennial Royal Society of New Zealand Science Book Prize was won by *Tangata Whenua: an Illustrated History* by Atholl Anderson FRSNZ, the late Dame Judith Binney FRSNZ and Aroha Harris, published by Bridget Williams Books. Other titles shortlisted were *The Wandering Mind* by Michael Corballis FRSNZ; *Gathering Evidence* by Caoilinn Hughes; *Dolphins of Aotearoa: Living with New Zealand Dolphins* by Raewyn Peart and *Manuka: the Biography of an Extraordinary Honey* by Cliff Van Eaton.

See more at www.royalsociety.org.nz/bookprize

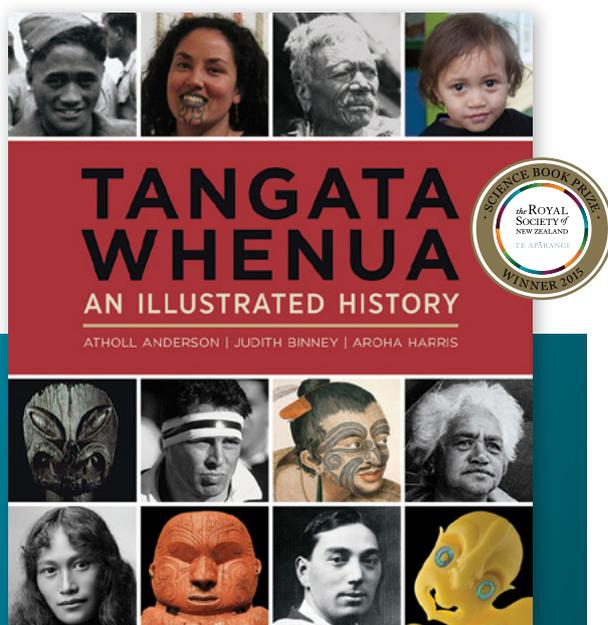
"Tangata Whenua: an Illustrated History by Atholl Anderson, Dame Judith Binney and Aroha Harris is a dazzling work of scholarship. It draws on archaeology, anthropology, ethnography, palaeoecology, genetics and climate science, as well as history, to tell the stories of the Māori people, their origins, their journeys to find this country and their stories in Aotearoa New Zealand."

Support needed for New Zealand's taxonomic collections

In 2015 we convened an expert panel to undertake a review of New Zealand's taxonomic collections, bringing together a wide range of interdisciplinary evidence about the current state and future potential of New Zealand's taxonomic collections. The resulting report, *National Taxonomic Collections in New Zealand*, was published in December and called for a coordinated approach and more resources to safeguard and grow New Zealand's taxonomic collections which are intrinsic to supporting sectors of New Zealand life from economic growth to human health.

See more at www.royalsociety.org.nz/taxonomy

The panel members were Professor Wendy Nelson MNZM FRSNZ (Chair), Dr Ilse Breitwieser, Professor Ewan Fordyce FRSNZ, Dr Janet Bradford-Grieve ONZM FRSNZ, Dr David Penman, Dr Nick Roskrige, Dr Tom Trnski, Dr Susan Waugh and Dr Colin Webb FRSNZ.



2015 Royal Society of New Zealand Science Book Prize judges: Emeritus Professor Jean Fleming CRSNZ, Emeritus Professor Ken Strongman FRSNZ and Dr Rebecca Priestley



“New Zealand must contribute effectively to the global effort to avoid dangerous climate change. The Royal Society of New Zealand has developed expert advice on the implications of climate change for New Zealand, and on possible options New Zealand might take to reduce its emissions.”

Emeritus Professor Richard Bedford QSO FRSNZ, President of the Royal Society of New Zealand

Risks of asbestos exposure to house occupants minimal

A review of the health risks of asbestos exposure to residents was released by the Society in April 2015, in conjunction with the Office of the Prime Minister's Chief Science Advisor. It found asbestos exposure during the rebuild following the Canterbury 2010–11 earthquakes was unlikely to cause significant health problems for house occupants. A public meeting was held in Christchurch in May to explain the evidence used in the review.

See more at www.royalsociety.org.nz/asbestos

Languages and super-diversity in Aotearoa workshop

The Society held a workshop to discuss a national approach to diversity and languages in May, timed to coincide with the release of Statistics New Zealand's National Ethnic Projections. Speakers were Dame Susan Devoy, Associate Professor Sharon Harvey and Emeritus Professor Richard Bedford QSO FRSNZ. It followed on from the 2013 paper *Languages in Aotearoa/New Zealand*.

Climate Change in New Zealand: implications and mitigation options panels

Work was undertaken in 2015 towards two expert reports on climate change, one looking at what the Intergovernmental Panel on Climate Change's Fifth Assessment Report will mean for New Zealand and the other looking at the particular opportunities for New Zealand to mitigate the effects of climate change. These reports are now published and available online.

See more at www.royalsociety.org.nz/climate

Bringing science to the public: light, resilience and the Great Barrier Reef

The Society programme of events to promote the awareness and understanding of science, technology and the humanities in 2015 included:

Spark of Life: 2015 Distinguished Speaker Professor Frances Ashcroft FRS explained why ion channels in our bodies are the 'spark of life'.

Dinosaurs and Space-Shuttles: palaeontologist and writer Dr Phil Manning spoke about how space-shuttle technology was used to study a very special fossil dinosaur called Dakota, a 67-million-year-old hadrosaur with preserved soft tissue.

Bright Earth – the Invention of Colour: UK author and science communicator Dr Philip Ball gave a fascinating account of the science behind the colours used by artists. He also gave the talk **Invisibility: a Cultural History**.

The Chemistry of Light Show: Dr Peter Wothers wowed audiences young and old with his demonstrations of how chemistry has been used through the ages to light our way. He also gave a talk exploring the history of some of the ingredients in shampoo in **The Secret Life of Shampoo**.



“Ion channels are proteins that sit in the membranes that surround each of our cells, and they act as tiny pores through which ions can move. This movement produces a tiny electrical current – about a billion times smaller than that needed to power your electric kettle.”

Professor Francis Ashcroft FRS, 2015 Royal Society of New Zealand Distinguished Speaker



“Taxonomy allows us to understand New Zealand’s unique flora and fauna – 50 per cent of which is found nowhere else in the world – but it also allows us to make the most of opportunities in trade, health, and our environment, and to meet our international obligations.”

Professor Wendy Nelson FRSNZ, Chair of the National Taxonomic Collections in New Zealand panel



“It is the inhalation of asbestos fibres, not skin contact or ingestion, that has been established as causing harm.

The review found no evidence that a single peak in exposure of the kind encountered during house maintenance or repair following the Canterbury earthquakes would have a material effect on disease risk.”

Professor Sir David Skegg KNZM OBE FRSNZ, Cancer epidemiologist and former President, Royal Society of New Zealand



“New Zealand’s linguistic and cultural diversity surpasses any level of complexity we have previously

known or experienced, with more than 160 languages being spoken in our homes, playgrounds and workplaces. We would like to see a comprehensive, across-government, languages policy that would provide New Zealand with a joined-up approach to recognising and working with the many languages and cultures of our country.”

Associate Professor Sharon Harvey, speaker at workshop on Languages in Aotearoa New Zealand



The Age of Resilience: three panel discussions held in partnership with the Embassy of France and facilitated by broadcaster Kim Hill CRSNZ looked at how humanity can adapt and be resilient to anthropogenic climate change by using existing social structures such as cities, economics or justice.

Hear panel discussions at www.royalsociety.org.nz/resilience

The panellists were Pierre Ducret, Professor David Frame, Associate Professor Bronwyn Hayward, Dr Suzi Kerr, Professor Catherine Larrère, Sarah Meads, Lucile Schmid, Sir Geoffrey Palmer and Fraser Whineray.

Going Super Heavy: 2014 Rutherford Medallist Peter Schwerdtfeger FRSNZ spoke on the super heavy end of the periodic table of elements.

At Six – How to Discover a Planet from your Sofa: Professor Chris Lintott talked about the new developments that have made finding and classifying new planets and galaxies much easier, and the role citizen scientists are playing in this through platforms Galaxy Zoo and Zooniverse.

Ten by Ten Luminaries: For the International Year of Light ten speakers addressed many facets of light, including light and the body clock, solar energy, light in literature, lasers, the search for planets and new medicines and Māori astronomical knowledge.

Videos available to watch at www.royalsociety.org.nz/ten

Speakers were Dr Guy Warman, Dr Justin Hodgkiss, Dr Miro Erkontalo, Associate Professor Cather Simpson, Dr Nick Rattenbury, Ian Wedde, Dr Siouxsie Wiles, Dr Pauline Harris, Associate Professor Martin Allen and Dr Vonda Cummings.

Great Barrier Reef Passions: 2015 New Zealand Aronui speaker Professor Iain McCalman shared the history of Australia’s Great Barrier Reef through stories from original inhabitants, shipwreck survivors and environmentalists fighting to protect it.

Goal 2

Raise awareness of New Zealand research and scholarship

2

Celebrating the achievements of researchers and scholars

The Royal Society of New Zealand presented eleven medals at the 2015 Research Honours in Auckland in November.

Distinguished Professor Ian Reid FRSNZ, University of Auckland, received the **Rutherford Medal**, the Society's premier award, for his seminal contributions to the understanding and treatment of metabolic bone diseases such as osteoporosis and Paget's disease. He was also part of the team with **Associate Professors Mark Bolland** and **Andrew Grey** who separately received the 2015 **Prime Minister's Science Prize**.

The **Pickering Medal** was awarded to **Professor Margaret Hyland**, University of Auckland, for her basic and applied research to reduce fluoride emissions from the aluminium industry, providing environmental, economic and health benefits.

The **Thomson Medal** for science leadership was awarded to **Professor Richard Blaikie** FRSNZ, University of Otago, for leadership of the MacDiarmid Institute and nanotechnology as a sub-discipline in New Zealand.

'Nanogirl' **Dr Michelle Dickinson**, University of Auckland, received the **Callaghan Medal**, named after Sir Paul Callaghan, for her passion and dedication to communicating the value of science, particularly to young people.

The **Hector Medal** was awarded to **Dr Ian Brown** FRSNZ, Callaghan Innovation, for his research into materials chemistry, including high-performance ceramics, glass and metallurgy, which have led to major technology platforms of strategic and commercial significance in New Zealand.

Professor Lionel Carter FRSNZ, Victoria University of Wellington, was presented with the **Hutton Medal** for his research into sea-floor geological processes, applied to understanding coastal erosion, seafloor cable integrity, New Zealand's Exclusive Economic Zone and ocean-climate interactions.

Professor Valery Feigin, Auckland University of Technology, was awarded the **MacDiarmid Medal** for his research into understanding international stroke epidemiology and the development of a mobile app that can help people assess and mitigate their stroke risk.

Emeritus Professor Atholl Anderson FRSNZ, of Ngāi Tahu descent and formerly at Australian National University, received the **Humanities Aronui Medal**. His research has challenged conventional thinking about ancient seafaring and the timing of Indian Ocean and Pacific Ocean island colonisation, particularly of Aotearoa.

"While we have been well acknowledged by bone research organisations internationally, it is especially significant to also receive accolades from the environment that has nurtured and supported us, and received the most direct benefit from our work."

Distinguished Professor Ian Reid FRSNZ, 2015 Rutherford Medallist and member of the team who received the 2015 Prime Minister's Science Prize





“My Ngāti Kahu, Te Rarawa and Ngāti Whātua elders wanted the extensive knowledge and wisdom they had passed on to the following generations to be made available and understood not only locally, but also nationally and internationally.”

Professor Margaret Mutu, 2015 Pou Aronui Award recipient for distinguished service to the humanities

Professor Margaret Mutu, University of Auckland, received the **Pou Aronui Award** for her sustained contributions to indigenous rights and scholarship in New Zealand on topics including Māori rights, oral traditions and histories, Māori resource management and conservation practices and Māori and Polynesian linguistics.

The **Mason Durie Medal** was awarded to **Professor Keith Petrie** FRSNZ, University of Auckland, for his research into patients' perceptions of illness and how these perceptions impact on recovery and coping, co-developing the widely-used Illness Perception Questionnaire (IPQ).

Associate Professor Ruth Fitzgerald, University of Otago, was awarded the **Te Rangi Hiroa Medal** for her work as a medical anthropologist that has placed many health issues such as genetic testing, disabilities, reproductive decisions and oral health in a New Zealand social and political context.

See more at www.royalsociety.org.nz/rh15

Science Media Centre builds capability in the media and research sectors

The Science Media Centre ramped up media training activity with its two-day Science Media SAVVY programme and SAVVY Express, where scientists at major science conferences attend a 15-minute session to hone their 90-second video pitch on their research. Media training workshops for Māori researchers were

also piloted and 'Spotting Bad Science' workshops were held for journalists in newsrooms around the country. The Centre also published the third edition of the *Desk Guide for Covering Science*.

Scimex.org, the Science Media Exchange portal for embargoed research news and expert database, went live in 2015 and now has nearly 900 registered journalists and 700 expert profiles from across Australasia. The science blog platform Sciblogs.co.nz was revamped and relaunched with new contributors and improved functionality.

Throughout the year the Science Media Centre assisted the media through briefings and support in covering a diverse range of subjects, from childhood obesity and the Kiwi genome to the historic climate change talks in Paris.

Journals on the up and up

The Society publishes seven peer-reviewed science journals and one peer-reviewed social science journal, of relevance to both New Zealand and international researchers, with a geographical scope of Australasia, the Pacific basin, Antarctica, and other countries with similar climates to New Zealand.

Downloads of the journal articles in 2015 increased by 39% compared with 2014 and 56% compared with

“The story on Dr Melanie Cheung’s Huntington’s research had its genesis in the media panel I was on at a Science Media SAVVY course back in 2013. A fascinating story to work on, and Mel was terrific. It was a really positive outcome thanks to the Science Media Centre.”



Joanna Wane, deputy editor, *North & South*

2013. *Kōtuitui: New Zealand Journal of Social Sciences Online* has demonstrated the largest increase in readership, with a percentage increase of 289% since 2012. *New Zealand Journal of Agricultural Research* has also had a very large increase, at 203%. Readership of the journals is from both New Zealand and overseas.

In June 2015 the *Journal of the Royal Society of New Zealand* published an issue entitled 'The Future of Science in New Zealand', guest-edited by Professor David Bibby and Associate Professor Ian Yeoman, both of Victoria University of Wellington. This forum issue hosted thirteen papers by New Zealand researchers who put forward their thoughts and ideas on this topic. "What emerges is a vision of New Zealand as a small but focused 'ecosystem' comprising both science and society, which is able to make the most of our resources and to contribute to the global effort to solve the problems of the future such as climate change and shortages of energy, food and water," says Associate Professor Yeoman.

Kōtuitui published a themed issue in November: 'Contested Meanings of Recovery: a Critical Exploration of the Canterbury Earthquakes – Voices from the Social Sciences'. This was guest-edited by Dr Ruth McManus, University of Canterbury; Professor David Johnston, Massey University; and Professor Bruce Glavovic, Massey University.



"One of Sir Paul Callaghan's visions was to make science more accessible for all. A vision which I passionately share and feel can only strengthen New Zealand's innovative and inventive future."

Dr Michelle Dickinson, winner of the 2015 Callaghan Medal for science communication



"I was tasked to find out how the New Zealand ocean and seabed work. A pretty tall order for a person who is not the world's best sailor."

Professor Lionel Carter FRSNZ, 2015 Hutton Medallist for Earth sciences



"A combination of supportive management from the Royal Society of New Zealand and a sharpened editorial commitment to 'local focus, global relevance' have given new momentum to *Kōtuitui*. We are beginning to see the benefits in higher quality copy and a growing readership. The journal looks forward to continuing to enhance the academic quality of its published papers whilst still informing policy-relevant national debates and offering a publication outlet for early-career researchers."

Associate Professor Nick Lewis, Senior Editor of *Kōtuitui: New Zealand Journal of Social Sciences Online*, commenting on the growing readership of the journal

Goal 3

3

Nurture talented people to support research and scholarship

Powering the potential of our talented science students

The inaugural Powering Potential event was held in December for 40 of the most successful and passionate science and technology secondary school students from around New Zealand. They formed small teams to work on real world problems submitted by researchers, such as ‘Antibiotic Superbugs. How are you going to stop the superbugs bringing an end to modern medicine within the next 10 years?’ After researching the issues they then presented their ideas to the question submitters and a public audience. The event aimed to inspire the participants to be catalysts for positive change in the future and allow them to see their own potential to work in sciences, technology and the wider innovation sector.



“Powering Potential showed me that I really want to help other people. I learnt that science isn’t just the creation of life-changing things, it can also be used to improve a single person’s life in amazing ways. From art to culture, science is the building block to creativity, and that’s where I’m headed!”

“The Powering Potential event has allowed me to understand that I can drift between borders—I don’t have to be just a scientist or doctor, I could also be an entrepreneur or a business person.”

“Powering Potential has given me more confidence entering university and opened me up to what it actually means to be a scientist.”

Feedback from Powering Potential students



Photo of Powering Potential inaugural participants with their certificates

New programme to improve science learning in New Zealand

The Science Teaching Leadership Programme, which builds on previous teacher fellowship schemes, was launched in February 2015 to provide opportunities for teachers of science for year 1–10 students to develop their leadership skills and enhance the teaching of science within school communities. In the first phase of the programme teachers work with scientists to gain a deeper understanding of the nature of science and undertake leadership training. In the second phase the teachers return to their schools to work with students, staff and their local community to enhance the quality of science teaching and learning. This programme requires a commitment from the school to make science learning a priority.

Giving teachers up-to-date industry experience

The Teachers in Industry pilot project, run in Taranaki and South Auckland in 2015, gave teachers the opportunity to spend time in technology-intensive businesses. This was to support teachers to design science and technology curriculum activities based on up-to-date experience in industry. The pilot facilitated links between 165 teachers, 39 businesses and 17 agencies. Teachers found it an inspiring experience and many businesses commented that they had wanted to be involved with schools but had not had the opportunity previously. This pilot has been extended into a programme for 2016.

Rutherford Foundation Trust supporting early-career researchers

In 2015 the Royal Society of New Zealand Rutherford Foundation Trust awarded scholarships to ten outstanding emerging researchers, including eight postdoctoral fellowships and two international PhD scholarships:

Dr Colm Carraher, Plant & Food Research, to create a proof of concept for an electronic nose inspired by the remarkable sense of smell in insects.

Dr Ashika Chhana, University of Auckland, to investigate whether gout-causing uric acid crystals form more easily in cartilage-damaged or osteoarthritic joints compared with healthy joints.

Dr Luke Fullard, Massey University, to mathematically model 'dense granular flow' phenomena such as flows of milk powder and gravel or landslides.

Dr Libby Liggins, Massey University, to study the Australian long-spined sea urchin as a model for understanding what triggers a range shift of an organism in response to climate change.

“It has been a real privilege to work with so many scientists who are so highly specialised but who realise the importance of working as a team. Their passion for what they do has been infectious, and their encouragement and support of me during my placement at the Photon Factory has been phenomenal. I am really looking forward to using these skills I have learnt back at the classroom at Papatoetoe High School.”

Su Mukund, participant in the Science Teaching Leadership Programme



Dr Brie Sorrenson, University of Auckland, to study how insulin-producing pancreatic beta cells are influenced by glucose and genes thought to be a risk factor for type-2 diabetes.

Dr Lucy Stewart, GNS Science, to study the microbial diversity and geochemistry in the Kermadec Arc from three off-shore islands to better understand the diversity of this region.

Dr Shaun Wilkinson, Victoria University of Wellington, to use bioinformatic techniques to understand hybridisation of the algae that live symbiotically with coral. Rapid hybridisation and reproduction of the algae may help the host coral adapt to climate change.

Dr Marsilea Harrison, Imperial College London, to investigate whether targeted delivery of relevant growth factors can stimulate cartilage cells to grow and repair damaged joints, with potential application to treating osteoarthritis (with support from the Freemasons Foundation).

Samuel Hall-McMaster, Oxford University, UK, to study the underlying neural mechanisms of cognitive skills that enable the pursuit of personally-meaningful goals (PhD).

Lauren Nicol, VU University Amsterdam, The Netherlands, to study how plants can adapt to varying levels of light, particularly high levels, and photosynthesise optimally without tissue damage, with possible application to artificial light harvesting (PhD).

See more at www.royalsociety.org.nz/ft15



“Your heart beat is governed by a bioelectrical impulse, and so is your stomach. After a meal, the stomach

works hard and contracts around three beats a minute to grind, mix, and empty its contents, but you do not feel the bioelectrical events associated with these contractions at all.”

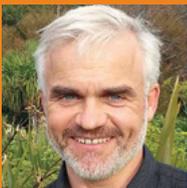
Dr Peng Du, awarded a Rutherford Discovery Fellowship in 2015



“The increase in the number of Māori involved in successful Marsden Fund proposals reflects the capacity building

that has been under way for several years. The proposals involving Māori researchers have been judged by top international referees as highly novel. Many proposals are multidisciplinary and use Mātauranga Māori.”

Professor Juliet Gerrard FRSNZ, Chair of the Marsden Fund Council



“The goal of the Deep Fault Drilling Project on the Alpine Fault in the central South Island is to go beneath the surface, to sample

and make observations of rocks and physical conditions at a range of depths, and monitor these over coming decades.

The second phase of this project involved more than 120 scientists from 12 countries. The project is co-funded by international sources, but Marsden funding came first and provided for New Zealand leadership of the project.”

Associate Professor Rupert Sutherland, GNS, principal investigator with John Townend, Victoria University of Wellington, on the Deep Fault Drilling Project

Supporting future research leaders

The prestigious Rutherford Discovery Fellowships assist the development of future research leaders by supporting them for up to five years. Twelve new fellows were announced in 2015:

Dr Jane Allison, Massey University, to develop computer simulation techniques to characterise how biomolecules move and interact in their natural environment, and how this influences their function and evolution.

Dr Peng Du, University of Auckland, to investigate the role of gut bioelectrical activity and muscle contraction on digestive function.

Dr Miro Erkintalo, University of Auckland, to develop next-generation lasers for scientific and industrial applications.

Dr Nicholas Golledge, Victoria University of Wellington, to model how the Antarctic ice-sheet will respond to a warming world and contribute to future sea-level rise.

Dr Annette Henderson, University of Auckland, to study how culture and caregiver interactions shape the development of cooperation in early childhood.

Dr Cate Macinnis-Ng, University of Auckland, to research how New Zealand's native forests will cope with a changing climate by manipulating rainfall and other environmental conditions and measuring the physiological response of Kauri.

Dr Troy Merry, University of Auckland, to investigate the role of protein beta-catenin in insulin secretion from the pancreas and whether it could be a target for preventing or treating type-2 diabetes.

Dr Kevin Norton, Victoria University of Wellington, to study the relationship between carbon dioxide concentrations and soil formation and thus whether weathering and erosion can contribute to global climate stability by removing carbon dioxide from the atmosphere.

Dr Geoffrey Rodgers, University of Canterbury, to investigate new building designs and energy dispersing and measuring systems to limit damage to buildings following earthquakes and assist decisions of whether buildings should be reoccupied.

Dr Emma Scotter, University of Auckland, to research the role of the blood-brain barrier in motor neuron disease by studying the pericyte cells that surround the blood vessels in the brain.

Dr Logan Walker, University of Otago, to study how next-generation genetic techniques can be best used to identify and treat those at high risk of inherited diseases, such as breast and ovarian cancer.

Dr Gwenda Willis, University of Auckland, to develop a strengths-based psychological treatment framework for preventing sexual violence reoffending.

See more at www.royalsociety.org.nz/rd15

Four James Cook Research Fellowships awarded

James Cook Research Fellowships support experienced researchers to pursue their research full-time for two years. In 2015 four fellowships were awarded:

Professor Marti Anderson FRSNZ, Massey University, to build and explore the use of novel multivariate statistical distributions for modelling ecological communities (biological sciences).

Professor Antony Braithwaite FRSNZ, University of Otago, to investigate ways to target the cancer-associated protein YB-1 as a novel cancer therapy (health sciences).

Distinguished Professor Geoff Chase FRSNZ, University of Canterbury, to explore if loss of elasticity in arterial vessels contributes to acute circulatory failure, common in critically ill patients (engineering sciences and technologies).

Professor Jennifer Hay FRSNZ, University of Canterbury, to study accent and social variability in New Zealand, contributing fundamental knowledge about mechanisms through which speakers from different backgrounds understand each other (social sciences).

Marsden Fund supporting 92 new research projects

A total of 92 research projects were allocated \$53.5 million (excl. GST) of funding in 2015's Marsden Fund grants, which support New Zealand's best investigator-initiated research in science, engineering, mathematics, social sciences and the humanities. From the 1,201 preliminary proposals received, 208 projects were invited to advance to the second round and submit a full proposal. The overall success rates were 7.7% for preliminary proposals and 44% for full proposals.

Gender and ethnicity data for the 2015 Marsden round showed that women and Māori investigators were well-represented in the final selections. Women were principal investigators on 44% of the funded projects (versus just over a third of preliminary proposals) and 5.3% were Māori (4.1% of preliminary proposals).

Funded projects will investigate topics including the thermodynamic properties of pyroclastic flows during volcanic eruptions; the role of zoos and wildlife sanctuaries in shaping current sustainability practices; geochemical links between Māori paru pits and heritage textiles; the evolution of an acute 'smell' sense in insects; and establishing electrically-conducting materials that can stretch, stick and self-heal.

See more at www.royalsociety.org.nz/marsden15

Evaluation of Marsden Fund shows scientific output increased

Independent researchers at Motu evaluated the Marsden Fund and found that Marsden funding significantly increases the scientific output of the funded researchers. Compared to similar groups that did not receive funding, a team that is given Marsden funding showed a 6–12% increase in their academic publications and a 13–30% increase in the papers that cite their work. The review didn't find a link between a project's future success and the rankings given to it by the second round and said there would be no diminishing returns if Marsden funding were increased to fund more proposals. It suggested that the resources devoted to the second round evaluation could be reduced without degrading the quality of decision-making but others have argued that the international review process benefits all researchers in the second round, not just those that go on to receive Marsden Fund grants.

See more at www.royalsociety.org.nz/marsden-evaluation

"The detection on 14 September 2015 of gravitational waves produced by the collision of two black holes 1.3 billion light years away was a truly momentous occasion.

It was made possible by increased detector sensitivity and the development of sophisticated statistical data analysis strategies. It's great that our group's data analysis methods were adopted by the LIGO collaboration."

Associate Professor Renate Meyer, University of Auckland, received grants from the Marsden Fund for this research, including one in 1998 when her research in this area commenced



Goal 4

4

Engage with the international research community

FRIENZ project wraps up

The three-year FRIENZ project (Facilitating Research and Innovation cooperation between Europe and New Zealand), funded through the European Commission, concluded in early 2016. This project has developed and strengthened strategic partnerships with Europe, supporting joint policy initiatives and enhancing research collaboration. During the life of this project 50 New Zealanders from both research institutions and industry travelled to 35 European cities, while New Zealand hosted 41 European senior researchers from 14 European Union countries. Overall 14 study tours were conducted in the areas of bio-economy, health, industrial technologies and resilient cities. This engagement has provided an implementation tool to underpin the Joint Agreement on Scientific and Technological Cooperation between the European Community and the Government of New Zealand.

Sharing research expertise with China

Under the New Zealand–China Scientist Exchange Programme 10 New Zealand scientists travel to China and 10 Chinese scientists visit New Zealand each year for scientifically-focussed visits. The Chinese researchers visited New Zealand in May 2015 and

New Zealand scientists travelled to Beijing in October, sharing expertise and research knowledge about water quality, non-communicable diseases and food safety.

Catalyst Fund launched

The Catalyst Fund for advancing global science partnerships for New Zealand was launched by the Ministry of Business, Innovation and Employment in late 2015. Catalyst, which replaces the International Relationships Fund, has been simplified and streamlined to better support high-quality international science collaborations for New Zealand. It has several streams: Catalyst: Influence; Catalyst: Leaders; Catalyst: Seeding and Catalyst: Strategic.

See more at www.royalsociety.org.nz/catalyst

“While the size of the Chinese science system is daunting, when you actually meet Chinese colleagues and spend time in their institutes you discover that many of the problems they are trying to solve are very similar to what we face. The secret is finding the synergies where together we can add value. You can only do that when you spend time with Chinese scientific teams. In addition to the scientific stimulation, the legendary Chinese hospitality makes it a thoroughly enjoyable country to develop new projects.”



Dr Brent Gilpin, ESR, who travelled to China on the New Zealand–China Scientist Exchange Programme to discuss the use of new methods to track harmful bacteria through the food chain and water supply

Ten-year anniversary of the Dumont d'Urville programme

The 10-year anniversary of the Dumont d'Urville programme was celebrated in November 2015. This scheme seeks to promote and support scientific and technological cooperation between New Zealand and French researchers and has so far funded over 50 projects with a focus on areas including agriculture, biotechnology, energy and biodiversity. To mark the anniversary 21 representatives of French research institutes travelled throughout New Zealand to visit universities and research institutes and to learn more about research excellence in New Zealand. The visits were followed by a two-day symposium in Wellington on bilateral research, organised by the Ministry of Business, Innovation and Employment.

Hosting US post-graduate research students

The East Asia and Pacific Summer Institutes (EAPSI) programme provides funding for up to 15 US students chosen by the US National Science Foundation each year to work in New Zealand research institutions on agreed projects for eight weeks over the US summer period. The Society supports the EAPSI programme in New Zealand and provides a three-day orientation for the students in Wellington, which in 2015 included a pōwhiri at Pipitea Marae and an introduction to Māori customs and culture. The topics of the students' projects in 2015 included tectonics, building seismic performance, climate and lake modelling, workplace resilience as well as a number of ecological studies.

Early-career researchers meet with Nobel laureates and the Emperor and Empress of Japan

Five early-career researchers attended the Japan Society for the Promotion of Sciences 7th HOPE Meeting in March 2015. HOPE Meetings are held annually for outstanding graduate students from selected countries in the Asia-Pacific region to form collegial networks and provide an opportunity for the students to learn from Nobel laureates about how to be successful in their careers. In 2015 some of the attendees were fortunate enough to meet the Emperor and Empress of Japan, who attended the festivities for the Nobel Prize Dialogue Tokyo, the first such dialogue to be held outside Sweden.



“All of the speakers expressed the importance of following interesting science, even if that means taking a bit of a risk on something other people don't think will work, or giving up a stable job to pursue, it's worth it. They also stressed the importance of having a broad knowledge base in many fields, but being an expert in something.”

Holly van der Salm on advice from Nobel laureates and other top scientists at the 2015 HOPE Meeting in Japan



“I enjoyed the welcome that you folks gave us in Wellington. I enjoyed learning about New Zealand history, culture and really enjoyed the parliament tour. I had looked into a lot of the natural history of New Zealand even before this grant because it is such a big hot spot for seabird research and restoration work, but I did not know much about the people and the history.”

EAPSI student Julia Rowe, University of Hawaii at Manoa, who came to New Zealand to study the input of nitrogen by seabirds to mountainous regions



“Understanding plankton is key to predicting climate change and a good way to gather it was to ask the global sailing community to help.”

Dr Xavier Pochon, Cawthron Institute, who has received Dumont d'Urville funding for the project 'Plankton Planet: a citizen-based monitoring programme of open ocean plankton'

Photo credit: RNZ/Tracy Neal

Goal 5

5

Create an enduring organisation with effective resource management

New Fellows elected to the Academy

In 2015 the Society elected 12 new Fellows and one new Honorary Fellow in fields as diverse as linguistics, statistics, medicine, sustainable agriculture, psychology, electrical engineering and ecology.

Professor Richard Beasley, Medical Research Institute of New Zealand, is an internationally-recognised academic whose translational research has had a major impact on clinical practice and public health, primarily in respiratory medicine. He identified the asthma drug fenoterol as the major cause of an epidemic of asthma deaths in New Zealand, allowing the epidemic to be brought to an end.

Professor Keith Cameron, Centre for Soil and Environmental Research, Lincoln University, is recognised internationally for his research to reduce the environmental impact of agriculture. His publications on nitrate leaching from soil and his development of on-farm technologies to measure and mitigate nitrogen losses have been utilised internationally.

Professor Grant Covic, Department of Electrical and Computer Engineering, University of Auckland, works principally in power electronics and electromagnetics and is a pioneer of inductive power transfer technology (IPT) now used globally to charge electronic devices wirelessly. Professor Covic is currently working on the electrification of roads for wirelessly charging electric vehicles.

Professor Alexei Drummond, Department of Computer Science, University of Auckland, specialises in probabilistic models at the intersection of computational biology, phylogenetics, population genetics, epidemiology and evolution. He is a world leader in Bayesian inference for phylogenetics and population genetics and is a leader in the development of the internationally-renowned open scientific software package BEAST and related statistical methodology.

Professor Edward Gane, New Zealand Liver Transplant Unit/University of Auckland, has led world-class clinical research in viral liver disease that underpins new curative drugs. He has improved awareness and testing for both hepatitis B and hepatitis C virus infections in New Zealand and has overseen 600 liver transplants with outcomes comparable to the largest units in Europe or the US.

Professor Jennifer Hay, Department of Linguistics, University of Canterbury, is one of the world's leading linguists with a diverse range of specialisations including phonology, morphology, sociolinguistics and psycholinguistics. She is founding Director of the New Zealand Institute of Language, Brain and Behaviour with over 30 faculty members across 11 disciplines.

Professor Thomas Lumley, Department of Statistics, University of Auckland, has made outstanding contributions both to statistical theory and to statistical practice. He has developed new statistical methodology, most notably network meta-analysis and case-crossover designs, and developed specialist software packages. He is a member of the international core development team of the R Project: a software environment for statistical computing and graphics.

Professor Keith Petrie, Department of Psychological Medicine, University of Auckland, has made significant contributions to health, medicine and psycho-immunology. His Illness Perception Questionnaire (IPQ) has advanced understanding of how people perceive and respond to illness, with implications for recovery. He is also a leader in the study of 'modern health worries' – the public perception of risks associated with technology, often creating a nocebo effect.

Professor Nicolas Smith, Faculty of Engineering, University of Auckland, is a world-leading researcher in computational biology, with a focus on models of heart function. His research is focussed on electrophysiology and muscle contraction at the cellular level and the translation of these models to simulate blood flow and cardiac function at the tissue level.

Professor Colleen Ward, Centre for Applied Cross-Cultural Research, Victoria University of Wellington, has made substantial contributions to the psychological study of immigration, acculturation and intercultural relations. Her research has been systematically and widely applied and she is recognised internationally for leadership in capacity building. She has worked on many government contracts for understanding and improving relationships amongst the many cultures that call New Zealand home.

Professor Jonathan Waters, Department of Zoology, University of Otago, is an evolutionary biologist working at the interface between previously distinct fields: genetics and geology; marine ecology and oceanography; and ancient DNA and archaeology. He is known for his ancient DNA research highlighting numerous extinction events in New Zealand's coastal prehistoric record and his marine biological research on Southern Hemisphere ecosystems and climate change.

Associate Professor Janet Wilmschurst, Landcare Research/University of Auckland, is at the leading edge of research in fields of pre-historic plant and animal ecology, climate change, fire disturbance, archaeology and restoration ecology. She uses a wide range of fossil types in her research, including pollen, seeds, charcoal, coprolites, bird bones, ancient DNA, dung fungi and amoebae. Her work on rats has provided insights into the timing and impacts of Polynesian settlement of New Zealand and the Pacific.

Professor Jeffrey Simpson, Department of Psychology, University of Minnesota (elected Honorary Fellow), is a leading social psychologist specialising in the scientific study of romantic relationships. He has maintained extensive contact with New Zealand academics for over 20 years and has been a major influence in the establishment of an internationally-recognised group of academics in New Zealand studying romantic relationships.



“One of the most important things that New Zealand permits immigrants to do is to keep their own culture as well as becoming

kiwis. This is a big key to success – immigrants who can do this have higher levels of life satisfaction and better social functioning. It’s generally agreed that having two cultures has benefits, but we’ve actually found a positive relationship between ethnic and national identities. So the more Samoan a person feels, the more of a New Zealander they feel too.”

Professor Colleen Ward FRSNZ, elected Fellow in 2015 for her research into multiculturalism



“Generally we are healthier than in the past, but much more concerned about our health. But in a way we’re victims of our

own success because there’s a paradox that the healthier we are, the more we worry about our health. And we tend to worry about ridiculously small dangers to our health while downplaying the risk from common risks.”

Professor Keith Petrie FRSNZ, elected Fellow in 2015 for his research into patients’ perceptions of illness and awarded the 2015 Mason Durie Medal



“Words are distributed differently across people. For example, the word ‘library’ is more likely to be used by a female New

Zealander than a male New Zealander. We find it easier to identify words if they are produced by the speakers that are most likely to say them, so we are quicker to understand the word ‘library’ in a female voice than a male voice.”

Professor Jennifer Hay FRSNZ, elected Fellow and awarded a James Cook Research Fellowship in 2015

Better knowledge sharing with branches

Representatives from the Society's 10 branches attended a meeting at the Society in August 2015. The branches are diverse, but their principal role is to provide opportunities for as many people as possible to benefit from new knowledge. In 2015 the Society improved how we share information among the branches about the events run by other branches and the nationally-organised programmes.

The 10 branches of the Royal Society of New Zealand are: Auckland Museum Institute; Waikato Branch; Rotorua Branch; Hawke's Bay Branch; Manawatu Branch; Wellington Branch; Nelson Science Society; Canterbury Branch; Otago Institute for the Arts and Sciences and Wanaka Branch.

Discussing how constituent organisations can contribute to expert advice

An open forum for constituent organisations was held at the Society on 18 November 2015. Representatives of 35 organisations, representing over 8,000 members, attended the meeting.

Following a plenary session led by Dr Liz Gordon, the organisational member's Council representative, the forum split into discipline-based groups led by the Vice Presidents. There was a high level of interest in the expert advice programme run by the Society and the role of constituent organisations in providing both ideas for topics and potential panel members. The latest organisational member is the New Zealand Political Studies Association/Te Kāhui Tātai Tōrangapū o Aotearoa.

Membership of the Royal Society of New Zealand

As at 31 December 2015

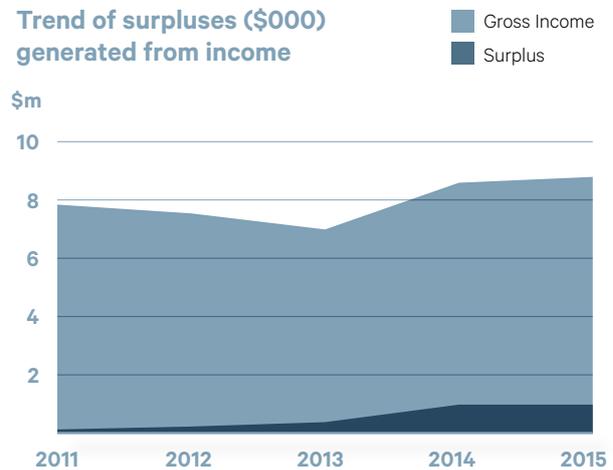
Fellows	402
Honorary Fellows	58
Companions	36
Members	1117
Branches	10
Constituent organisations	49
Affiliate organisations	10

Financial report

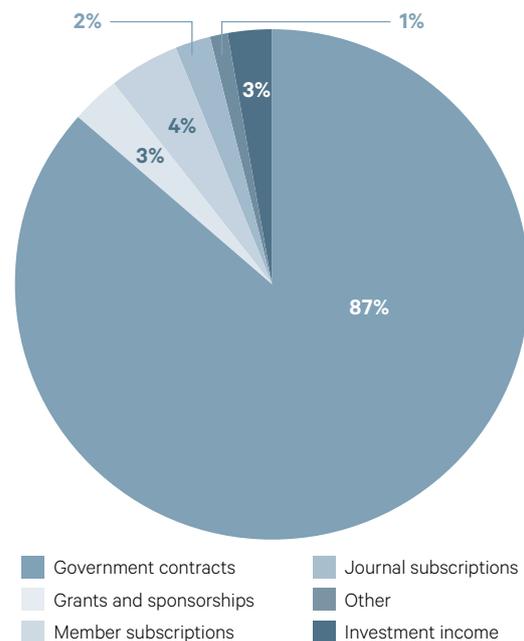
Good financial performance has seen the Society recover its equity position partially lost due to revaluations of the property. The Society is in a strong position, holding 80% equity of its assets.

The Society is dependent on income from business and contract work undertaken to support its activities. Gross income has stabilised at levels achieved prior to the development of the Turnbull Street site in 2012 and 2013. This income provides the means for the Society to meet its objectives of the advancement and promotion of science, technology and the humanities in New Zealand.

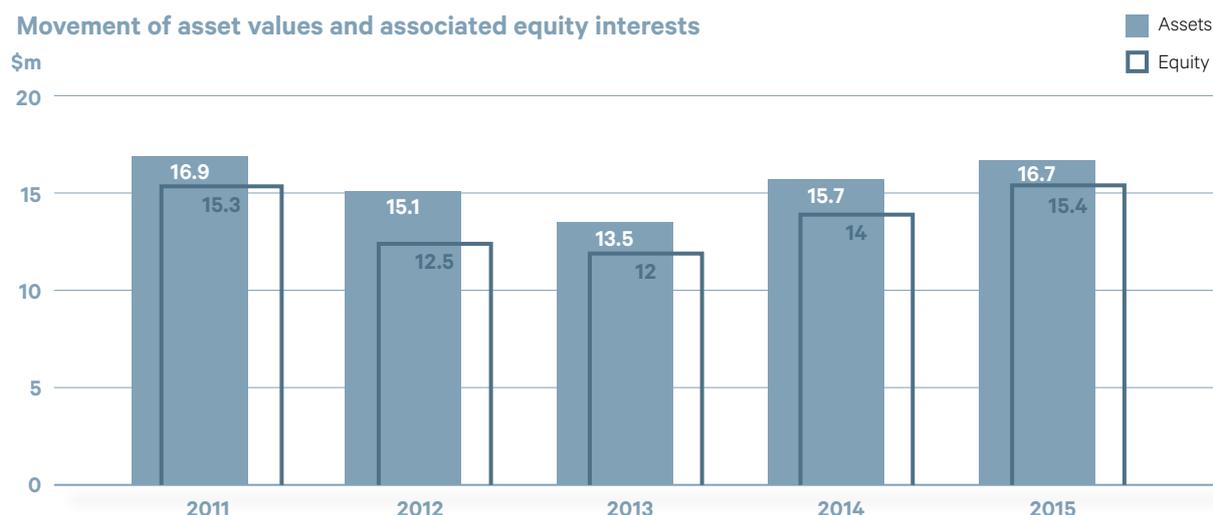
Trend of surpluses (\$'000) generated from income



Analysis of income sources 2015 year



Movement of asset values and associated equity interests



Summary financial statements

The summary financial statements presented here have been extracted from the consolidated audited financial statements of the Royal Society of New Zealand for the year ended 30 June 2015, approved for issue by Council on 6 October 2015. Review full statements online: www.royalsociety.org.nz/financial

Royal Society of New Zealand (Group) Statements of comprehensive income for the year ended 30 June 2015

	2015 \$000's	2014 \$000's
Revenue		
Society membership	291	310
Income from products and services	6,464	6,334
Sponsorship and donations	304	318
Rental of investment property	581	435
Total revenue	7,640	7,397
Interest income	232	162
Total income	7,872	7,559
Expenditure		
Audit expense	37	41
Depreciation expense	153	150
Employee benefits expense	3,337	3,539
Grants	60	16
Other expenses	3,239	2,582
Total expenses	6,826	6,328
Net surplus	1,046	1,231
Adjustments from revaluation of land and buildings	99	48
Total comprehensive income for the year	1,145	(1,279)

Royal Society of New Zealand (Group)
Balance sheet as at 30 June 2015

	2015 \$000's	2014 \$000's
Assets		
Current assets		
Cash and cash equivalents	2,443	747
Trade and other receivables	235	414
Investments and other financial assets	3,446	3,928
Prepayments	42	57
Inventories	17	8
Total current assets	6,184	5,154
Non-current assets		
Property, plant and equipment	10,529	10,546
Total assets	16,713	15,700
Liabilities		
Current liabilities		
Trade and other payables	862	940
Income in advance	500	552
Total liabilities	1,362	1,491
Net assets	15,350	14,208
Equity		
Retained earnings	14,160	13,024
Designated purpose reserve	1,190	1,184
Total equity	15,350	14,208

The financial statements have been prepared in accordance with Generally Accepted Accounting Practice (NZ GAAP) in New Zealand. They comply with the New Zealand equivalents to International Financial Reporting Standards (NZ IFRS) and other applicable Financial Reporting Standards, as appropriate for public benefit entities that qualify and apply differential reporting concessions.

They are prepared subject to the provisions of the Royal Society of New Zealand Act 1997.

Basis of preparation

The principal accounting policies adopted in the preparation of the financial statements are set out below. These policies have been consistently applied to all the periods presented, unless otherwise stated.

Statutory base

The Society was established under the Royal Society of New Zealand Act 1997. The financial statements have been prepared in accordance with NZ GAAP as defined in the Financial Reporting Act 2013.

Differential reporting

The Society and the Group are qualifying entities within the Framework of Differential Reporting. The Society and the Group qualify on the basis

that they are not issuers and are not large (have less than 50 employees and total income below \$20 million). The Society and the Group have taken advantage of all differential reporting concessions available to them except for NZIAS 18 revenue paragraph NZ6.1 with which they have complied with fully.

Historical cost convention

These financial statements have been prepared under the historical cost convention, as modified by the revaluation of certain assets as identified in specific accounting policies.





Royal Society of New Zealand, 11 Turnbull Street, Thorndon
PO Box 598, Wellington 6140, New Zealand
Telephone: +64 4 472 7421
www.royalsociety.org.nz

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Cover image: A selection of New Zealand's biodiversity
Back cover and inside back cover images: Vials of New Zealand
amphipod species from Dr Th. Mortensen's Pacific Expedition 1914–1916

To learn more about these species and for photo credits
visit www.royalsociety.org.nz/annualreview2015