

# Profiling Excellence

Highlights of 2014

As the Royal Society of New Zealand, our purpose is to advance and promote science, technology and the humanities in New Zealand.

Three years ago we set a strategic plan with five goals:

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## Goal 4 Engage with the international research community

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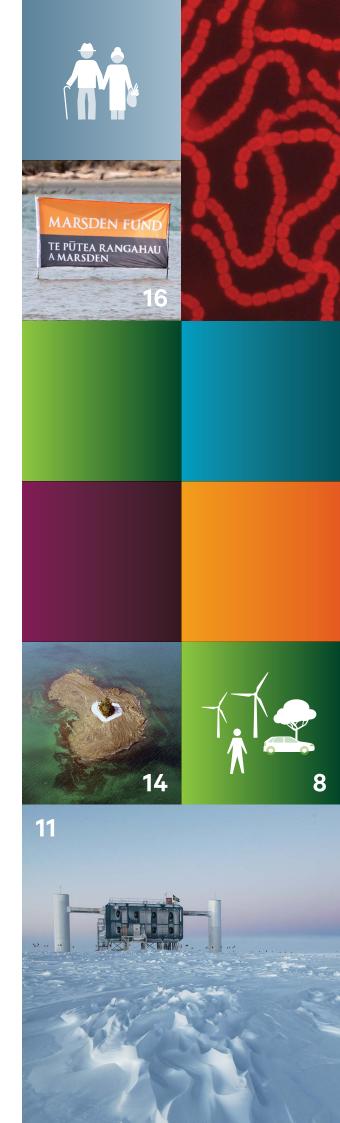
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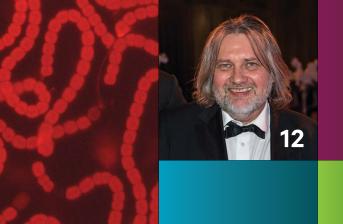
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Images from top right: The first photo of the Marsden Fund flag taken 'on location' during a research trip to Antarctica, near the summit of Mt Erebus, with (from left) Chelsea Vickers, Professor Craig Cary, Dr Craig Herbold and Jason Watson; Francoise Padellec's image of a man with an umbrella won the migration category of the Our Futures: Te Pae Tawhiti photo competition.

The remaining photos on this page feature throughout the document.





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The following were members of the Royal Society of New Zealand Council during 2014.

Professor Sir David Skegg KNZM OBE FRSNZ, President

Distinguished Professor Gaven Martin FRSNZ, Vice President - Physical Sciences, Mathematical Sciences, Technology and Engineering (from 1 July 2014)

Professor Geoff Austin FRSNZ, Vice President - Physical Sciences, Mathematical Sciences, Technology and Engineering (until 30 June 2014)

Dr John Caradus FRSNZ, Vice President

- Biological and Life Sciences

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

Professor Richard Bedford QSO FRSNZ, Councillor

CRSNZ, Councillor

Representative (from 1 July 2014)

Constituent Organisation Representative

John Lancashire QSM, Constituent Organisation Representative (until 30 June 2014)

Dr David McNamara, Co-opted Councillor

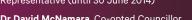
Professor Caroline Saunders ONZM, Councillor

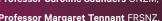
Professor Margaret Tennant FRSNZ, Co-opted Councillor











Professor Linda Tuhiwai Smith CNZM. Co-opted Councillor











#### From the President

As the Royal Society of New Zealand approaches its 150th anniversary in 2017, our Fellows, Members and staff have been involved in a prodigious range of activities. I hope this annual report will provide an overview of events and achievements during 2014.

We have continued to develop the role of providing independent advice to the Government and the community. Expert panels chaired by Fellows produced reports on topics such as our changing population, pest management, the path to a green economy, fluoridation of water, science investment, and genetically modified organisms.

Nearly all developed countries have national academies, but many of those are confined to the traditional sciences. The Royal Society is New Zealand's national academy for science, technology and the humanities. It is also unique in having not only Fellows and Members, but also constituent organisations and regional branches. These differences were highlighted for me in August, when I participated in a meeting organised by the Royal Society of Edinburgh on the future of national academies and their roles.

Later in August we were honoured to host the triennial general assembly of the International Council for Science (ICSU). Founded in 1931, ICSU brings together national scientific bodies and international scientific unions. Of the previous 30 general assemblies, only three have been held in the southern hemisphere (and none in the South Pacific). In what became a World Science Week, several other major international conferences were held in conjunction with the ICSU meeting. We are grateful to Richard Meylan and other staff for ensuring that the ICSU assembly was such a conspicuous success.

In the middle of the year, Dr Di McCarthy retired from her position as Chief Executive, after seven highly successful years in that role. Dr McCarthy raised the profile of this organisation, strengthened its financial position, and promoted several new initiatives such as the establishment of the Rutherford Foundation Trust. Her support of young scientists underpinned new developments which are outlined in this report, and she oversaw the building of our award-winning national headquarters in Wellington. All of us are indebted to Di for her many achievements.

Dr McCarthy's successor, Dr Andrew Cleland, was selected from a strong field of applicants. He is an experienced Chief Executive, having led IPENZ (the Institution of Professional Engineers) since 2000. Dr Cleland is himself a Fellow of the Royal Society of New Zealand, elected to the Academy when he was a professor at Massey University. The Council is grateful to Phillippa Gardiner for her work as Acting Chief Executive until Dr Cleland took up his position in September.

I wish to thank my colleagues on the Council, the staff in Wellington, and all of our many supporters and collaborators, for making 2014 such a productive year.

Professor Sir David Skegg

KNZM OBE FRSNZ President

Navid Skess



#### From the Chief Executive

Having joined the Society as Chief Executive in early September, I acknowledge that much of what is reported in this document for the 2014 calendar year is a credit to the previous Chief Executive, Dr Di McCarthy, who served in the role until June 2014, but also to the Acting Chief Executive Phillippa Gardiner.

Over a period of time, the Society has developed a high level of expertise in managing the processes involved in evaluating competitive bids for various types of research funding, and also in selecting the most suitable applicants for roles, recognition, or to participate in development programmes. Undertaking such activities, as well as the more traditional roles of the Society, has enabled the organisation to build a level of scale into its operations, and has allowed the Society to slowly lift its financial resources. That in turn has meant the Society has been able to develop its staff capability and also improve its own accommodation in Thorndon, Wellington. The site is now an attractive location for a variety of groups to come together for meetings, seminars and conferences. That has had beneficial flow-on benefits - a much more diverse group of people have learned about the Society through being on our site, but also significant streams of income from hireage. That income stream gives a return on the considerable invested capital. The culmination of these factors is that the Society has performed well financially in its most recent financial year to 30 June 2014, and has an adequate level of reserves.

It is now 20 years since the creation of the Marsden Fund, a fund managed by the Society since its inception. There was, yet again, a higher number of preliminary proposals received than the previous year, but the anniversary also gave an opportunity to reflect on the growth of the fund and its impact over the 20 years. The nature of the research funded is to have a long gestation time before it can be applied and outcomes can be difficult to measure, but there is now an established track record for the fund of building

world-class research excellence with useful benefits flowing to New Zealand. Early-career Marsden Fund success often provides a real stimulus to a person's research career. Other funds the Society manages, such as the Rutherford Discovery Fellowships and James Cook Research Fellowships, offer further opportunities.

Being at the heart of such programmes is an important role for the Society, but one we could not perform without the willing participation of many volunteers in a variety of ways – undertaking peer reviews, sitting on adjudication committees, sitting on expert panels and so on. On behalf of the Society, I wish to acknowledge the contribution of volunteers, many of whom are not Fellows or Members, but who share a belief that working as a volunteer for the Society is indeed a worthy activity to the wider benefit. Then there are the various organisations and people who provide financial support and sponsorship – I thank them also.

I look forward to my first full year in the role. As a Fellow myself I have strong belief and pride in what the Society has delivered through its first 147 years, and am grateful for the opportunity to contribute further in the future.

Dr Andrew Cleland

Andrew Clifand

FRSNZ

Chief Executive

#### Goal 1

# Meet New Zealand's need for information on challenging issues

# Our Futures: the changing face of New Zealand

During 2014 the Society published and ran numerous public discussions for the paper Our Futures: Te Pae Tawhiti, a major review of the rapidly changing New Zealand population. The paper brought together data and analysis from the 2013 census and other sources, together with input from a wide range of researchers to understand the changing nature of New Zealand society and the implications of this for the economy, social cohesion, education, and health. The paper covered seven key themes: diversity, population change, tangata whenua, migration, households and families, regional variation and work. A public photo competition was run to capture images that reflected New Zealand's changing society and infographics were created to make the findings as accessible as possible.

Professor Gary Hawke FRSNZ, chair of the panel, said the review was unique in that it was multi-disciplinary and focused on the big picture. "We wanted to highlight what an evolving New Zealand society might look like, what is underlying these changes, and the challenges and opportunities these present."

Professor Hawke said that the review did not result in sweeping predictions for the future, but offered comment on trends and implications based on what we know today and the pressures for change.

The key findings for each theme are outlined on the facing page.

Images from top: The Our Futures: Te Pae Tawhiti report cover features Barefoot Childhood by Mariam El Beshlawi, a highly commended entry in the associated photo competition; Our Futures: Te Pae Tawhiti authors panel at the launch of the report (from left): Professor Erik Olssen FRSNZ, Professor Richard Bedford FRSNZ, Professor Paul Spoonley FRSNZ, Dr Tahu Kukutai, Professor Gary Hawke FRSNZ (Chair) and Dr Malcom McKinnon.





## **Diversity**

New Zealand has always had minority communities – both ethnic and religious – but in the last 20 years, the country has become diverse in new ways: increasing migration from Asia and an increasing proportion of the population born overseas.

The implication for New Zealand is that it is, increasingly, a country with multiple cultural identities and values.



1 in 4

New Zealand residents in 2013 was born overseas (1 in 5 in 2001)

## Population change

People are living and staying active longer, and the proportion of the population in the older age groups will increase.

The implications for New Zealand are that people will need income for longer, and keeping the birth rate above replacement level will be a challenge.

# Tangata whenua

Māori have a distinctive but rapidly changing population structure with significant assets, as well as a growing labour force.

Māori culture and institutions continue to endure and evolve along with demographic change, but the maintenance of te reo Māori faces challenges.



21.8%

of Māori could converse daily in **te reo Māori** in 2013 (24.4% in 2006)

## Households and families

Household patterns have changed little in the 21st century.

There has been a rise in two-family households, and many children live in households which have limited income and assets.



#### Work

Employment is shifting in terms of location and the rise and fall of occupations and industries. This has been accompanied by changes in labour supply, resulting in part from the ageing of the population, the contraction in entry-level cohorts and the reliance on immigrant labour.

The implications for New Zealand are that the growing diversity of the nature of paid employment will continue, so that there will be less security and participation will be more precarious.

## Regional variation

New Zealand is regionally diverse and interconnected, with Auckland accounting for over half the population growth between 2006 and 2013. Internal migration has decelerated between regions.

The implication for New Zealand is a pattern of greater relative growth for Auckland, a few centres with slower growth, and population decline in much



of rural New Zealand, with challenges for maintaining service levels for an ageing and possibly dwindling population.

of the total population is living in Auckland

## Migration

New Zealand's population is the product of two long-established migration flows: immigration and circulation of citizens of other countries, and emigration and circulation of New Zealanders.

The implications for New Zealand could include immigration surges from the diaspora, such as the 650,000 New Zealanders who live in Australia, and from the 23 million Australians who have right of access to the New Zealand labour market and welfare.

The contribution migration makes to population growth is likely to increase, relative to that from natural increase, from the mid 2030s as the gap between births and deaths continues to shrink with rising numbers of deaths and falling birth rates.

The authors of the review were Professor Gary Hawke FRSNZ (Chair), Professor Richard Bedford FRSNZ, Dr Tahu Kukutai, Dr Malcom McKinnon, Professor Erik Olssen FRSNZ and Professor Paul Spoonley FRSNZ.

See more: www.royalsociety.org.nz/our-futures

Images: Infographics from report Our Futures: Te Pae Tawhiti.

# Challenging issues



## Pest management in New Zealand

How New Zealand can best manage pests, which threaten our economy and environment, was the topic of an Emerging Issues paper launched in March 2014. It highlighted that New Zealand remains under intense pressure from pests, despite large investments in biosecurity and pest management systems.

The report points to research that weeds are conservatively estimated to cost the economy \$1.2 billion per annum in lost animal production and control costs and could potentially degrade seven per cent of the conservation estate within a decade, corresponding to a loss of native biodiversity equivalent to \$1.3 billion.

It identified the need for improved tools and technologies, such as fertility suppression and biological control, to counter increasing pest resistance and the loss of older, now less acceptable pest management tools. The report also emphasised the need for more species-focused biological research, including population processes of individual pest species, so that new approaches can be developed and appropriately targeted.

Research into monitoring and surveillance technologies was found to be critical, because early detection of pests is essential to successful eradication.

The authors of this paper were Dr Matt McGlone FRSNZ (Chair), Dr Graeme Bourdôt, Dr Andrea Byrom, Professor Mick Clout FRSNZ, Dr Stephen Goldson FRSNZ, Dr Wendy Nelson FRSNZ, Dr Alison Popay, Dr Max Suckling FRSNZ and Dr Matt Templeton.

See more: www.royalsociety.org.nz/pestmanagement

#### Green economy for New Zealand

Emerging Issues paper Facing the Future: Towards a Green Economy for New Zealand, released in March 2014, highlighted research on the resource and consumption challenges facing New Zealand and the rest of the world, and the opportunities for dealing with them. It concluded that New Zealand can have a number of economic, social and environmental gains by accelerating its move to a green economy (defined by the United Nations Environment Programme as being resource efficient, low carbon and socially inclusive).

The paper said New Zealand is well positioned to become a green economy with its many natural advantages, such as extensive renewable energy sources, and has many opportunities for growing low-carbon technologies and services and these should be incentivised.

It reported that resilient and sustainable solutions are more likely to be generated by collaborative processes that incorporate government, communities, businesses and individuals.

The authors of this paper were Emeritus Professor Gerry Carrington FRSNZ (Chair), Professor Geoff Austin FRSNZ, Dr Sea Rotmann, Professor Ralph Sims CRSNZ, Dr Janet Stephenson, Professor John Boys FRSNZ, Professor Les Oxley FRSNZ, and Distinguished Professor Dame Anne Salmond FRSNZ.

See more: www.royalsociety.org.nz/greeneconomy





#### Water fluoridation review

In August 2014 a review of the scientific evidence for and against the efficacy and safety of fluoridation of public water supplies was released jointly by the Society and the Office of the Prime Minister's Chief Science Advisor. It found that the levels of fluoridation used in New Zealand create no health risks and provide protection against tooth decay. The review, Health Effects of Water Fluoridation: a Review of the Scientific Evidence, was convened by Professor Sir Peter Gluckman FRS FRSNZ, Chief Science Advisor, and Professor Sir David Skegg FRSNZ, President of the Royal Society of New Zealand, at the request of Auckland Council on behalf of several councils.

The process for the review included an extensive evaluation of the scientific literature by a panel of five experts, as well as one lay observer with local body experience. The resulting report was reviewed by three international experts and a further New Zealand scientist.

The panel paid particularly close attention to the claims that fluoride contributes to the risks of cancer, musculoskeletal and hormonal disorders, as well as to claims that it has adverse effects on brain development – these being the major contentions about potential harms that have been made.

The panel concluded that the concerns raised by those opposed to fluoridation are not supported by the scientific evidence.

The panel members were Dr Charles Eason, Professor Mark Elwood, Professor Gregory Seymour FRSNZ, Professor Murray Thomson, Associate Professor Nick Wilson, Kerry Prendergast and Dr Anne Bardsley (literature reviewer/writer). The reviewers were Dr Wayne Temple, Professor David Coggon, Professor Mark Ferguson and Professor Eric Reynolds.

See more: www.royalsociety.org.nz/fluoridation

# 2014 Speaker's Science Forum

The Speaker's Science Forum continued in 2014 with six presentations made to Members of Parliament and decision-makers. The topics of the series in 2014 were:

**Advanced manufacturing:** 3D printing and nanotechnologies.

**Antarctica:** the international research New Zealand is undertaking and its research on the Southern Ocean.

**Dealing with risk:** an overview of global practices, benefits and safety concerns, using genetically modified organisms as an example.

**Health and wellbeing:** nutrition for wellbeing and factors affecting childhood obesity.

**Sustainable land use:** reducing the impacts of future land-use intensification and the management of New Zealand's soils.

**Science and innovation:** regarding the uniqueness of the New Zealand economy, with a consideration of intellectual property, open innovation and globalisation.

# Science investment statement feedback

In August 2014 the Society provided feedback on the Ministry of Business, Innovation and Employment's *Draft National Statement of Science Investment 2014–2024.* The feedback was prepared by a panel which had been formed by the Society to review the New Zealand research system. Key points of the feedback included the need to emphasise the importance of science excellence, and the use of high quality independent review processes.

The submission highlighted that the current levels of untargeted, curiosity-driven (investigator-led) science were inadequate for sustaining an innovation-led economy, and that better mechanisms were needed to ensure that the findings of curiosity-driven science are translated to economic, social, health and environmental outcomes.

Other issues raised included the need for better mechanisms for career development in the science system and that more evidence-based decision making was needed around science investment.

The panel members were Professor Peter Hunter FRSNZ (Chair), Distinguished Professor Marston Conder FRSNZ, Professor Harlene Hayne FRSNZ, Professor Shaun Hendy FRSNZ, Professor Warren McNabb, Dr William Rolleston, Professor Linda Tuhiwai Smith, Professor Warren Tate FRSNZ, Professor Margaret Tennant FRSNZ and Professor Christine Winterbourn FRSNZ.

See more: www.royalsociety.org.nz/nssi







# Risks of outdoor genetically modified organism use

In February 2014 two experts were invited by the Council of the Royal Society of New Zealand to review the scientific conclusions underpinning a planned change to the district/unitary plan Managing Risks Associated with Outdoor Use of Genetically Modified Organisms for Auckland Council, Far North District Council, Kaipara District Council and Whangarei District Council.

Professor Barry Scott FRSNZ and Professor Clive Ronson FRSNZ reviewed the scientific and technical assertions in the report on behalf of the Royal Society of New Zealand.

See more: www.royalsociety.org.nz/gmo

# World science in New Zealand

In August 2014 the Royal Society of New Zealand hosted the 31st General Assembly of the International Council for Science (ICSU) in Auckland, the third time this event has been held in the southern hemisphere and the first time in the South Pacific. The Society is New Zealand's ICSU National Scientific Member.

The ICSU General Assembly takes place every three years for representatives of the scientific community to make key decisions to define the direction of international science for the coming years. Topics discussed at the meeting included the new Future Earth research initiative to develop the knowledge for responding effectively to the risks and opportunities of global environmental change, endorsement of the principle of open access to the scientific record, and how to best support early career scientists.

A number of international science meetings were timed to take place in New Zealand adjacent to the ICSU meeting, including:

The 6th biennial Open Science Conference of the Scientific Committee on Antarctic Research (SCAR). With almost 1,000 attendees in Auckland, the SCAR conference is the largest international gathering of Antarctic scientists.

The annual general meeting of the Council of Managers of National Antarctic Programs (COMNAP).

The 4th biennial United States-New Zealand Joint Committee Meeting on Science and Technology Cooperation (JCM), a joint dialogue on areas such as natural hazards and resilience, climate change and oceans.

The Science and Diplomacy Symposium, focusing on how scientists can have input into foreign affairs.

Inaugural Science Advice to Governments conference, on the practice of providing policy-relevant science advice to governments.

The 2nd APEC Chief Science Advisors and equivalents meeting, a forum for informal discussion on the science and policy interface amongst science advisors to the highest levels of government within APEC economies.

In order to bring public attention to this series of events, leading visiting scientists were invited to give public talks and panel discussions in Auckland under the umbrella of World Science Week New Zealand. These talks included:

**Wizards on Ice:** How researchers overcome the immense logistical challenges of operating in Antarctica's harsh environment.

From the Big Bang to Tomorrow: IceCube and other observatories in Antarctica have revealed echoes of the Big Bang and provide clues about the future of our planet.

Melting Ice, Rising Sea: The impact melting ice caps can have on sea level rise, including for New Zealand's coastline.

Future Food for the Planet: The soil literally feeds the world, but is itself being depleted. Food security is essential at a time of climatic change.

Pandemics and Climate Change: How climate change may impact the incidence and severity of pandemics in the future.



Image: Royal Society of New Zealand President Professor Sir David Skegg FRSNZ with Prime Minister John Key and outgoing ICSU President and Nobel Prize laureate Professor Yuan-Tseh Lee at the ICSU General Assembly opening function.



Image: The IceCube neutrino detector in Antarctica is one of a number of observatories on the frozen continent revealing echoes of the Big Bang and providing information for predicting the future. Credit: S. Lindstrom; US National Science Foundation.

# Communicating science

The Science Media Centre (SMC) hosted its global network during World Science Week New Zealand. Directors, board members and staff from the UK SMC, Australian SMC, SMC-Japan and prospective science media centres in the US and China discussed common issues at a summit in Auckland.

As part of this gathering, the SMC participated in the inaugural Science Advice to Governments conference, and jointly hosted an event for Chief Science Advisors from the UK, EU, Australia, Japan, India, Malaysia and other countries where SMCs have been proposed to encourage further cooperation and support for SMCs.

Founding director of the UK's SMC, Fiona Fox OBE, joined New Zealand SMC Manager Peter Griffin in a public session on handling media frenzies around disasters or perceived impending disasters – from nuclear meltdowns and earthquakes to GM, vaccinations and the use of animals in research. This event was supported by the Public Relations Institute of New Zealand and the Science Communicators Association of New Zealand (SCANZ).

# Thought-provoking speakers

Through the Society's public programmes, New Zealanders had the opportunity to hear from many internationally acclaimed researchers, writers and artists in 2014. These included:

What a Wonderful World: Marcus Chown spoke on his book in which he "attempts to explain the big stuff" from finance to thermodynamics, human origins to special relativity and more. **Paradox:** Professor Jim Al-Khalili OBE shared his favourite science enigmas from Schrödinger's famous cat in the box that is dead and alive at the same time to Olbers' paradox about why the sky gets dark at night.

At Six – Mathematics and Music: Professor James Sneyd FRSNZ explored the patterns found in mathematics and music.

**Astronomy and Poetry:** Professor Dame Jocelyn Bell Burnell DBE FRS spoke on poets who have responded to astronomy and space science and astronomers who have written poetry about the night sky.

Where Science Ends and Art Begins: Professor Robert Lord Winston explored the cross-over of science into art and vice versa.

**Catching the Wind:** Professor Atholl Anderson FRSNZ gave the 2014 New Zealand Aronui Lecture on the first great phase of oceanic colonisation.

At Six – Re-integrating Art, Design and Science for a Future World: Associate Professor Natalie Jeremijenko, Professor Frances Whitehead and David Buckland reflected on what new future might be created if artists, scientists, designers and engineers collaborated on urgent issues.

**Experiments across Worlds:** 2013 Rutherford Medallist Distinguished Professor Dame Anne Salmond FRSNZ gave a series of lectures that explored new ways of thinking in key areas of national life, drawing ideas from cross-cultural exchanges.

The Art of Mathematics: Professor Marcus du Sautoy OBE FRS spoke on the hidden mathematical ideas that underpin the creative output of well-known artists and revealed that the work of mathematicians is also often driven by strong aesthetic values.

Many of these talks are available online: www.royalsociety.org.nz/viewing-room

#### Goal 2

# Raise awareness of New Zealand research and scholarship

# Celebrating excellence

#### Research honours

The Society presented 12 medals at its 2014 Research Honours Dinner in Wellington in November.

Distinguished Professor Peter Schwerdtfeger FRSNZ was awarded the Rutherford Medal, the Society's highest honour, for his world-leading contributions to fundamental aspects of chemical and physical phenomena in atoms, molecules and condensed matter, providing deep insights into how atoms and molecules interact at the quantum level.

One recent example of his work was solving the long-standing problem of why mercury is the only metallic element liquid at room temperature. Through calculations and computational simulations, he showed that this is due to Einstein's special relativity. Without this effect, the melting point of mercury would be around  $80^{\circ}$ C, not  $-39^{\circ}$ C as observed.

Distinguished Professor Schwerdtfeger is Director of the Centre for Theoretical Chemistry and Physics (CTCP) at the New Zealand Institute for Advanced Study at Massey University, Albany. His approach is interdisciplinary, ranging from theoretical chemistry and physics to computer science and mathematics.

Distinguished Professor Schwerdtfeger said he was overwhelmed and deeply honoured to be receiving the Rutherford Medal, even more so as it is named after physicist Sir Ernest Rutherford. "I have always admired Rutherford's work. For me he is a true giant of science."

#### Other medallists

**Dr Rob Murdoch**, General Manager of Research at the National Institute of Water and Atmospheric Research (NIWA), won the **Thomson Medal** awarded for science and technology leadership and organisation. The medal recognises his contribution to the development of environmental science in New Zealand.

The Callaghan Medal for science communication was awarded to University of Otago geneticist Associate Professor Peter Dearden for the outreach activities of Genetics Otago that he helped form and his involvement



Images from left: Distinguished Professor Peter Schwerdtfeger FRSNZ received the 2014 Rutherford Medal; 2014 Research Honours medal winners (from left): Professor Alistair Gunn FRSNZ, Professor Simon Malpas, Professor Alison Jones, Distinguished Professor Brian Boyd FRSNZ, Distinguished Professor Marston Conder FRSNZ; Emeritus Professor Richard Bedford FRSNZ presents Pou Aronui Award to Professor Lydia Wevers.

in communicating his genetics research on honey bees with the beekeeping industry and the public.

The MacDiarmid Medal for research with potential for human benefit was awarded to medical scientist Professor Alistair Gunn FRSNZ, University of Auckland, for research into using brain cooling to prevent brain injury in babies who experience low oxygen at birth. This treatment is now the standard of care around the world and can prevent disability in all but the most affected newborns.

The **Pickering Medal** for application of technology was awarded to **Professor Simon Malpas**, Professor of Physiology at the University of Auckland and head of research for Millar Inc, who has developed and commercialised implantable wireless sensors that can monitor physiological processes such as heart activity or lung function in the body.

Archaeologist **Professor Charles Higham** FRSNZ from the University of Otago was awarded the social science **Mason Durie Medal** for his work to understand social change in Southeast Asia over three millennia. His work has identified a series of social changes that ultimately led to the rise of the Angkor state in modern-day Thailand.

Distinguished Professor Brian Boyd FRSNZ from the University of Auckland was presented with the Humanities Aronui Medal for his wide-ranging contributions to the humanities. Recognised as the leading world scholar on novelist Vladimir Nabokov, Distinguished Professor Boyd has written on a wide range of literature from Homer to Shakespeare and more recently has been exploring whether our minds and behaviour can be reshaped by art and literature.

Professor Lydia Wevers, Director of the Stout Research Centre at Victoria University of Wellington, was awarded the Pou Aronui Award for her dedication to promoting New Zealand studies, literature and art. A literary critic, historian, editor and reviewer, Professor Wevers has researched New Zealand's writing and print culture, edited and collated many collections of Australasian literature, has served on numerous arts bodies and has played key roles in academic administration of the humanities in New Zealand.

Emeritus Professor David Vere-Jones FRSNZ from Victoria University of Wellington was awarded the Jones Medal to recognise his lifetime achievement in statistics, both for his novel work on forecasting earthquakes and earthquake risk and for his contribution to the teaching of statistics and mathematics in New Zealand.

**Distinguished Professor Marston Conder** FRSNZ from the University of Auckland was awarded the **Hector Medal** for his outstanding contribution to mathematics. His main interest is in group theory and its applications, especially to the study of symmetry.

He is considered a world authority on discrete objects with maximum possible symmetry in their class.

Professor Alison Jones was awarded the Dame Joan Metge Medal for the significant impact she has made on New Zealand educational research and practice, particularly on Māori–Pākehā educational relationships and women's education at tertiary level. In addition to her research, she has mentored many early career researchers and teaches academic writing.

The Sir Charles Hercus Medal for excellence in biomedical and health sciences was awarded to Professor Parry Guilford of the University of Otago for his work that established the gene mutation that can lead to hereditary stomach cancer in families. Since the discovery of the gene, approximately 350 families have been diagnosed worldwide, leading to dramatic improvements in clinical management and cancer prevention.

## 2014 James Cook Research Fellowships

James Cook Research Fellowships support qualified and experienced researchers to pursue their research programme full-time for two years. Three fellowships were announced in 2014:

Biological Sciences: Professor Philip Lester, Victoria University of Wellington, for research entitled 'Bringing back honey bees using beneficial bacteria'. The goal of this research is to make bees resistant to deformed wing virus and the Varroa mite.

Physical Sciences: Professor Geoff Whittle FRSNZ, Victoria University of Wellington, for research entitled 'Rota's Conjecture'. Professor Whittle will write up the proof of Rota's Conjecture on matroid theory that he and two colleagues solved after 15 years of work.

Social Sciences: Professor Peter Davis, University of Auckland, for research entitled 'New Zealand as a "social laboratory". The project aims to extend and adapt a working model of the early childhood years by linking this to census data so that a dynamic representation of New Zealand society can be created to carry out virtual experiments on matters of policy and substantive interest.





# Promoting research

# Journal special issues

The Society publishes eight peer-reviewed journals, in partnership with international publisher Taylor & Francis. In addition to the regular editions, in 2014 a number of special, themed journal issues were published.

In March, the New Zealand Journal of Botany published an issue devoted to algal and cyanobacterial bioenergy and diversity, guest edited by Professor Julian Eaton-Rye (University of Otago), Dr Mike Packer (Cawthron Institute), Dr Tina Summerfield (University of Otago) and Dr Susie Wood (Cawthron Institute). Eleven papers, representing 38 authors from New Zealand and abroad, were published.

In June, the New Zealand Journal of Geology and Geophysics published an issue entitled 'Oligocene paleogeography of New Zealand: maximum marine transgression', guest edited by Dr Kari Bassett (University of Canterbury), Associate Professor Daphne Lee (University of Otago), Dr Dallas Mildenhall (GNS), Emeritus Professor Cam Nelson FRSNZ (University of Waikato) and Dr Catherine Reid (University of Canterbury). This publication offered

a contribution to the ongoing debate as to whether the entire continent of Zealandia was below sea level sometime during the Oligocene and/or earliest Miocene.

A special themed issue on 'Aquaculture Research in New Zealand', guest edited by Professor Andrea Alfaro (Auckland University of Technology), Professor Andrew Jeffs (University of Auckland) and Dr Nick King (Cawthron Institute), was published in September in the New Zealand Journal of Marine and Freshwater Research. This issue included 12 papers highlighting the wide scope of current research for new and existing aquaculture species, and some key biotechnical advances currently under way in New Zealand.

A special, themed issue of *Kōtuitui: New Zealand Journal of Social Sciences Online* was published in September, guest edited by Dr Jay Marlowe (University of Auckland) and Sue Elliott (Unitec Institute of Technology). This special issue was on the theme of refugee resettlement and seeking asylum in New Zealand. It included six papers cowritten by academics or practitioners, and those with first-hand experience of forced migration to New Zealand.



Image: Beehive Island (Taungamaro Island), Hauraki Gulf, icon for the Oligocene drowning controversy. An intertidal platform of bedded Waipapa Terrane greywacke is capped by a white shell beach. The island is frequented by seabirds and supports a mix of native and introduced species including pohutukawa, pines and agaves. Credit: Lloyd Homer, GNS Science.

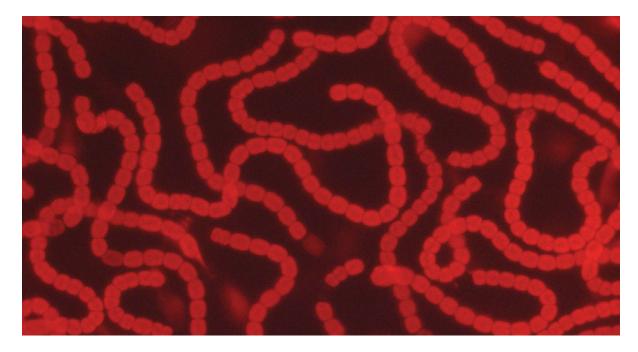


Image: Autofluorescence from Nostoc cells isolated from Takahe Valley, Fiordland, New Zealand. Credit: Jocelyn PS Chua, Department of Botany, University of Otago.

## Scimex: Science Media Exchange

In 2014 the New Zealand Science Media Centre (SMC) together with the Australian SMC designed a breaking-news website for science-related content, which will allow journalists to better plan their coverage and scientists and their institutions to forge deeper relationships with the media. Called Scimex, it launched for beta testing in December 2014.

Peter Griffin, Manager of the New Zealand SMC, said it will provide multiple benefits.

"Journalists will have access to embargoed journal papers and media releases from some of the world's top science journals. Media officers will be able to upload research-related press releases with accompanying multimedia material such as photographs or videos. Scientists will have the opportunity to be listed as experts together with their media experience and to pitch story ideas to journalists."

Scimex will also feature an events calendar and multimedia library of science images and videos.

The site will replace and improve the SMC's resource library for journalists and, once releases come out of embargo, the content will be available for the public to browse as well, creating an archive of research-related releases and the SMC's own releases providing expert reactions to breaking news.

See more: www.scimex.org

## Science Media SAVVY expands

The SMC's SAVVY programme that gives scientists the skills to better communicate their science expanded during 2014 with an increased number of events and a boosted number of scholarships on offer to allow a larger number of emerging researchers to attend the courses.

In addition to the SAVVY workshops that give scientists extensive two-day media training, a number of other events took place.

Half-day workshops on science blogging and science podcasting were held, taking advantage of experts visiting from overseas. These courses offered practical tools and tips for scientists and science communicators looking to undertake their own new media science communication projects and included participants from CRIs, universities, museums and local and regional councils.

A full-day communications workshop and seminar **Media, Disasters and the Public** was held for natural hazards researchers, scientists and engineers in October. It covered effective techniques for communicating risk and uncertainty and featured case studies from the Canterbury earthquakes and other disasters.

The SMC also collaborated with the organisers of the 2014 Public Health Congress held in Auckland to deliver two short SAVVY workshops for participants. The well-received workshops focused on development of key messages and dealing with controversial medical-related issues

## Goal 3

# Nurture talented people to support research and scholarship

# Celebrating 20 years of the Marsden Fund

In 2014 the Marsden Fund celebrated 20 years of supporting leading-edge research in New Zealand. The fund was set up by the New Zealand government to support investigator-led research. Rt Honourable Simon Upton FRSNZ, who was the Minister of Research, Science and Technology when the Marsden Fund was established, said it was to support "absolutely novel, lateral, fundamental research that owed nothing to the political and economic priorities of the day". Since then it has distributed more than \$600 million for over 1,200 projects in the areas of science, engineering and mathematics, social sciences and the humanities. It has grown from \$5 million per annum in its first year to more than \$55 million in recent years.

Professor Juliet Gerrard FRSNZ, Marsden Fund Council Chair, said that many of New Zealand's best researchers have received Marsden funding.

In 2001, Fast-Start grants were added to support outstanding researchers early in their careers. "The Fast-Start scheme has been a hugely successful



mechanism to enable emerging researchers to develop their own interests in the research community. Many Fast-Start recipients have gone on to head their own groups and make outstanding discoveries," said Professor Gerrard.

"The Marsden Fund not only supports the development of research talent but also uncovers findings that can lead to whole new areas of research.

"By supporting New Zealand researchers to carry out fundamental research which they are passionate about, the Marsden Fund is helping to build a stronger nation, both economically and socially. The Marsden Fund is an investment in the long-term success of New Zealand and we look forward to its 40-year celebration in 2034."



Images from left: The Marsden Fund flag was flying high in many locations during 2014. Here it forms the background to Dr Phil Battley's research into the migrating bar-tailed godwits at the Manawatu Estuary; Celebrating 20 years of the Marsden Fund at Parliament (from left): Professor Antonia Lyons, Professor Jason Tylianakis, Professor Ngahuia Te Awekotuku, Hon Steven Joyce, Professor Colin Green, Professor Juliet Gerrard FRSNZ, Professor Ken McNatty FRSNZ, Professor Jennifer Hay, Dr Dillon Mayhew, Professor Catherine Day FRSNZ.

#### Ten by Ten

As part of the 20 year celebrations, a number of New Zealand researchers gave talks around the country for the Ten by Ten series, telling the story of their research and how it has led to beneficial outcomes for New Zealand.

Several Marsden Fund grants have helped **Professor Jeff Tallon** FRSNZ and his world-renowned team, originally based at IRL and now at Victoria University of Wellington, to understand the behaviour of high-temperature superconducting materials. This has formed the basis for applied work that has led to the development of a superconducting ceramic wire that can replace conventional copper wire in high-current applications such as magnets. High-tech company, HTS-110 Ltd, utilises these discoveries, supplying superconducting magnets, NMR analysers, generator components, and fabrication and testing facilities for electronics industries.

Professor Ngahuia Te Awekotuku, along with Professor Linda Waimarie Nikora, both of the University of Waikato, have explored the cultural, spiritual, and technical aspects of tā moko, and its decline and subsequent revival. Their research has been beautifully documented in *Mau Moko: The World of Māori Tattoo*, winner of the inaugural Ngā Kupu Ora Māori Book of the Decade Award.

Professor Harlene Hayne FRSNZ from the University of Otago has been studying why we have no conscious recognition of the momentous events that occurred early in our life, such as starting to walk. She has found that recall is disrupted by even minor changes to context, and that children have almost no ability to verbally describe events that took place before they learned to talk. Her team's work helps us to understand children's responses when they are relying on their memory in educational, legal and clinical settings.

Professor Antonia Lyons of Massey University has investigated the link between drinking culture of young people and social media. She has found that social media accentuate the good times associated with alcohol (an "airbrushed drinking culture"), and that commercial interests are skilfully using social media for marketing purposes.

Professor Catherine Day FRSNZ from the University of Otago looks at cell death, a natural and necessary event for some 60 billion cells in the human body every day. By working out the atomic detail of the proteins that are involved in pathways leading to cell death, her team sheds light on the cellular signalling processes that are involved. This helps in the design of drugs to treat illnesses such as cancer and autoimmune diseases, where the processes associated with cell death go awry.

Professor Colin Green and his students at the University of Auckland serendipitously discovered a way to heal wounds. A substance which was originally designed to reduce cell-to-cell communication also limited the lesions from brain injury. Following this, the successful healing of a seemingly untreatable chemical eye burn took the research team in the direction of non-healing wounds. Now Nexagon™ – a clear gel that is dripped onto wounds such as venous or diabetic leg ulcers – is ready for Phase III clinical trials

Dr Martin Reyners FRSNZ and his team from GNS Science have mapped the velocity of seismic waves under New Zealand and have discovered the location of the subducted western edge of the Hikurangi Plateau. Their results can explain why New Zealand has an Alpine Fault, why our southern and northern zones slide opposite ways (the Pacific plate over the Australian plate in the south, and vice versa), and the characteristics of the Canterbury earthquakes. The team has also determined how the variation in the behaviour of fluids at the boundary between plates alters the size and frequency of earthquakes.

Professor Ken McNatty FRSNZ, originally from AgResearch but now based at Victoria University of Wellington, discovered that fertility is affected by proteins that are produced by eggs in the ovary. This has led to dramatic improvements in livestock fertility and human fertility clinic success rates, and may also lead to methods of limiting reproduction in mammalian pests.

**Dr Dillon Mayhew**, from Victoria University of Wellington, works on matroid theory, a theory that provides better understanding of the arrangement of objects in space. Matroids represent discrete points in space and so their geometry relates to the digital age, rather than the continuum associated with classical geometry. It is a field in which New Zealand is a world leader. Dr Mayhew sees his work in theoretical mathematics, not simply as a source of applications, but also as an addition to human culture, like music, dance and sport.

Many of these Ten by Ten talks are available online www.royalsociety.org.nz/marsden-ten



# Supporting early career researchers

## Early Career Researcher Forum

In May 2014 a successful forum for early career researchers was hosted by the Society, with 127 people from 26 research institutions attending the two-day conference. The keynote speaker was Dr Marguerite Evans-Galea, Chair of the Australian Academy of Science's Early Career Researcher Forum, whose topic was 'ECRs in a National Science Academy Framework'.

Other topics presented by keynote speakers were: the near-future funding landscape of New Zealand; innovation in New Zealand; and realising the impact and reach of research.

The keynote presentations were interspersed with breakaway sessions and 'info-blitzes' where early career researchers briefly introduced their research topics, providing a stimulating conference for both participants and presenters.

Following on from the May conference, a focus group meeting attended by 17 early career researchers from around the country, along with Society councillors Associate Professor Christine Jasoni and Dr David McNamara, was held in December. The meeting identified issues and concerns of early career researchers and opportunities for the Society to assist in coordinating early career researcher activities. Possible activities included cross-institutional communication among early career researchers, and facilitating contact between researchers at different points on their career path, as well as providing an ongoing forum for coordinating activities. The meeting resulted in a draft statement of purpose for an early career researchers' forum, a short-term work plan, and the appointment of an interim working group to present a paper to the Royal Society of New Zealand Council for further consideration.

Videos from forum available: www.royalsociety.org.nz/ecr

#### **Rutherford Foundation Trust**

The Royal Society of New Zealand Rutherford Foundation Trust aims to build human capability in science and technology by providing career support for New Zealand's brightest and most promising researchers. This year the Trust awarded scholarships to seven outstanding emerging researchers, including four postdoctoral fellowships and three international PhD scholarships.

#### **New Zealand Postdoctoral Fellows**

**Dr Sachi Kodippily**, University of Auckland, for research entitled: 'Improving the life of our roads – reducing moisture damage of New Zealand's road pavements'.

**Dr Matthew Sagar**, Victoria University of Wellington, for research entitled: 'Alpine fault "big bend": evolution and earthquake hazard'.

**Dr Charlotte King**, University of Otago, for research entitled: 'Major transitions in prehistory: using a new life histories approach to trace health and diet in northern Chile'.

**Dr Karen Reader**, University of Otago, for research entitled: 'How does Activin C modulate granulosa cell tumours? Implications for human disease'.

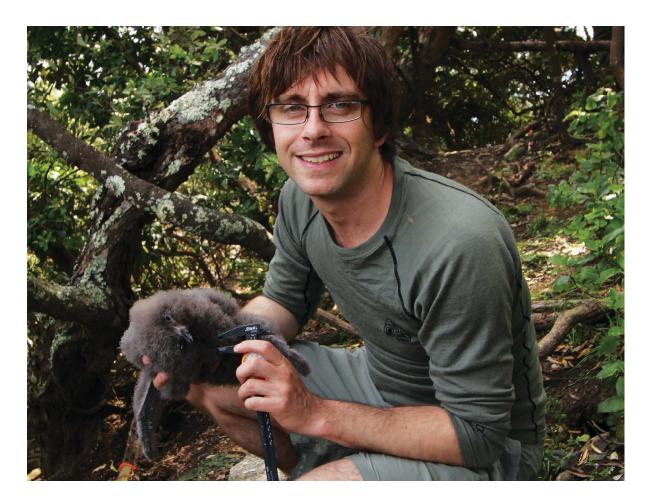
#### Cambridge-Rutherford Memorial PhD Scholarships

**Mark Burrell**, for research entitled: 'Neuroeconomics: behavioural neurophysiology of reward, risk and decision-making'.

**Elisabeth Liddle**, for research entitled: 'Determination of recharge and the seasonal variations in groundwater availability for Ndola, Zambia'.

**Max Wilkinson**, for research entitled: 'The structure and function of macromolecular machines'.





Images from left: Focus group participants brainstorm ideas for how the Society can assist early career researchers; Dr James Russell was awarded a Rutherford Discovery Fellowship in 2014 for his conservation research. He seeks to discover how to scale up pest-control methods, which have been successful for protecting biodiversity on small offshore islands, to larger islands.

# **Rutherford Discovery Fellowships**

The Rutherford Discovery Fellowships support the development of future research leaders in New Zealand by providing up to \$160,000 a year for five years. This year's successful recipients work in a diverse range of research fields from health to conservation to optoelectronics.

#### 2014 Rutherford Discovery Fellows

**Dr Louise Bicknell**, University of Otago, for research entitled: 'Investigating the contribution of genetic variation to shaping human disease'.

**Dr Alys Clark**, University of Auckland, for research entitled: 'Biophysical models to predict markers of health in early pregnancy'.

**Dr Francis Collins**, University of Auckland, for research entitled: 'Nation and migration: population mobilities, desires and state practices in 21st century New Zealand'.

**Dr Katie Fitzpatrick**, University of Auckland, for research entitled: 'Rethinking health education and promotion: health capital and diverse youth'.

**Dr Jonathan Halpert**, Victoria University of Wellington, for research entitled: 'Novel nanostructured materials and optoelectronic devices: solar cells and LEDs'.

**Dr Kim Handley**, University of Auckland, for research entitled: 'Who is eating what in coastal marine sediments? Understanding microbial contributions to coastal marine health, stability and ecosystem functioning'.

**Dr Michael Knapp**, University of Otago, for research entitled: 'Evolution and conservation of the New Zealand bird fauna – a genomic approach'.

**Dr James Russell**, University of Auckland, for research entitled: 'Conservation complexity: scaling vertebrate pest control'.

**Dr Alex Taylor**, University of Auckland, for research entitled: 'The signature-testing approach to the evolution of intelligence'.

**Dr Priscilla Wehi**, Landcare Research, for research entitled: 'Indigenous ecological knowledge, introduced species, and the New Zealand environment'.

# Improving science learning

# Creative learning

CREST is an international awards scheme designed to encourage school students of all ages to carry out science investigations or technology projects individually or in teams, with the input of expert mentors. Students learn to be innovative, creative and to solve problems.

Cambridge received a Team First CREST for their three teams which worked on three aspects of the project: construction, plantings and creating a tuatara sculpture for the site. They learned how to select and plant native species that suited the soil and will attract animals to the site and a range of skills relating trigonometry, scale drawing and building techniques. Futureintech ambassador Stuart McCready, a civil engineer at Beca, was a mentor for the project. Teacher Gill McCready said the technical advice and involvement in teaching maths skills for problemsolving that Stuart gave the students was "invaluable" and that it was wonderful to have a young engineer as an inspirational role model. In addition to the CREST award, the project was the junior winner of the 2014 Transpower Neighbourhood Engineers Awards.

At the other end of their schooling, school leavers Brittany Vining and Chris Ryan were awarded Gold CRESTs in 2014.

Brittany Vining, formally of Palmerston North Girls High School, investigated whether an increase of whey protein in the diet of female adolescents improved their endurance, agility and leg power in set physical tests. She did not see an effect with the dosage and study design that she used. Chris Ryan, formally of Howick College, studied the anti-inflammatory function of Kawakawa leaves, which are used by Māori in rongoā (traditional medicine). He found significant anti-inflammatory action in white blood cells but only when a water extract of the leaves was used, not an extract with organic solvents.





## Teaching awards

Three primary teachers and their schools were presented with a Primary Science Teacher Fellowship Alumni Award in 2014, to recognise the effort and commitment by both teacher and school and the subsequent success in improving science learning, following the fellowship.

During their two-term fellowship, teachers carried out research at a host science organisation and developed their leadership skills and knowledge of the Nature of Science strand of the New Zealand curriculum. They then returned to school to put into practice what they had learned.

#### 2014 teacher alumni awardees

Carol Brieseman, Hampton Hill School, Tawa Tracey Kinloch-Jones, Hereworth School, Havelock North Barbara Ryan, Muritai School, Eastbourne, Lower Hutt

The award is valued at \$10,000, with half going to the school to further enhance science education.

Carol Brieseman said she was thrilled to win the award. "The time on the Primary Science Teacher Fellowship really reignited my passion for science and I couldn't wait to get back into the classroom and share. Science fits into all other curriculum areas so well and I love seeing the curiosity, excitement and confidence that comes out of it in the students and colleagues alike."

Kelly Scott, Principal of Hampton Hill School, said the school was very proud of Carol and her achievements as a leader of science in the school. "She has supported staff to bring science to the forefront of our teaching and learning. Carol has shown us how to get the children thinking like a scientist."

The Primary Science Teacher Fellowship has now been replaced with the Science Teaching Leadership Programme, commencing in 2015.

# Realising their dreams

Sixteen of New Zealand's top secondary school students were selected for the Genesis Energy Realise the Dream programme for their science or technology project. They travelled south from Auckland to Wellington, visiting a number of science and technology organisations to gain insight into possible science and engineering careers in New Zealand. Organisations visited included the Liggins Institute and the Photon Factory at the University of Auckland, Fisher & Paykel Healthcare, DairyNZ, Genesis Energy, Acme Engineering and NIWA.

The week concluded with an award ceremony hosted by the Governor General at Government House, at which many of the students received further scholarships and travel grants to attend international science and technology events. The judges were extremely impressed with the calibre of the projects in 2014, which were on topics including bulk food dispensing, tractor safety, earthworm composting, nitrate leaching, algal blooms, stream health and tendon cell regeneration.

The Genesis Energy Supreme Award winner was Tim Logan, from Darfield High School in Canterbury, who also received the 2014 Prime Minister's Future Scientist Prize.

Tim researched whether stock grazing affects the survival of threatened native low-growing species. He designed and carried out a sophisticated statistical survey of plant species in two sites dominated by exotic grasses. His results suggest that grazing is not necessarily harmful to the prostrate native vegetation and, in some cases, may aid it by reducing competition from the exotic grasses. Tim's results support the idea that ecosystems like the semi-natural grasslands in the mid-Waimakariri floodplain offer an opportunity to restore and conserve native biodiversity while still under agricultural management – but he cautions that areas of native shrubs should be fenced from stock.



Image right: Tim Logan, Genesis Energy Supreme Award winner and 2014 Prime Minister's Future Scientist Prize winner, addresses fellow Genesis Energy Realise the Dream participants and guests at an awards function at Government House.

Goal 4

# Engage with the international research community

# International engagement

## Society marks 40-year anniversary of scientific engagement with Chinese Academy

In December the Society welcomed Professor Bai Chunli, President of the Chinese Academy of Sciences (CAS), and a delegation of senior Chinese science leaders to Wellington to mark the 40-year anniversary of friendly relations between the two organisations.

The event was attended by members of the Society as well as representatives of Science New Zealand, Universities New Zealand, the Confucius Institute at the Victoria University of Wellington and the Embassy of the People's Republic of China.

The Chinese visitors heard presentations outlining the landscape of the New Zealand science system, including information on the seven crown research institutes and eight universities. The multiple individual and organisational relationships between New Zealand and China were highlighted as being valuable contributors to the New Zealand research sector.

In turn, Professor Bai expressed his positive wishes for the future of the partnership between the two countries and presented an outline of the scope of research and development carried out with the support of CAS.

Professor Bai and Distinguished Professor Gaven Martin FRSNZ, Royal Society of New Zealand Councillor, jointly signed a Memorandum of Understanding on behalf of the two organisations.

The relationship between the Society and CAS was established in 1974 when the first delegation of New Zealand researchers travelled to China.



# New Zealand–Germany collaborations

The Julius von Haast Fellowship allows internationallyrecognised German researchers to spend time working collaboratively with their New Zealand colleagues to establish or enhance collaborative research, over three years.

Professor Alexander Verl, Executive Vice President, Technology Marketing and Business Models for Fraunhofer, Europe's largest application-oriented research organisation, was awarded a Julius von Haast Fellowship in 2012. His host for New Zealand research trips has been Professor Peter Xu, Professor and Chair in Mechatronics at the University of Auckland. During his visits to New Zealand, Professor Verl has been collaborating with Professor Xu on 'soft robotics', which is the field of biology-inspired robots.

These visits contributed to a series of workshops being held in 2013 and 2014 between the University of Auckland and Fraunhofer, and the setting up in November 2014 of Bionic Joint, a New Zealand–Germany collaboration that will integrate the latest wearable sensor technology from the University of Auckland's Bioengineering Institute with mechanisms that enable movement provided by researchers at the Fraunhofer Institute in Stuttgart, Germany. The goal is to create human exoskeletons that will reduce workplace injury associated with heavy lifting and assist the rehabilitation of stroke patients.

# Building HOPE in Japan

Five New Zealand students attended the 6th HOPE conference held in Japan in March 2014. HOPE Meetings are held for outstanding graduate students and early-stage researchers selected from countries around the Asia-Pacific region. These meetings provide an opportunity for the participants to engage in interdisciplinary discussions with Nobel laureates and other distinguished scientists. They also give the participants a chance to form collegial networks with peers from other regions. The title 'HOPE Meeting' signifies the promise held for the future roles of young researchers and optimism for creating a bright science and technology future within the global community.

Dr Janice Cheng, a recent PhD graduate in cancer immunotherapy from the Malaghan Institute, said it was a memorable event that she will treasure. Like the other New Zealand delegates, she appreciated the many opportunities she was given to interact with the distinguished speakers and Nobel laureates over meals and activities. "I particularly enjoyed

hearing stories of what drives them, what led them to where they are today, and the people who were a part of their journey. Their humility and willingness to impart knowledge and experience have inspired me and emphasised to me the qualities that are important for a successful scientist."

# FRIENZ Europe—New Zealand reciprocal study tours lead to new collaborations

2014 saw the first study tours organised through the FRIENZ (Facilitating Research and Innovation cooperation between Europe and New Zealand) project. European researchers visited New Zealand for a study tour into personalised healthcare and a food for health tour, focused on substantiating health claims. Tours in both directions have also been undertaken in the areas of food processing and resilient cities. Following these study tours, eight formal collaborations have received external funding.

Dr Stefan Clerens, Science Team Leader in the Food and Bio-based Products Group at AgResearch, took part in the food processing study tour to Europe. He said a number of research teams with capabilities and facilities complementary to AgResearch were identified during the tour. New collaborative opportunities with INRA, France and the Fraunhofer Institute, Germany include staff exchanges, a joint PhD programme and development of industry-targeted tools for managing food processing efficiency.

AgResearch has since received a grant from the Ministry of Business, Innovation and Employment to collaborate with INRA. "Partnering with a New Zealand-based company, we are analysing how food proteins are affected by a prolonged cooking process. INRA are assisting to develop a mathematical model to predict product profiles under different cooking parameters," Dr Clerens said.

Dr Mandy Suddes, Research and Development Head for Manuka Health, also attended the food processing tour. "It gave me the opportunity to meet with a range of potential research collaborators, evaluate technological solutions and meet subject matter experts."

Manuka Health subsequently received funding from the Ministry of Business, Innovation and Employment to engage with experts at the Institute of Food Research in Norwich, UK to generate data to assess health claims for its proprietary product: Manuka Honey with Cyclopower<sup>TM</sup>.

Image left: A delegation of senior Chinese science leaders and representatives from the Society, Science New Zealand, Universities New Zealand, the Confucius Institute at Victoria University of Wellington and the Embassy of the People's Republic of China celebrate 40 years of scientific engagement between New Zealand and China.

## Goal 5

# Create an enduring organisation with effective resource management

# **Enduring organisation**

## Academy

Twelve top New Zealand researchers and scholars were elected as Fellows of the Royal Society of New Zealand in October 2014.

**Professor Stuart Carr**, Dept of Psychology, Massey University, Albany, has spent over 25 years showing how everyday workplace dynamics impact global and local poverty, and poverty reduction.

Professor Catherine Day, Dept of Biochemistry, University of Otago, is a protein biochemist and structural biologist who has made advances in understanding protein interactions that occur in programmed cell death and survival – critical in normal human development and cancer.

**Professor Alison Downard**, Dept of Chemistry, University of Canterbury, is an internationally acclaimed scientist working in the fields of electrochemistry, materials chemistry and surface science.

**Professor Ewan Fordyce**, Dept of Geology, University of Otago, is New Zealand's leading vertebrate paleontologist and a world leader in research on the evolution of whales, dolphins and penguins.

**Professor Nigel French**, Institute of Veterinary, Animal and Biomedical Sciences, Massey University, has made a major contribution to our understanding of the epidemiology and control of zoonotic diseases of national and global importance.

#### Membership of the Royal Society of New Zealand As at 31 December 2014

Fellows	396
Honorary Fellows	
Companions	34
Members	1185
Branches	10
Constituent Organisations	48
Affiliate Organisations	10

**Professor Neil McNaughton**, Dept of Psychology, University of Otago, is an internationally acclaimed behavioural neuroscientist who has developed a neuropsychological theory of anxiety.

**Professor Alan Merry**, Dept of Anaesthesiology, University of Auckland, has researched patient safety (particularly in anaesthetics) and the influence of the law on medical practice.

**Professor Tim Naish**, Antarctic Research Centre, Victoria University of Wellington, has advanced our knowledge of Antarctica's response to past and present climate changes and their effects on the Earth system.

**Professor Iain Raeburn**, Dept of Mathematics and Statistics, University of Otago, specialises in functional analysis, particularly operator algebras.

**Professor David Schiel**, Dept of Biological Sciences, University of Canterbury, is a marine ecologist, covering aquaculture, fisheries, and the diversity and functioning of coastal ecosystems.

**Professor Peter Watts**, Faculty of Law, University of Auckland, has a high international standing in the general area of commercial law, more especially in agency law, company law, and the law of restitution.

**Professor John Windsor**, Dept of Surgery, University of Auckland, is an eminent academic surgeon and research scientist and a pioneer in keyhole surgery. He is a specialist in pancreatic surgery and has developed innovative surgical skills training methods and centres.

#### **Honorary Fellows elected**

**Professor Michael Fellows**, School of Engineering and IT, Charles Darwin University, is a leading computer scientist who co-founded the field of parameterised complexity theory with Professor Rod Downey FRSNZ of Victoria University of Wellington.

**Professor David Paterson**, Dept of Physiology, Anatomy and Genetics, University of Oxford, is a leading cardiorespiratory physiologist and a world authority in cardiac-neural control.

## Society organisation members

In addition to individual Fellows, Companions and Members, the Society has three types of organisation members: Branches (also known as Regional Constituent Organisations), Constituent Organisations and Affiliate Organisations.

## **Constituent Organisations**

Nearly 50 Constituent Organisations assist the Society to identify and address issues relevant to the research, knowledge and innovation sectors. They link into the expert advice activities that the Society undertakes through the Vice Presidents' Advisory Panels. Constituent Organisations may be discipline-based or cross-discipline. The Society provides support through communication, information and conference sponsorship, where possible.

#### Women in science

The newest Constituent Organisation of the Society is the New Zealand Association for Women in the Sciences (AWIS), founded in Wellington in 1985. This association has 130 members throughout New Zealand, with branches in Dunedin, Christchurch, Nelson, Wellington, Palmerston North, Rotorua, Hamilton and Auckland.

The association aims to: provide a network for women interested or working in the sciences to share scientific information, experience and skills; explore and speak on issues relating to women and science; provide social interaction with others who have similar interests; assist girls and women to gain confidence in their role in the sciences and increase self knowledge; and provide visibility for women in the sciences and to support women to achieve visibility in the sciences.

To achieve this they hold regional events and a triennial conference (the latest was held in 2014), send newsletters and prepare submissions to government and other bodies on issues relating to women and science.

# **Affiliate Organisations**

Affiliate Organisations may cover a diversity of disciplines or have a broad interest. Through membership of the Society, Affiliate Organisations gain opportunities to further engage with the wider research community in New Zealand, and to benefit from interaction with research-based organisations in other disciplines.

## House of Science Tauranga

The newest Affiliate Organisation is House of Science Tauranga, which is a charitable trust established in 2013 to connect and provide resources to its local science community.

It provides member schools with a science resource library and runs regular professional development and networking events. It also runs after-school and holiday programmes for children in the community, provides a science tutoring service and has a robotics club.

Currently House of Science Tauranga has 36 member schools, putting it in direct contact with over 650 teachers who, in turn, are in touch with 19,000 local students in the Western Bay of Plenty from Katikati to Pukehina.

# Constituent Organisation and Branch Forum

Each year the Society hosts a discussion day for representatives from member organisations. 'That which unites us' was the theme of the 2014 Constituent Organisation and Branch Forum which aimed to identify shared issues, encourage discussion and debate and strengthen engagement.

Six key opportunities for action were identified from the Forum: commitment to regular two-way communications; clarification of purpose and composition of the Vice Presidents' Advisory Panels of the Society; role of Constituent Organisations in expert advice prepared by the Society; the Society as a resource provider of good practice to constituents; clarifying membership structures relating to the Society's Branches; and improving the diversity amongst participants in Society and Constituent Organisation activities.

#### **Branches**

As at 31 December 2014

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

Wanaka Branch

#### **Constituent Organisations**

As at 31 December 2014

#### **Biological Sciences and Technologies**

New Zealand Society for Biochemistry and Molecular Biology

New Zealand Ecological Society

New Zealand Freshwater Sciences Society

New Zealand Marine Sciences Society

New Zealand Society for Parasitology

Physiological Society of New Zealand

New Zealand Society of Plant Biologists

#### **Earth Sciences and Technologies**

Royal Astronomical Society of New Zealand Geoscience Society of New Zealand New Zealand Geothermal Association New Zealand Hydrological Society Meteorological Society of New Zealand

#### **Health Sciences and Technologies**

Australasian Society for Immunology
(New Zealand Branch) (NZ ASI)
New Zealand Society of Endocrinology
New Zealand Microbiological Society
Nutrition Society of New Zealand
New Zealand Society for Oncology
Australasian Society of Clinical and Experimental
Pharmacologists and Toxicologists
(NZ Section) (ASCEPT)

#### **Humanities**

Australian and New Zealand Communication Association Institute of Registered Music Teachers of New Zealand New Zealand Historical Association Philosophy of Education Society of Australasia

# Mathematical and Information Sciences and Technologies

New Zealand Mathematical Society
Operations Research Society of New Zealand
New Zealand Statistical Association

#### **Physical Sciences and Technologies**

New Zealand Institute of Chemistry New Zealand Institute of Physics

#### **Primary Resources Sciences and Technologies**

New Zealand Institute of Agricultural & Horticultural Science

Agronomy Society of New Zealand

New Zealand Society of Animal Production

New Zealand Institute of Forestry

New Zealand Plant Protection Society

New Zealand Society of Soil Science

New Zealand Veterinary Association

#### **Science and Technology Education**

New Zealand Association of Mathematics Teachers New Zealand Association of Science Educators

#### **Social Sciences**

New Zealand Archaeological Association

New Zealand Geographical Society

Population Association of New Zealand

New Zealand Psychological Society

New Zealand Association for Research in Education

Association of Social Anthropologists

of Aotearoa/New Zealand

Association of Social Science Researchers (ASSR) Sociological Association of Aotearoa NZ (SAANZ)

#### **Technology and Engineering**

New Zealand Institute of Food Science and Technology New Zealand Institute of Surveyors

#### Othe

Association for Women in the Sciences New Zealand Association of Scientists

#### **Affiliate Organisations**

As at 31 December 2014

Discovery World, Otago Museum

House of Science Tauranga

International Institute of Refrigeration

(New Zealand National Committee)

Motu Economic and Public Policy Research

National Science-Technology Roadshow Trust

New Zealand Association of Economists

Opus International Laboratories

Science Alive, Christchurch

Statistics Research Associates Ltd

Te Manawa: Science Centre/Manawatu Museum, Palmerston North

# Financial report

## Summary financial statements for the year ended 30 June 2014

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 2014, approved for issue by Council on 26 November 2014. Review full statements online: www.royalsociety.org.nz/financial

#### Royal Society of New Zealand Statements of comprehensive income for the year ended 30 June 2014

	2014 \$000's	2013 \$000's
Revenue		
Society membership	310	258
Income from products and services	6,334	5,558
Sponsorship and donations	318	573
Rental of investment property	435	143
Total revenue	7,397	6,532
Interest income	162	132
Total income	7,559	6,664
Expenditure		
Audit expense	41	42
Operating lease expense	-	40
Depreciation expense	150	183
Employee benefits expense	3,539	3,507
Grants	16	30
Other expenses	2,582	2,520
Total expenses	6,328	6,322
Net surplus	1,231	342
Adjustments from revaluation		
of land and buildings	48	(797)
Total comprehensive income for the year	1,279	(454)

Royal Society of New Zealand		
Balance sheet as at 30 June 2014	2014	2013
	\$000's	\$000's
Assets		
Current assets		
Cash and cash equivalents	747	1,988
Trade and other receivables	414	291
Investments and other financial assets	3,928	1,531
Prepayments	57	30
Inventories	8	6
Total current assets	5,154	3,846
Non-current assets		
Property, plant and equipment	10,546	10,587
Total assets	15,700	14,433
Total assets Liabilities	15,700	14,433
	15,700	14,433
Liabilities	<b>15,700</b>	<b>14,433</b>
<b>Liabilities</b> Current liabilities	·	·
Liabilities Current liabilities Trade and other payables	940	1,105
Liabilities Current liabilities Trade and other payables Income in advance	940	1,105 398
Liabilities Current liabilities Trade and other payables Income in advance Total liabilities Net assets	940 552 <b>1,491</b>	1,105 398 <b>1,503</b>
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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 is 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 1993.

#### 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 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.

