

THE ROYAL SOCIETY OF NEW ZEALAND  
GATEWAY TO SCIENCE AND TECHNOLOGY  
PROFILING EXCELLENCE : 2008

*the* ROYAL  
SOCIETY *of*  
NEW ZEALAND  
TE APĀRANGI





### FROM THE PRESIDENT



2008 has been a time of many achievements and much change within the Royal Society of New Zealand.

Traditional values combined with an innovative, modern approach ensure the Society is now well placed to play its part in promoting science in the 21st century. We have strengthened our international networks and supported high quality research within New Zealand. Through the newly established Rutherford Foundation, we are fostering young scientists and technologists.

Science and technology are of great value to our country and I am proud of our role in upholding and promoting them. To quote Ernest Lord Rutherford, whose Nobel Prize centenary we celebrated a few months ago: "As a man of science I have had the opportunity of seeing the remarkable effects of the application of science to the improvement and development of industry." In 2009, I hope New Zealand will recognise the value and importance of science and technology to the country as a whole.

**Neville Jordan** CNZM BE DistFIPENZ  
President

### FROM THE CHIEF EXECUTIVE

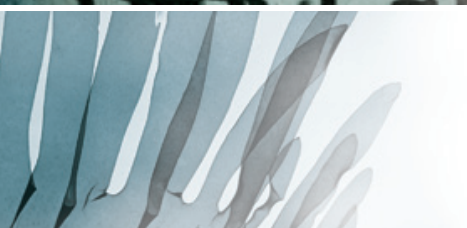
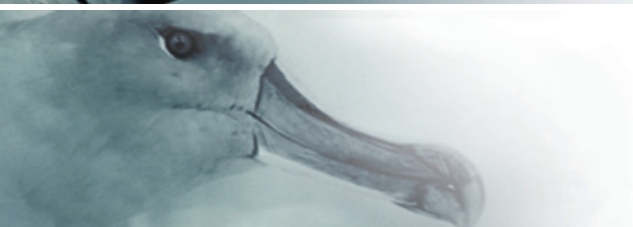


*Profiling Excellence* showcases the diverse range of activities undertaken by the Royal Society of New Zealand during 2008. It tells the story of who we are and what we do, who we work with and why. The stories we have chosen to include represent just a few of the many highlights of the past year and it is with a great sense of pride and achievement that we present these to you.

The work of the Royal Society of New Zealand could not continue without the support of government and our many friends and sponsors to whom we remain most grateful. Furthermore it could not be accomplished without the enthusiasm, dedication and commitment of our staff, fellows, companions and members.

**Dr Di McCarthy** ONZM  
Chief Executive

MAKING A DIFFERENCE



As the independent national academy of science and technology, the Royal Society of New Zealand supports excellence in science and technology across the applied, biological, earth, engineering, mathematical, medical, physical, social and technological sciences.

The Society offers a unique contribution to New Zealand science and technology by cultivating relationships with the public, our young people, the next generation of scientists, government and international academics.

#### Who we are

The Society is a modern and professional organisation with a long history linking back to the Royal Society of London and is governed by a private Act of Parliament. We provide objective and authoritative informed advice on important science issues; we award prestigious scholarships, grants and medals; we manage significant contracts for the New Zealand Government including the Marsden Fund; we publish high quality New Zealand research; we advance science and technology education; we continually promote science through the national media; and we build relationships internationally to further New Zealand science offshore.

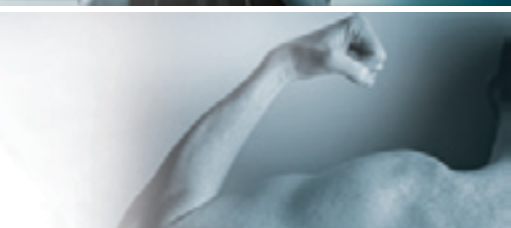
#### What we deliver

The Society is a voice for science and technology in New Zealand. We offer balanced and wise advice to government and the public. We provide information and raise awareness of current and future science and technology issues.

#### The Royal Society of New Zealand:

- publicly celebrates science excellence and our best young people
- champions the value of basic research
- promotes the value of applied science and technology
- provides support for science and technology education
- promotes ethical standards in research
- promotes New Zealand's science capability overseas through our international collaborations
- supports the professional development of our scientists and technologists

These aspirations are reflected in the activities that are profiled in this document. We hope you enjoy our story!





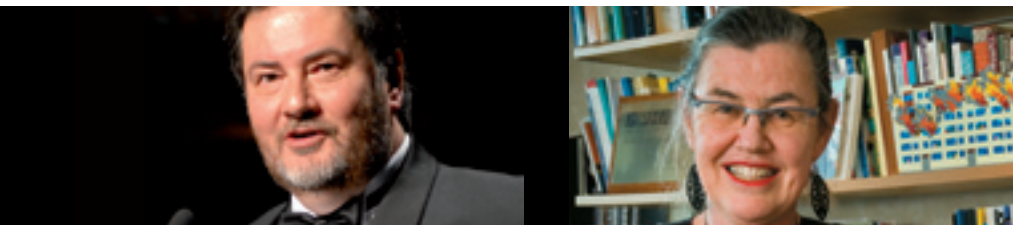
DINING OUT ON SCIENCE



The Royal Society of New Zealand holds an annual Science Honours Dinner to celebrate science and technology through the presentation of the country's eminent science and technology medals and awards.







From left to right: 2008 Science Honours Dinner held in Te Papa • Associate Professor Ross Ihaka • Professor Philippa Howden-Chapman  
Background Image: Professor David Parry, Waikaremoana

The theme of the 2008 Science Honours Dinner was the centenary of Ernest Lord Rutherford's Nobel Prize for Chemistry, and the guest of honour was Lord Rutherford's great granddaughter, Professor Mary Fowler, herself an eminent scientist at the University of London.

#### Top award spans physics and biology

Professor Fowler and the then Minister of Research, Science and Technology, the Hon. Pete Hodgson, presented the Rutherford Medal, New Zealand's highest science and technology award, to Professor David Parry FRSNZ, from Massey University.

As a structural biophysicist, Professor Parry works at the boundary between physics and biology. His research has focused on the fibrous proteins that make up the bulk of the proteins in the human body and enable it to move.

Amongst the problems he has tackled are the structure of hair and skin in health and disease, the manner in which muscles are turned on and off, the mechanics of skin and tendons, the transparency of the cornea in the eye, how proteins can be designed from simple building blocks to give desired structures and functions, and how hair and wool can provide thermo-regulation and protection against predators.

Aspects of Professor Parry's work have been applied in the wool and meat industries and in surgical procedures, as well as in physiology and medicine.

#### Say 'R'

The top award for technology, the Pickering Medal, was awarded to The University of Auckland statistician, Associate Professor Ross Ihaka, for open source software he has developed.

Simply named 'R', the software is capable of huge data processing tasks and has had phenomenal uptake internationally. It is used in research and teaching by many of the world's most prestigious universities.

#### Childhood and public health also winners

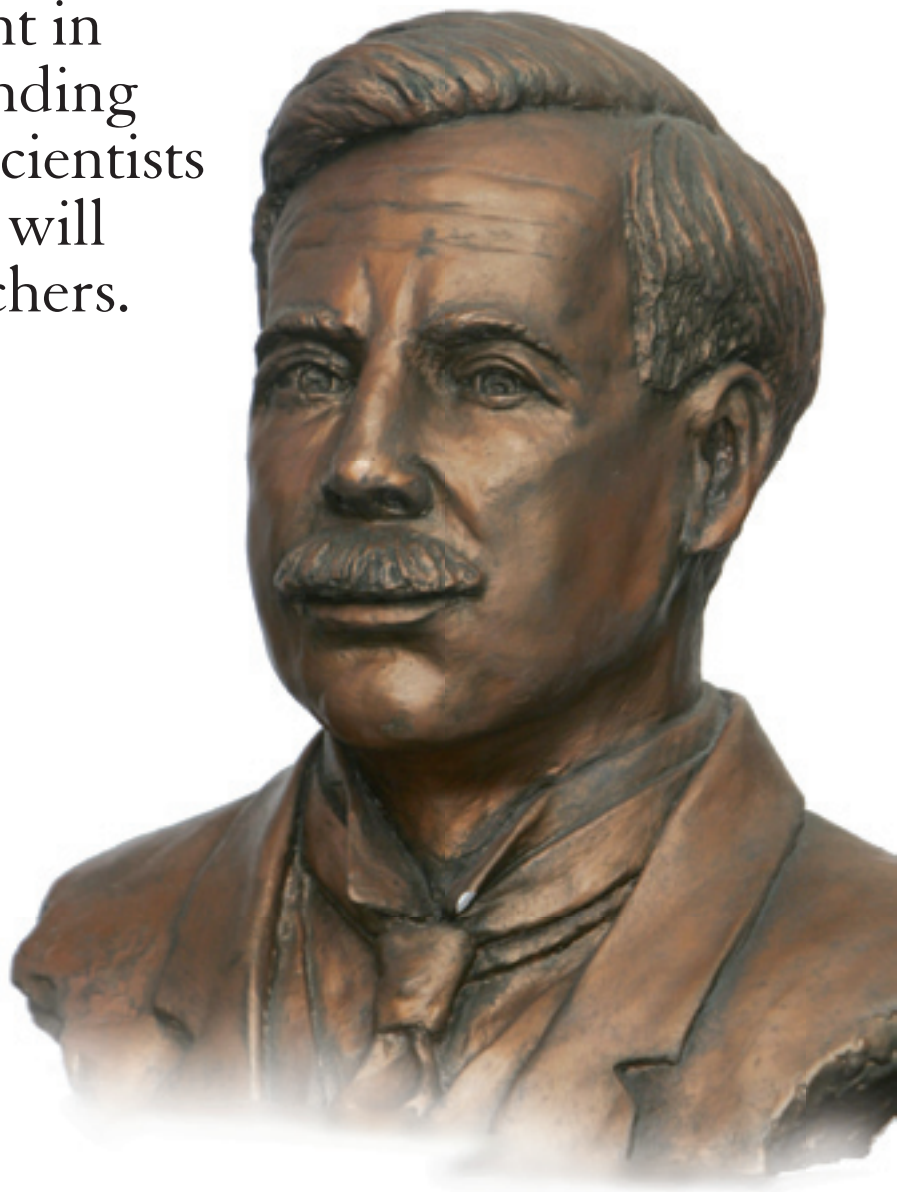
The inaugural Dame Joan Metge Medal for Social Science was shared by paediatrician and scientist Professor Diana Lennon from The University of Auckland, and public health researcher Professor Philippa Howden-Chapman from the University of Otago Wellington School of Medicine and Health Sciences.

Professor Lennon is an expert on infectious childhood diseases and Dr Howden-Chapman is well known for her research into the beneficial effects on health of warmer, drier homes.

IN RUTHERFORD'S FOOTSTEPS



The Rutherford Foundation is a new charitable trust, established by the Royal Society of New Zealand. It supports PhD education, postdoctoral research, early career development in science and provides funding to bring New Zealand scientists home. The Foundation will also support science teachers.







**From left to right:** Professor Margaret Brimble (Rutherford Foundation Trustee) with two of her team • Professor Mary Fowler and Professor David Parry

The Rutherford Foundation is appropriately named after Ernest Lord Rutherford, who, in 1894, was awarded an Exhibition Scholarship that allowed him to travel abroad to carry out research in physics. He chose to attend the University of Cambridge.

The work of the Foundation is supported by the New Zealand Government through the Ministry of Research, Science and Technology, and by the Freemasons Roskill Foundation and private donors.

#### **Scholarships for Cambridge**

In 2008, the Rutherford Foundation awarded two PhD scholarships to students of The University of Auckland: George Gordon and Rachel Shaw, both of whom have shown exceptional academic ability.

President of the Royal Society of New Zealand, Neville Jordan, announced the scholarships at a special function held at the New Zealand High Commission in London.

George Gordon is an engineering graduate whose studies will be part of an intelligent airport project, using fibre optic and radio frequency technologies to connect information from many independent electronic sources.

Rachel Shaw will undertake psychological studies of mental time travel in a bird – specifically the western scrub jay. She will study consciousness and memory, contributing to the field of evolutionary biology and psychology.

#### **Rutherford's great granddaughter**

To mark the centenary of Ernest Lord Rutherford receiving the Nobel Prize, the Royal Society invited his great granddaughter, Professor Mary Fowler, to give a lecture tour of New Zealand as the 2008 Royal Society of New Zealand Distinguished Speaker.

The Royal Society of New Zealand Distinguished Speaker Series has been supported by the David and Genevieve Becroft Trust since its inception in 2002, when the inaugural speaker was Robert Lord May, then President of the Royal Society of London.

Subsequent speakers have included Robert Lord Winston, Professor Mandyam Srinivasan, and eminent New Zealand physicist Professor Paul Callaghan FRSNZ.



EXCELLENCE IN RESEARCH

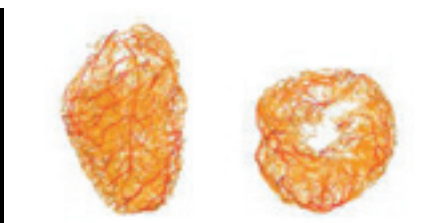


From left: Rat gnawed matai nut *Prumnopitys taxifolia* • Dr Janet Wilmschurst and research team at excavation site • Reconstructed rat coronary vascular • Associate Professor Andrew Wilson (second from right)

The Royal Society of New Zealand administers the Marsden Fund on behalf of the Marsden Fund Council. This is New Zealand's prestigious research fund covering the physical and life sciences, mathematics, engineering, social sciences and humanities.



Background image: Taurewa Victor Biddle of Te Waimana, Bay of Plenty. Photo: Becky Nunes



### Mau Moko: the world of Māori tattoo

In the traditional Māori world, the moko, or tattoo, was part of everyday life; everyone had some patterning on their skin. After almost dying out in the twentieth century, Māori skin art is now experiencing a powerful revival, with many young urban Māori displaying the moko as a gesture of ethnic pride and identity.

A group of Māori scholars from the University of Waikato has recently published a beautifully illustrated new book, arising from a Marsden Fund project. *Mau Moko* investigates the origins, significance, technology and practice of moko, or facial and body tattooing, from pre-contact period to contemporary times.

Authored by Professor Ngāhuia Te Awakōtuku, Dr Linda Waimārie Nikora, Mohi Rua and Rolinda Karapu, the book was the winner of the Lifestyle and Contemporary Culture section of the 2008 Montana New Zealand Book Awards. Many portraits in the book are by photographer Becky Nunes.

### A new state of matter

The Bose-Einstein condensate is a new state of matter, created in the laboratory in 1995. In it, millions of atoms are merged, losing their individual identities. The material behaves quite differently from other forms of matter, and offers an excellent way to study quantum physics.

Associate Professor Andrew Wilson from the University of Otago has made many contributions to the field. A major achievement has been to arrange for two condensates to collide, building an understanding of how they interact.

The research has led to the founding of a company, Photonic Innovations Ltd. Using advanced laser technology developed during the experimental programme, the company produces cost-effective high-tech gas detectors for industrial purposes.

### Engineering, mathematics, physiology and disease

Mathematics and engineering are being used to understand better how the heart works in health and disease. Researchers based at The University of Auckland are at the leading edge of this work.

Associate Professor Martyn Nash has created a three-dimensional model of the working heart to study ventricular fibrillation, an electrical dysfunction that causes many deaths. Professor Nic Smith has taken a similar approach to ischaemia, which is reduced blood flow to a region of the heart. Professor James Sneyd FRSNZ is studying the waves of calcium ions that lead to contraction of heart muscle and other physiological functions.

All of this research, supported by the Marsden Fund, combines the disciplines of mathematics, engineering, physiology and pathology. It is new and innovative, with the expectation that it will eventually contribute to improved diagnoses and therapies.

### Kiore and gnawed seeds

Dr Janet Wilmshurst from Landcare Research has obtained two Marsden grants to investigate seeds gnawed by ancient kiore, as a way to establish the time at which humans settled New Zealand.

The Pacific rat or kiore spread throughout the islands of the Pacific with voyaging humans, tagging along as a stowaway in Polynesian canoes. Because of the kiore's close association with human migration, knowing the time of its earliest presence in New Zealand helps to pin down the date that people first arrived here.

The research shows that the Pacific rat was widespread in New Zealand by AD 1280, confirming other evidence that humans arrived in New Zealand around AD 1280-1300.



## ACHIEVEMENTS HONoured

From left to right: Distinguished Professor  
Dame Anne Salmond • Professor James Sneyd  
• Professor Kenneth McNatty

Fellowship of the Royal Society of New Zealand is an honour given for distinction in research or in the advancement of science or technology and is given to New Zealand's most eminent scientists and technologists.





Fellows of the Royal Society of New Zealand are eminent scientists who regularly receive accolades and awards both nationally and internationally. For example, in 2008:

The Hector Medal in Mathematical and Information Sciences, one of New Zealand's oldest science medals, was awarded to Professor Gaven Martin FRSNZ from Massey University for contributions to modern mathematics, including the solution of a number of difficult and long-standing problems.

The Hutton Medal in Animal Sciences was awarded to Dr Bryce Buddle FRSNZ of AgResearch. Dr Buddle is a world leader in controlling infectious animal diseases. He has designed new vaccines and diagnostic tests for disease in deer and cattle, as well as in wildlife, thus reducing disease in both our natural and farming environments.

The Sir Charles Hercus Medal for Bio-medical Sciences and Technologies was awarded to Professor Mark Richards FRSNZ, University of Otago Christchurch School of Medicine and Health Sciences, for his cardiovascular research over more than 30 years. Professor Richards is one of the leading clinical scientists in the broad area of translational cardiovascular biology and medicine.

The University of Auckland's Distinguished Professor Dame Anne Salmond CBE FRSNZ has been elected as a Corresponding Fellow of the British Academy. The Professor of Māori Studies joins a handful of other New Zealanders who have achieved this recognition.

Professor Nik Kasabov FRSNZ, Auckland University of Technology, has been elected President of the International Neural Network Society for 2009 and 2010 and President of the Asia-Pacific Neural Network Assembly. He has also been awarded the 2007-08 Bayer Science Innovator Award (presented for the first time in New Zealand).

### The gift of time

James Cook Research Fellowships are awarded to researchers who have achieved national and international recognition in their field. The Fellowships allow them to concentrate fully on their chosen research for two years. There are seven current James Cook Research Fellows.

James Cook Research Fellow Professor James Sneyd FRSNZ from the Department of Mathematics at The University of Auckland is researching airway smooth muscle, an unusual cell type whose only known function is to constrict breathing and cause asthma. Studying how contraction of airway smooth muscle occurs, and is controlled, is thus clearly crucial for the study of asthma.

Professor Kenneth McNatty FRSNZ from the School of Biological Sciences at Victoria University of Wellington is developing new ways to assess the quality of mammalian eggs for use in *in vitro* technology. In New Zealand, the average age of women delivering their first child is currently 29.9 years, which is among the oldest recorded for any nation. The number of women requiring assisted reproductive technologies continues to increase and at present there are no reliable methods for assessing the quality of their eggs.

Professor Wei Gao FRSNZ from the Department of Chemical and Materials Engineering at The University of Auckland is working in the field of nano-structured materials, one of the most promising technologies of our time. Professor Gao is developing new techniques to produce nano-films, which could lead to electronic devices that are faster, smaller and more efficient.

BIG ADVENTURES IN SCIENCE



Freemasons BIG Science Adventures is a nationwide secondary school DVD competition that has made a big impact on the students involved since it began in 2004.







**From left:** Glenda Lewis, Ross Inness McLeish, Jack Tippler, Leigh Riley, Oliver Neas in Royal Society of London archives • HMNZS Te Kaha, Photo: Stephen Jaquiere • Filming in Tasiilaq, Greenland **Background image:** Angmagssalik Fjord, Greenland, Photo: Sarah Barnett

The motivation for the establishment of BIG Science Adventures was the celebration of a Transit of Venus in 2004; this rare astronomical event had been the reason the Royal Society of London and the Admiralty sent Captain Cook to the Pacific in 1769. He and his astronomers observed the Transit from Tahiti, before sailing west in search of the 'great unknown southern continent'.

Thanks to a timely approach by Freemasons New Zealand, funding was available to get the competition up and running and send an expedition to the UK to observe the Transit in Whitby, Cook's hometown. Since then the Freemasons have been generous and visionary sponsors of this high stakes competition. Winning teams have gone on life-changing adventures to Europe, Greenland, the Antarctic, the subantarctic islands, and other remote locations around New Zealand.

A strong supporter from the beginning has been the Royal New Zealand Navy, who provide the means of transport to remote locations like the Chatham and subantarctic islands.

*Lessons from a Melting Icecap* is a full length documentary that follows Otago Girls' High School students, Susan, Peggy and Annika, on their journey to Greenland where they come face to face with the harsh realities of climate change on the world's largest icecap. As they see the stark impact on Greenland's abandoned hunting villages, they start to question the future for New Zealand and their part in it. *Lessons from a Melting Icecap* takes the huge, often intangible issues of climate change and sustainability and gives them a human face – a young, hopeful, very Kiwi one.

### In Darwin's footsteps

Each year, a different theme is chosen for the competition; in 2008 it was Charles Darwin and evolution.

Ross, Jack and Oliver, from Nelson College, produced a superb entry on Rutherford's estimation of the age of the Earth through radioactive decay processes. This underpinned Darwin's theory by giving a much older age for the Earth, a long enough timeframe for evolutionary processes to have produced the incredible biodiversity we now have.

The team went to the UK in July/August 2008 to follow in Darwin's footsteps – Shrewsbury, London and Down House in Kent. Their itinerary included visiting Martin Lord Rees, President of the Royal Society of London, at Trinity College, Cambridge. The librarian at the Royal Society of London showed them an awe-inspiring selection of science artifacts, including Isaac Newton's death mask.

TEACHING AND LEARNING

Having school students passionate and enthusiastic about science and technology is a key objective of the Royal Society of New Zealand. The Society takes a leadership role in coordinating activities that support effective teaching and learning. This includes managing a range of educational programmes, celebrating New Zealand's top students and raising the profile of science in primary schools.







**From left to right:** Giemsa stained blood cells  
 • Freshwater crayfish *Paranephrops* sp  
 • Awesome Forces, Te Papa **Background image:**  
 Len Doel (left) and Alan Thomas with weather  
 balloon, *Photo: Hamish Chisholm*

### Realising their dreams

*Realise the Dream* brings together top school students who have produced winning research projects in various science and technology competitions. At this five day event, the students share their passion for science with other like-minded students and participate in a wide range of activities, culminating in a gala awards dinner.

### Creativity and innovation

“Persistence, imagination and attention to detail...”. So reads the *North & South* magazine headline for their New Zealander of the Year – Young Achiever category, Jessie Lineham. Jessie won the accolade for her work on her Gold CREST project on the impact of riparian planting on stream water quality.

CREST is an international scheme designed to encourage students to be innovative, creative, and to problem solve in science, technology and environmental studies.

### Koura crazy

On a chilly day in March 2008, Gordon Blair’s class from Pyes Pa school in Tauranga were searching for koura in the Tautau Stream. Koura are freshwater crayfish and are good indicators of stream health. Mr Blair’s class proved to have some experienced koura ‘finders’ and nine koura were found, recorded and gently returned to the stream. Koura surveys were initiated throughout New Zealand in March, part of EMAP (Environmental Monitoring and Action Project).

### On the international stage

Snowstorms, kelp shoes and the mysteries of sleep were just some of the experiences of those attending Youth ANZAAS 2008. Forty-five school students from Australia and New Zealand joined together to celebrate their passion for science with a week-long programme of activities in and around Dunedin.

Later in 2008, Katikati College student Pippa Grierson was selected as part of the Young Achievers Programme to participate at the European Union Contest for Young Scientists (EUCYS) in Copenhagen, where she won the International Cooperation Award for the best project from a guest country. Pippa investigated whether agricultural lime products affect the incidence of facial eczema spores on pastoral land.

### New learning

Len Doel has been researching some of the most important environmental issues facing New Zealand. As a Teacher Fellow he has been helping collect data on the effects of flooding on our coastlines and travelled on two winter voyages aboard the *Tangaroa* to sample the deep ocean near the Chatham Rise. In Antarctica, he participated in two research projects, looking at Adelie penguins and sampling soil from the Dry Valleys.

The Teacher Fellowships are designed to give teachers the opportunity to work on a significant research project over one year to gain an understanding of modern science and technology processes. This enables them to be more effective as teachers. As Len says, “I’ll go back to teaching encouraging students to be observant and curious about the world around them”.

### Supporting primary science

Enthusiasm for science starts at a young age. It is important that our students are involved with science from the day they start school if they are to develop a lifelong understanding and interest. The Advancing Primary Science programme has been developed to support effective teaching and learning of science in our primary schools.

Alongside this, a new initiative has been developed as part of the Teacher Fellowship scheme. Short-term fellowships enable primary teachers to work with scientists to gain an understanding of science and its applications.



## GOOD WRITING WINS THE PRIZE

## VIP SCIENCE



“The Universe makes rather an indifferent parent, I’m afraid,” said Dickens’ kindly Mr Jarndyce.

So began the evolutionary theme for the 2008 Manhire Prize for Creative Science Writing, which commemorated 150 years since the joint Wallace-Darwin paper on evolution by natural selection was made public at the Linnean Society in London.

The Royal Society of New Zealand Manhire Prize for Creative Science Writing is an annual competition organised in association with the *New Zealand Listener* magazine and the International Institute of Modern Letters at Victoria University of Wellington.

The judge of the 2008 prize was writer Bernard Beckett, who has written successful fiction and non-fiction on science themes.

The fiction category was won by Wellington writer Dave Armstrong, for his piece *Waimate*. “As Dad was raving about Darwin, I realised why he liked the man so much. Dad saw a bit of himself in the naturalist.”

The non-fiction category was won by University of Otago PhD student Will Catton, for *Progress, laughter, sex*. “Funniness has played a far more powerful role in human evolution than anyone seems to realise...with our love of laughing, and of those who make us laugh, we exert a selection pressure that significantly advantages those with the imagination that it takes to be funny.”

In partnership with the MacDiarmid Institute for Advanced Materials and Nanotechnology, the VIP Science Class is a small class for senior producers and presenters from Radio New Zealand, freelance science journalists, writers, artists and publishers. The classes have covered concepts such as entropy and wave-particle duality, climate change, the science of land use, natural disasters that might affect New Zealand, and in 2008, mathematics and nanotechnology.

## WHEN SCIENCE HITS THE HEADLINES



**From left to right:** Will Catton • Dave Armstrong  
• Dr Howard Lukefahr (centre) teaching the  
VIP Science Class • Vincent Heeringa (left),  
Chair of Advisory Board, at launch of Science  
Media Centre

Around the world there is a move towards greater transparency in the scientific research process and greater emphasis on better communication of science by the media. In Australia and the UK this has led to the formation of independent science media centres, which have proved highly effective in aiding the media when science is in the headlines on topics ranging from climate change to nanotechnology, from stem cell research to ocean acidification. The New Zealand Science Media Centre was established by the Royal Society of New Zealand in 2008 to fulfil this role locally, where a hunger for science news in general exists.

Based in Wellington but nationally focused, the Science Media Centre comprises a small team of media experts who help journalists gain access to the scientific community and to the resources they need to develop science-related stories. The Centre alerts reporters to new scientific research under embargo, giving them time to prepare in-depth coverage and interviews. Their aim is to give scientists a stronger voice in the media leading to better quality science coverage across all media genres. The internet is a crucial tool in this process and the Centre has developed an invaluable website at [www.sciencemediacentre.co.nz](http://www.sciencemediacentre.co.nz)





Promoting excellence in science and technology

The Royal Society of New Zealand

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