

# Finalists for the 25<sup>th</sup> edition of the Australian Museum Eureka Prizes



**Embargoed until 9 am (AEST), Friday 8 August 2014**

Forty-four entries have been selected as finalists for the 15 Australian Museum Eureka Prizes worth a total of \$150,000 in prize money. The finalists are from Western Australia, South Australia, Queensland, Tasmania, ACT, Victoria and New South Wales.

*The achievements of the 2014 Eureka Prize finalists are inspirational and vitally important for Australia," Kim McKay AO, director and CEO of the Australian Museum said. "The finalists' inventions and research will save lives, safeguard our environment for the future, and ensure the viability of Australian industry."*

The Australian Museum Eureka Prizes are the country's most comprehensive national science awards, honouring excellence in Research and Innovation, Leadership, Science Communication and Journalism, and School Science. 2014 is the 25th edition of the Australian Museum Eureka Prizes. They were first awarded in 1990.

## **The 2014 Eureka Prizes finalists have invented:**

- A \$2 microscope that turns your smartphone into a mobile, web-enabled laboratory (Canberra/Sydney)
- A simple, non-electric oxygen concentrator that could prevent hundreds of thousands of new-born deaths globally (Melbourne)
- A virtual Planet Earth that allows you to move continents around—and backwards or forwards in time (Sydney)

A DVD that's fighting parasitic worms in China (Brisbane/Canberra)

## **They've discovered:**

- Which animals and plants thrive on fire in the Mallee, and which take decades to recover (Melbourne)
- How to double grain production without using more water—through weed control, stubble maintenance and other smart management techniques (Canberra)
- What tree rings, coral growth, ice cores, old newspapers, and leather-bound weather journals reveal about south-eastern Australia's changing climate (Melbourne)

## **And, they've:**

- Revealed early indicators of Alzheimers by studying 1,400 people (Perth/Melbourne)
- Brought together thousands of hours of submarine citizen science to reveal biodiversity hotspots from the poles to the tropics (Hobart)
- Explored ocean acidification from the polar seas to the Great Barrier Reef (Sydney/Townsville)
- Filmed 'the crusty blue stuff' on trees—a Central Coast NSW student exploring lichen

Read about these and the many other achievements of the 2014 Australian Museum Eureka Prizes finalists at – <http://australianmuseum.net.au/2014-Finalists-Eureka>

## **Also revealed today: top ten stunning science photographs for 2014**

Ten images have been highly commended in the New Scientist Eureka Prize for Science Photography. All 10 images are online at <http://australianmuseum.net.au/eureka>. They're also available for publication. Here's one of the shots:



*Bolt out of the blue* is the result of Queenslander Peter Enright's lucky four-second handheld exposure during a sudden summer storm at the Woodford Folk Festival. The image encapsulates the incredible power of nature.



The winners of all 15 prizes will be announced in the presence of 660 science, government, culture and media leaders at the Eureka Prizes Award Dinner at Sydney Town Hall on Wednesday 10 September 2014. Details about all 2014 Australian Museum Eureka Prizes finalists are now online at [australianmuseum.net.au/eureka](http://australianmuseum.net.au/eureka)

For media enquiries please contact the Australian Museum Eureka Prizes media team

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## **Background**

The 2014 Eureka Prizes are:

- NSW Office of Environment and Heritage Eureka Prize for Environmental Research
- University of New South Wales Eureka Prize for Excellence in Interdisciplinary Scientific Research
- Australian Infectious Diseases Research Centre Eureka Prize for Infectious Diseases Research
- ANSTO Eureka Prize for Innovative Use of Technology
- Macquarie University Eureka Prize for Outstanding Early Career Researcher
- Defence Science and Technology Organisation Eureka Prize for Outstanding Science in Safeguarding Australia
- University of New South Wales Eureka Prize for Scientific Research
- Department of Agriculture Landcare Eureka Prize for Sustainable Agriculture
- 3M Eureka Prize for Emerging Leader in Science
- CSIRO Eureka Prize for Leadership in Science
- University of Technology, Sydney Eureka Prize for Outstanding Mentor of Young Researchers
- Australian Government Eureka Prize for Promoting Understanding of Australian Science Research
- Australian Government Eureka Prize for Science Journalism
- New Scientist Eureka Prize for Science Photography
- University of Sydney Sleek Geeks Science Eureka Prize – Primary
- University of Sydney Sleek Geeks Science Eureka Prize – Secondary

A full list of finalists is at <http://australianmuseum.net.au/2014-Finalists-Eureka>.

# 2014 Australian Museum Eureka Prizes Finalists



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## Research & Innovation

### NSW Office of Environment and Heritage Eureka Prize for Environmental Research



**Professor Graham Edgar and Dr Rick Stuart-Smith**, University of Tasmania

Reef Life Survey provides a new perspective for scientists and managers on the magnitude and distribution of threats occurring out-of-sight underwater. The survey applies the skills and commitment of highly trained recreational divers to collect data on population trends of thousands of marine species across geographic scales impossible for traditional scientific dive teams to cover.

**The IUCN Red List of Ecosystems Team**, University of New South Wales

Professor David Keith and his team in the International Union for the Conservation of Nature have developed the first global standard for assessing risks to ecosystems. Already used to assess risks to numerous terrestrial, freshwater and marine ecosystems in Australia and overseas, this method will be critical for reporting on the status of biodiversity globally under the Convention for Biodiversity.

**The Mallee Fire and Biodiversity Project Team**, La Trobe University and Deakin University

Australian landscapes have a long history of exposure to fire, and yet we know surprisingly little about how fire should be managed for biodiversity conservation. This project was an ambitious, tri-state study that used empirical data to test some of the key theories that underpin ecological fire management in Australia.

**The AIBL Research Team**, CSIRO, National Ageing Research Institute, Howard Florey Institute of Neuroscience and Mental Health, Austin Health and Edith Cowan University

The AIBL (Australian Imaging, Biomarkers and Lifestyle) study is one of the largest, well-characterised longitudinal cohorts of healthy ageing and cognitive decline in the world. The multidisciplinary approach and engagement of its 1400 participants has enabled AIBL researchers to make groundbreaking inroads towards understanding the progression of Alzheimer’s Disease and strategies for its prevention.

**Professor Justin Gooding, Professor Katharina Gaus and Dr Peter Reece**, University of New South Wales

Professor Justin Gooding’s team of chemists, physicists and cell biologists has developed an optical device that can monitor the activity of a single living cell, with wide-ranging applications in drug discovery, toxin detection and personalised medicine. The team’s work is making the next generation of cell-based diagnostic devices our present, not our future.

**SEARCH Project**, University of Melbourne

SEARCH (South-eastern Australian Recent Climate History) was a landmark project that drew together a world-class team of climate scientists, water managers and historians to extend our record of natural climate variability in the Australian region. The team uncovered a comprehensive picture of our climate history over the past 1000 years, a feat not achieved before.

**Professor Elizabeth Hartland and Dr Jaclyn Pearson, University of Melbourne**

Pathogenic *E. coli* is a significant cause of diarrhoeal disease worldwide. Professor Elizabeth Hartland and Dr Jaclyn Pearson have revealed new virulence mechanisms in bacterial infection and uncovered immune pathways important for fighting gut infection. This research has applications in the development of preventative measures for disease, and it extends our understanding of the host cell processes that contribute to fighting bacterial infections of the gastrointestinal tract.

**Hendra Virus Research Team, CSIRO**

The work of Dr Deborah Middleton and her team has led to the development of the first horse vaccine and human treatment for the Hendra virus. Until this breakthrough the Hendra virus was an unmanaged emerging infectious disease. This vaccine provides Australia, and the world, with the first targeted tools to protect people and animals against this deadly virus.

**Magic Glasses, QIMR Berghofer Medical Research Institute and University of Queensland**

The Magic Glasses team has developed a cartoon DVD and educational package promoting hygiene across rural China. The package was hugely successful in reducing parasitic worm infection rates – a major global health problem – and has been described as a game changer for global health initiatives.

## ANSTO Eureka Prize for Innovative Use of Technology



**DIY Droplet Lens**, Garvan Institute of Medical Research and Australian National University

The traditional light microscope is bulky and expensive. Dr Tri Phan and Dr Steve Lee used gravity to manufacture high-performance polymer lenses. These can be seamlessly integrated with 3D printing and mini-LEDs to produce a cheap, portable microscope device that is digital and web-enabled to transform smartphones into mobile laboratories, all for just \$2 each.

**FREO2**, University of Melbourne and DETECT Australia

Globally, pneumonia kills more children than any other illness. Oxygen treatment could save many lives, but a lack of reliable electricity means that small clinics rarely have it. To meet this challenge the FREO2 (Fully Renewable Oxygen) team is developing a low-cost, electricity-free oxygen concentrator for developing countries.

**Monash Engineering**, Monash University

Stimuli-responsive polymer hydrogels have been developed by the Monash Engineering team as a new class of osmotic agent for extracting fresh water from saline water and wastewaters using sunlight or low-grade heat sources. They provide a low-cost, environmentally friendly technology for producing clean water with important economic, environmental and social benefits.

**The Extremes Team**, University of New South Wales

Extreme temperature and rainfall events have devastating impacts on people, ecosystems and infrastructure. Until now, surprisingly little was known about the long-term variability of extreme weather events, the mechanisms driving them and how they might change in future. Led by Dr Lisa Alexander, The Extremes Team has made major advances in assessing the long-term global trends in both temperature and precipitation extremes.

**Associate Professor Simon Ho**, University of Sydney

Evolutionary biologist Simon Ho has made major contributions and developed new methods in the field of 'molecular clocks'. These are a way of estimating evolutionary rates and timescales from DNA sequences using statistical models. Professor Ho has made a huge impact on understanding variation in evolutionary rates at the genetic level.

**Associate Professor Richard Payne**, University of Sydney

Professor Richard Payne is pioneering the development of much-needed therapies for tuberculosis, malaria and cancer, which are responsible for enormous morbidity and mortality worldwide. Professor Payne has developed and used highly innovative synthetic chemistry methods and drug-screening technologies to develop novel molecules for treating these diseases.



**Defence Science and Technology Organisation Eureka Prize for Outstanding Science  
in Safeguarding Australia**



**Tim Lyons, One Atmosphere**

When a helicopter crashes into water, fatalities will more likely be caused by drowning than the impact of the crash. Tim Lyons has invented the Pegasus ABS (Aircraft Buoyancy System) which is a lightweight post-crash emergency buoyancy system designed to increase survivability following a helicopter crash in water.

**B-cell Team**, Walter and Eliza Hall Institute of Medical Research

Antibody is essential for long-term protection against infection, but the production and maintenance of the cells responsible is remarkably complex. Professor Philip Hodgkin's team fostered a unique approach for solving this problem that revealed how different immune cells are made and how they survive for long periods.

**EarthByte**, University of Sydney

Professor Dietmar Müller and his team have developed GPlates, an Experimental Virtual Planet for exploring Earth's geological evolution. Used in 143 countries, this free software is revolutionising Earth process modeling and frontier deep Earth resource exploration by combining innovative data-mining and fusion, computer simulation and visualisation features.

**Professor Steven Sherwood**, University of New South Wales

Professor Steven Sherwood has made unprecedented advances in our understanding of Earth's climate and how continued warming would affect humanity. By directly addressing the two most important questions surrounding this problem, 'how much will the world warm in the future?' and 'how readily could we adapt?', Professor Sherwood's findings are of crucial scientific and societal importance.

**EverGraze**, Future Farm Industries CRC

Through integrated research and modelling, EverGraze demonstrated that significant increases in the profitability of livestock enterprises could be achieved concurrent with reductions in groundwater recharge and soil loss. Communication of results as key messages which consider the implications of the research for the whole farm has so far led more than 4000 farmers to implement changes on farms.

**Dr John Kirkegaard** and **Dr James Hunt**, CSIRO and **Stuart Kearns**, Grains Research and Development Corporation

The Water Use Efficiency Initiative has provided leadership for the Australian grains industry. The initiative has delivered innovative farming systems science and achieved widely adopted and profound impact on crop productivity and sustainability, as well as environmental benefits through the implementation of achievable practice change for growers.

**Professor Richard Oliver**, **Dr Caroline Moffat**, **Dr Kar-Chun Tan**, **Kasia Clarke** and **Dr Huyen Phan**, Curtin University

In Australia, annual wheat losses due to yellow spot (also known as tan spot) and septoria nodorum blotch are estimated at more than \$300 million. Professor Richard Oliver's team is combating these 'cereal killers' using a novel approach to breed disease-resistant wheat, including a test that can clearly identify resistant varieties. This two-week test replaces three years of field testing, bringing multi-million dollar savings to Australia's agricultural industry.

## Leadership

### 3M Eureka Prize for Emerging Leader in Science



**Dr Ravi Bakaraju**, Brien Holden Vision Institute

Myopia (near-sightedness) is becoming epidemic globally, affecting up to 90% of adolescent girls in Asian countries, while presbyopia (age-related loss of ability to focus near objects) will soon affect more than 40% of Australians. Dr Ravi Bakaraju assembled a dedicated and top-performing team that has developed a novel contact lens design to slow myopia progression and dramatically improve vision for presbyopes.

**Dr Adriana Downie**, Pacific Pyrolysis Pty Ltd

Dr Adriana Downie is a scientist, engineer, academic and entrepreneur who passionately leads the way towards her clear vision of contributing to a sustainable future with biochar technology. She upholds a solid publication record while effectively mobilising fellow researchers, industry partners, government bodies, environmental NGOs and international collaborators.

## CSIRO Eureka Prize for Leadership in Science



### **Professor Hugh Durrant-Whyte**, National ICT Australia (NICTA)

As the CEO of NICTA and a world leader in Field Robotics, Professor Hugh Durrant-Whyte has an outstanding record in training young engineers and scientists. Professor Durrant-Whyte has focused NICTA on tackling challenging research problems and delivering major wealth creation outcomes for Australia.

### **Professor Michelle Simmons**, University of New South Wales

Professor Michelle Simmons has pioneered a radical new technology for creating atomic-scale devices. Professor Simmons leads a team of over 180 Australian researchers through the ARC Centre of Excellence in Quantum Computation and Communications Technology. Their groundbreaking work has opened a new frontier of research in computing and electronics globally, placing Australia at the forefront of this field.

### **Professor Terence Speed**, Walter and Eliza Hall Institute of Medical Research

Professor Terry Speed has played a major role in building Australia's capacity in bioinformatics research through outstanding leadership for science and mentoring in the fields of mathematics, statistics and genetics. His passion for advocating interdisciplinary collaboration and fostering diversity makes him one of the most respected leaders in science worldwide.

## University of Technology, Sydney Eureka Prize for Outstanding Mentor of Young Researchers



**Associate Professor Lynn Corcoran**, Walter and Eliza Hall Institute of Medical Research

Achieving outstanding success in a number of different research areas throughout her career, Professor Lynn Corcoran has also been involved in mentoring young researchers and advocating for women in science, both within and outside her organisation. Professor Corcoran is actively involved in promoting high school science education to Victorian students and facilitating the career progression of female scientists.

**Professor Maree Teesson**, Centre of Research Excellence in Mental Health and Substance Use, University of New South Wales

Professor Maree Teesson's passion for mentoring and nurturing the next generation of researchers has been instrumental in positioning Australia at the forefront of the discipline of mental health and substance use internationally. Professor Teesson's vision and drive, mixed with compassion and care, make her one of our true academic leaders.

**Professor Bob Williamson**, University of Melbourne

One of Australia's most distinguished scientists, Professor Bob Williamson is frank, down-to-earth and generous with his time and experience. He has mentored many young researchers in science, medicine and policy, and their success at national and international levels, and across multiple sectors, is testament to his innate ability to empower young researchers, particularly women.

## Science Communication & Journalism

### Australian Government Eureka Prize for Promoting Understanding of Australian Science Research



#### **Professor Philip Batterham**, University of Melbourne

Professor Philip Batterham has activated every available medium to creatively engage the Australian public with his inexhaustible passion for research on genetics, evolution, agriculture and health. He mobilises other scientists and students to communicate with those who sit outside the reach of traditional engagement activity, exciting their interest in science.

#### **Associate Professor Darren Curnoe**, University of New South Wales

Challenging how we think about human evolution, Professor Darren Curnoe forges innovative ways to meet the strong public desire for reliable knowledge about human origins. From documentaries to regular radio interviews, and articles in *The Conversation* to a dedicated blog, Professor Curnoe is central to moulding public understanding of 'how did we get here?'

#### **Professor Lesley Hughes**, Macquarie University

Professor Lesley Hughes believes climate change is the most important social, environmental and economic challenge of our time. Simply doing research on the science and impacts of climate change is not enough for her; through communicating her work, Professor Hughes aims to reach the hearts and minds of the public and policy-makers to make a real difference.

**Sally Ingleton**, 360 Degree Films

Ocean acidification is one of the biggest environmental challenges facing our planet today. From the icy polar seas to the world's most pristine coral reefs, *Acid Ocean* tracks the latest in marine scientific research and introduces the audience to Dr Katharina Fabricius from the Australian Institute of Marine Science who has made a game-changing discovery.

Broadcast on *SBS1*, 30 October 2013

**Sonya Pemberton**, Genepool Productions

Across the world, children are getting sick and dying from vaccine-preventable diseases, because nervous parents are skipping their children's shots. Yet there are frightening stories of people injured, even dying, after vaccination. *Jabbed – Love, Fear and Vaccines* examines the risks and asks, 'How do we decide whether to vaccinate, or not?'

Broadcast on *SBS1*, 26 May 2013

**Michael Slezak**, *New Scientist*

Michael Slezak follows scientific advances as they happen, presenting the iterative, dynamic and exciting nature of science. From groundbreaking Darwinian cancer research and cutting-edge technology used in a solar car race across Australia, to drug policy in New Zealand and cane toad research, Michael presents the world's science to Australians and outstanding Australian science to the world.

Published in *New Scientist*, 19 June 2013, 16 July 2013, 16 October 2013, 10 March 2014 and 25 April 2014



## New Scientist Eureka Prize for Science Photography

### Finalists

*Alfred Manta Feeding*, **Gary Cranitch**, Queensland Museum

The Alfred Manta, *Manta alfredi*, one of the largest rays on the planet, is currently listed as vulnerable in eastern Australian waters with recorded individuals numbering in the few hundred. Gary Cranitch's awe-inspiring image is an important reminder that we still have much to do to ensure the survival of this beautiful species.

*Wheat Through the Looking Glass*, **Dr Mark Talbot**, CSIRO Plant Industry

Dr Talbot's scanning electron microscope (SEM) image shows young flower buds of wheat that will eventually become seeds. Using different modes of the SEM, two images of the same tissue were captured, superimposed and artificially coloured to highlight cell outlines (blue) and nuclei (orange). This unique way of creating SEM images unexpectedly revealed details normally seen only with a confocal laser microscope, even though the microscopes work in very different ways.

*Unravelling a Basket Star*, **Charles Tambiah**, Australian National University

Charles Tambiah's striking image of a basket star, *Gorgonocephalus* sp., has been composed by 'painting' with micro-light to peel back layers of science. Utilising the full breadth of tools within imaging software, and fibre-optics for lighting hidden spaces, Charles has painted multiple layers of information out of blackness, unravelling a simple, yet complex, marine invertebrate.

### Highly commended

*Nanoparticle Planet*, **Michael Bradshaw**

Michael Bradshaw's image shows skin cells with internalised nanoparticles. The large circle is a 10-millimetre coverslip and the bright orange dots are the fluorescent and magnetic nanoparticles inside the cells. The cells are being induced to migrate off to the left of the coverslip via an external magnetic field. This kind of cellular control has implications in wound healing.

*Bolt Out of the Blue*, **Peter Enright**

*Bolt out of the Blue* is the result of Peter Enright's lucky four-second handheld exposure during a sudden summer storm at the Woodford Folk Festival. The image encapsulates the incredible power of nature.

*The Face of a Moth*, **Ralph Grimm**



Many animals, particularly insects, have the ability to perceive their surroundings in a totally different way to humans. Ralph Grimm's textural, close-up image draws the viewer in to reveal the exquisite detail and complexity of a moth's head, thereby also encouraging people to not just see the surface but to look more closely at our amazing world.



*Flight of the Samara*, **Phred Petersen**, RMIT University

Phred Petersen's *Flight of the Samara* is a composite of four frames from high-speed video showing the aerodynamics of an auto-rotating winged seed (samara) common to trees such as maple and ash. This seed was tagged with a theatrical smoke formula to show an integrated picture of the descent of the seed over several rotations. Understanding the aerodynamics of these natural helicopters has application in the bio-inspired design of micro air vehicles.

*Probing the Breast in 3D*, **Dr Anne Rios**, Walter and Eliza Hall Institute of Medical Research

This picture, taken inside human breast tissue, shows a 3D view of the elaborated milk-producing ductal network enwrapped within the blood vessels. This photo represents more than 100GB of data, obtained with a new, cutting-edge 3D confocal strategy developed at WEHI. It allows a unique visualisation of expansive areas of breast tissue with high cellular resolution that could bring new insights in breast cancer.

*An Ancient Landscape for Modern Science*, **Pete Wheeler**, International Centre for Radio Astronomy Research

Using a long exposure and the light of the full moon to illuminate the landscape, Pete Wheeler has captured one of the 128 'tiles' of the radio telescope called the Murchison Widefield Array and a distant 'breakaway' beneath a star-studded Murchison sky. Located in the Western Australian outback, the Murchison Widefield Array is a precursor to what will be the largest telescope ever built, the Square Kilometre Array.

*Thorny Problems*, **Richard Wylie**, Euakafa Island Research Centre

Crown-of-thorns Sea Stars have a justifiably bad reputation for causing damage to the Great Barrier Reef. Richard Wylie's photo, taken at Lizard Island, demonstrates that even one 40-centimetre wide Crown-of-thorns can eat its way through a large area of reef. The white coral, which has been consumed by this sea star, is in sharp contrast to the healthy sections of reef.

## School Science

### University of Sydney Sleek Geeks Science Eureka Prize – Primary



*What Colour is a Tree in the Dark?* **Ella Cuthbert**, Majura Primary, ACT

Ella is passionate about colour and recognises its importance not only in science, but also in our world. Using a variety of film techniques including claymation, Ella's film explores the connection between colour and light, and proves that without light there is no colour.

*The Sound of Music*, **Harry Driessen**, Croydon Public School, NSW

In *The Sound of Music* Harry explains what sound waves are, how we hear sound, and how various stringed, woodwind and brass instruments produce notes of different pitch. Harry's film brings together two subjects that are close to his heart: music and science.

### University of Sydney Sleek Geeks Science Eureka Prize – Secondary

*The Mystery of Lichen*, **Mikali Anagnostis**, St Philip's Christian College, NSW

Mikali's film explores the unusual topic of lichen, the 'crusty blue stuff' on trees. He shows the audience a variety of types of lichen, describes their structure and explains how they consist of a symbiosis between an alga or cyanobacterium and a fungus.

*Phantom Limbs*, **Jackson Huang**, Queensland Academy for Science, Mathematics and Technology, Qld

Jackson uses phantom limbs, a puzzling neurological disorder often experienced by amputees, to enlighten the audience about the nervous system. The film engages people with neuroscience and outlines the theories behind phantom limb syndrome.

*Epigenetics*, **Jackson McDonald**, Varsity College, Qld

Jack Mac tackles a fascinating new field of science in his film, *Epigenetics*. While DNA is our genetic blueprint, external factors like diet and stress can sometimes switch off a gene and therefore stop it from acting according to the plan. Jack's film is a clever introduction to a complex subject.