

2014  
VICTORIA PRIZE  
FOR SCIENCE &  
INNOVATION  
VICTORIA  
FELLOWSHIPS







# MESSAGE FROM THE MINISTER

The 2014 Victoria Prize and Victoria Fellowships recognise and celebrate the outstanding contribution our state's leading scientists and researchers are making in the fields of physical sciences and life sciences. Their tireless efforts are at the forefront of the new technologies, products and services that are enhancing our way of life and creating new high value jobs and prosperity for our communities.

In 2012, the Victorian Government doubled the number of Victoria Prizes and Victoria Fellowships as part of our ongoing commitment to building a more productive economy underpinned by innovation and a highly skilled workforce. The Victoria Prize for Science & Innovation now provides two individual awards of \$50,000 each, one for work in the life sciences and one for work in the physical sciences. There are also 12 Victoria Fellowships available that award up to \$18,000 each to researchers and innovators to enable them to undertake international study missions.

I am delighted that the Australian French Association for Science and Technology Associate Awards will again support two Victoria Fellows to continue studies in France.

For 16 years, this prestigious prize and fellowship program has highlighted Victoria's position as the science and research capital of Australia, while also giving many talented Victorians the opportunity to progress their careers by deepening their research, undertaking specialist training and forging international connections. As in past years, the standard of applications has been extremely high, with nominees for a prize and applicants for a fellowship chosen after a rigorous and competitive selection process. On behalf of all Victorians, I congratulate the winners and applicants for their outstanding efforts

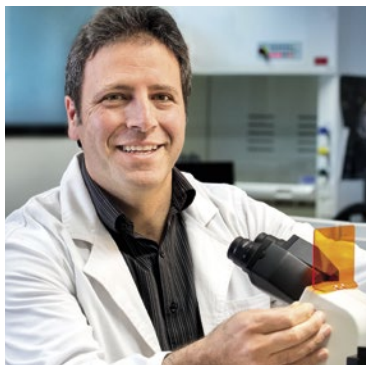


**Hon. Louise Asher MP**  
**Minister for Innovation**  
**Minister for Tourism and Major Events**  
**Minister for Employment and Trade**



# VICTORIA PRIZE FOR SCIENCE & INNOVATION

## Physical Sciences



*Developing nanoscale  
engineered particles aimed  
at improving medical and  
healthcare outcomes*

### Professor Frank Caruso The University of Melbourne

Patients with cancer, AIDS and cardiovascular disease are the potential beneficiaries of ground-breaking research by 2014 Victoria Prize for Science & Innovation recipient Professor Caruso.

Professor Caruso's work is focused on the development and application of nanomedicines which have the potential to supersede current therapeutics and significantly improve healthcare and medical outcomes.

His scientific research has led to the development of a new field based on particle-templated assembly of materials. Using particles as templates for the sequential deposition of ultra-thin layers of materials, the templates are then removed to create a new generation of miniature capsules. Professor Caruso's work on engineered capsules has transformed the field of particle engineering and has inspired researchers in a number of other related fields.

The innovative use of a nanotechnology-based approach has resulted in the development of new classes of stimulus-responsive capsules, novel strategies for loading capsules with therapeutics, pioneering studies in targeting capsules to cancer and immune cells for drug and gene delivery, and applying capsules for neuron preservation in the inner ear, bone formation in mice, and vaccine translational in vivo studies.

The economic and social significance for Australia of his work is considerable as particle-based nanomedicines are likely to supersede current treatments.

In 2006, Professor Caruso led research between The University of Melbourne and iCeutica Inc. that developed early drug formulations of the SoluMatrix Fine Particle Technology™, a scientific process that breaks drug particles into smaller pieces so that they dissolve faster and allow for lower doses of medication. This led to the development of ZORVOLEX™, a capsule that moderates acute pain in adults.

Professor Caruso is an Australian Research Council Laureate Fellow at The University of Melbourne. Among his numerous awards, he was the recipient of the inaugural 2012 American Chemical Society Nano Lectureship Award, the Royal Society of Victoria Medal for Excellence in Scientific Research in the Physical Sciences and in 2013 was awarded the prestigious CSIRO Eureka Prize for Leadership in Science.

# VICTORIA PRIZE FOR SCIENCE & INNOVATION

## Life Sciences



### Professor Ashley Bush

#### The Florey Institute of Neuroscience and Mental Health

Professor Bush is a recipient of the 2014 Victoria Prize for Science & Innovation for his outstanding body of work on translational neuroscience. This includes new findings on the cause of Alzheimer's disease and the importance of metal biology in degenerative brain diseases.

Professor Bush's research addresses how the interaction of key proteins and metals in the brain contributes to the development of diseases such as Alzheimer's, Parkinson's and Huntington's.

With neither a modifying treatment for Alzheimer's, nor a predictive diagnostic test currently available, this research is urgent. Professor Bush is actively working to develop disease-modifying drugs as well as blood tests to help diagnose and monitor disease progression.

Degenerative brain disease research is of critical importance given the proportion of Australians aged over 65 is projected to reach more than 27% by 2051.

Professor Bush's approach has championed an alternative to mainstream research by using an innovative target to develop a class of novel drugs (represented by PBT2) that has shown promise in not only treating Alzheimer's disease and other brain diseases, but in potentially preventing the progression of age-related cognitive decline. The mechanism of this class of drug involves restoring the uptake of trapped physiological metals to trigger biochemical and anatomical changes to rescue brain function.

The extremely promising results - in animals and humans - have been published in scientific journals, and the drug class is now moving through testing with the aim of delivering an effective treatment to market for degenerative brain diseases.

Professor Bush is the Director of the Oxidation Biology Unit at The Florey Institute, an NHMRC Australia Fellow, Co-Director of Biomarker Discovery for the Australian Imaging Biomarker and Lifestyle Flagship Study of Ageing, Chief Scientific Officer of the Cooperative Research Centre for Mental Health, and holds an academic appointment at Massachusetts General Hospital. He is the recipient of numerous awards including the Potamkin Prize for Alzheimer's research.



*Developing disease-modifying drugs for degenerative brain diseases as well as diagnostic and monitoring tools*

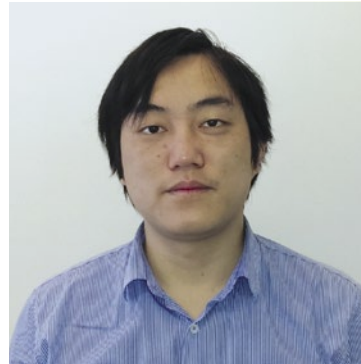
# VICTORIA FELLOWSHIPS

## Physical Sciences



**Dr Timothy Crouch**  
Monash University

The popularity of sports in Victoria is influencing career choice for young people with growing student interest in the subjects of sports engineering, applied aerodynamics and sports innovation. Dr Crouch's work in the development of applied solutions to sports engineering recognises collaboration as a key to successful outcomes. His study mission in the USA will provide first hand access to the experience of collaboration in the STE@M program (Sports, Technology and Education at the Massachusetts Institute of Technology) that is dedicated to building an interconnected community of faculty, students, industry partners and athletes passionate about tackling challenges associated with engineering and sports. Dr Crouch will also visit the Specialized Bikes' wind tunnel in California to support his work at Monash University on the largest wind tunnel in the Southern Hemisphere.



**Dr Zongsong Gan**  
Swinburne University of Technology

Cloud computing requires technological infrastructure to meet increased demand for big data storage while limiting energy consumption. Dr Gan is investigating the possibilities of optical memory and has already realised optical super-resolution fabrication with a feature size of 9 nm (nano metres). This ground-breaking achievement has the potential to revolutionise information industries and provide a new technology platform for big data centres. This study mission will allow Dr Gan to visit research institutes and data management organisations in Germany, the USA and China to further improve existing optical storage instruments in Australia. His work will help to ensure Victoria retains a leading position in ultra-high capacity photonic information technologies.



# VICTORIA FELLOWSHIPS

## Physical Sciences



**Mr Tobias Horrocks**  
Fold Theory

Mr Horrocks is an architect who designs cardboard installations, exhibitions and furniture using computer-aided technology to push the limits of this product beyond what was previously imagined. Cardboard is a light-weight material but when engineered intelligently is strong enough to replace less sustainable materials currently used in construction and interiors. This study mission will allow Mr Horrocks to visit leading international designers in Italy, Spain, Poland, the USA and the UK and to share the learnings with architecture and design communities in Victoria. Cardboard manufacturing capabilities already exist in Victoria but innovation in materials has been limited by lack of new experience and knowledge among local designers. The study mission will also be used to investigate new computer software for developing models.



**Dr Gregory Knowles**  
Monash University

Anthropogenic greenhouse gas emissions are the main drivers of global warming and climate change with the largest impact coming from fossil fuel power generators. Dr Knowles from Monash University is working on technologies for carbon dioxide capture and sequestration (CCS) as well as its utilisation. The application of CCS technologies in Victoria is a strategic interest as it would leverage the state's competitive advantage in energy while minimising the impact of emissions. The study mission to laboratories and facilities in Scotland and France will assist the understanding and development of amines and the CCS technology.

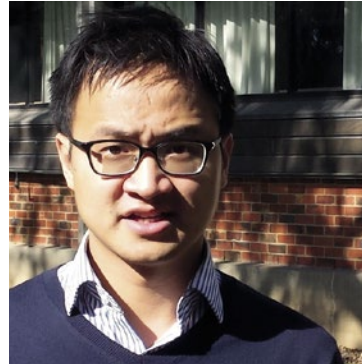
# VICTORIA FELLOWSHIPS

## Physical Sciences



**Dr David McCarthy**  
Monash University

Urbanisation, population growth and a changing climate are placing increased pressures on urban rivers and estuaries in Australia including Melbourne's Yarra River. Dr McCarthy from Monash University is evaluating the health risk posed by an increased concentration of pathogens in the water to people who use these rivers and estuaries. This study mission will connect Dr McCarthy with experts in recreational water epidemiology in the USA which currently has the most active community in this field of research. On his return, Dr McCarthy will integrate the knowledge to conduct an epidemiological study of the Yarra River to identify risk to recreational users of this iconic water system and to build Australia's expertise in recreational water epidemiology.



**Mr Steven Wang**  
CSIRO & Monash University

Mr Wang has been working on a new approach to separating solids and liquids that presents exciting opportunities for a number of Victorian industries including those in the processing of chemicals, minerals, pharmaceuticals, food, water and waste products. In particular, Mr Wang's work on particle clustering has potential commercial application in the Australian minerals industry as it has shown to increase product purity, reduce waste, better integrate biotech processes and accommodate lower quality raw materials. Mr Wang's travel to the Massachusetts Institute of Technology in the USA will further develop his research work on particle clustering.



# VICTORIA FELLOWSHIPS

## Life Sciences



**Dr Jacqueline Flynn**  
Burnet Institute

With more than 35 million people world-wide reported to have HIV and a further 700 new cases reported in children each day, there is a critical need to develop an effective vaccine and antivirals. A key to developing such preventative therapies is an understanding of how HIV spreads infection among immune cells. This study mission to the UK and France will provide Dr Flynn with specialist training in performing cell to cell HIV infection assays between macrophages and T cells. It will be an invaluable skill that can be incorporated into Victoria's HIV research capabilities.



**Dr Peter Macreadie**  
Deakin University

Green infrastructure can manage human and climate stress to the coastal landscape using a network of components, both natural and designed, to deliver economic, social and environmental benefits. Dr Macreadie's work involves exploring the green infrastructure approach to reduce urban runoff, improve air, soil and water quality, enhance fisheries and recreational activities and improve resilience to extreme weather events. The Victorian Coastal Council has identified a range of measures to deal with erosion and inundation and is evaluating whether green infrastructure could replace grey infrastructure. Dr Macreadie's study mission will involve visits to the USA's foremost authorities on green infrastructure to undertake training and develop collaborative networks. It will inform the future directions of Victoria's coastal infrastructure development.

# VICTORIA FELLOWSHIPS

## Life Sciences



**Ms Heather Nuske**  
Olga Tennison Autism Research  
Centre, La Trobe University

Over the past decade, autism research using brain-imaging techniques has enabled important discoveries not possible using behavioural research methods alone. Ms Nuske's study mission to a range of university research centres across the UK will allow her to engage in lab-based training in brain-imaging and psychophysiology recording techniques relevant to young children with autism. The techniques provide an understanding of how the brain and body of individuals with autism respond to certain types of information, such as social stimuli. These insights have the potential to aid the detection and treatment of autism. Ms Nuske will be able to apply these insights to her continuing research in Victoria on the emotional responses of children with autism as well as early diagnosis of autism.



**Dr Udani Ratnayake**  
Florey Institute of Neuroscience  
and Mental Health

Schizophrenia is a severely debilitating disorder affecting around one per cent of the world's population. Dr Ratnayake and her colleagues have been working on a revolutionary neuroanatomical technique, CLARITY that allows for the first time, the simultaneous imaging of molecular markers and network structure in the intact brain. The study mission to Massachusetts Institute of Technology and Cold Spring Harbour Laboratory will provide Dr Ratnayake with knowledge and training in the most current and innovative technologies in neuroscience. The insights and techniques will subsequently be shared with researchers at the Melbourne Brain Centre as well as other universities and research institutes in Australia.

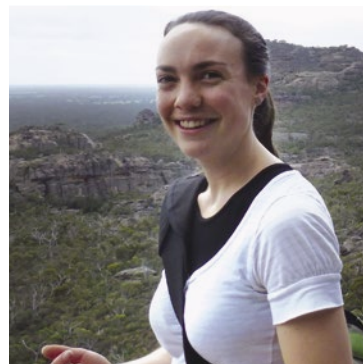
# VICTORIA FELLOWSHIPS

## Life Sciences



**Dr Megan Rees**  
Monash University

Tuberculosis (TB) from *Mycobacterium tuberculosis* (*M.tb*) is the world's greatest cause of death by a single species of bacteria with 1.4 million deaths recorded each year. Victoria's strong public health policies have helped maintain relatively low rates of TB in the state. However rates of infection have started to rise in the past decade as well as an increase in the cases of multiple drug resistance recorded in Victorian hospitals. There is an urgent need for a deeper understanding of the specific ways in which *M.tb* causes TB. Dr Rees will use the study mission in Canada to investigate the cutting edge technology of proteomics to unravel the differences between two species of mycobacteria and to identify disease-causing proteins. The study will inform her future research in Victoria.



**Miss Freya Thomas**  
The School of Botany, University  
of Melbourne

The Royal Commission into the Black Saturday bushfires re-emphasised the need to manage Victorian landscapes to protect life and property, while maintaining biodiversity. A key part of this process is evaluating the appropriateness of fuel reduction burning, or wildfire for Victorian landscapes, using tolerable fire intervals and plant attributes. These tools draw on expert knowledge of the reproductive lifespan of various species to identify which fire regimes sustain the majority of species. Data underlying the tools is scarce. Miss Thomas is developing methods to incorporate plant traits into multi-species models of plant growth and reproduction in order to predict demographic rates for plant species. This research can support fire management decisions. Miss Thomas will visit universities and training institutes in South Africa, Ireland, Spain, France and the USA.

# PREVIOUS WINNERS OF THE VICTORIA PRIZE FOR SCIENCE & INNOVATION

Year	Recipient	Research Area
2013	Professor Lloyd Hollenberg Professor Alan Cowman	(Physical) Quantum sensing technology (Life) Malaria research
2012	Professor Ana Deletic Professor Terence (Terry) Speed	(Physical) Storm water management (Life) Bioinformatics
2011	Professor Andreas Strasser	Cancer cell research and apoptosis
2010	Associate Professor Voytek Gutowski	Manufacturing technology
2009	Professor Murray Esler AM	Cardiovascular neuroscience
2008	Dr Peter Colman	A new class of anti-influenza viral drugs
2007	Professor Colin Masters	Alzheimer's disease pathways
2006	Professor David Solomon AM	Polymer chemistry
2005	Professor Eric Reynolds AO	Remineralisation of dental caries
2004	Professor Keith Nugent	Quantitative phase imaging
2003	Dr David Vaux	Programmed cell death – apoptosis
2002	Professor David Boger	Fluid mechanics
2001	Dr Roger Francey & Dr Paul Steele	Greenhouse gas monitoring
2000	Professor Donald Metcalf AC	Haematology
1999	Professor Graeme Clark AC	Hearing solutions: Cochlear implants
1998	Mr Andrew Martin	Digital microwave radio systems

For further information on the awards and to view a full list of past Victoria Prize and Victoria Fellowship recipients visit [business.vic.gov.au/vicprize](http://business.vic.gov.au/vicprize) or [business.vic.gov.au/vicfellows](http://business.vic.gov.au/vicfellows)



# 2014 VICTORIA PRIZE FOR SCIENCE & INNOVATION VICTORIA FELLOWSHIPS

## Victoria Prize for Science & Innovation

Created in 1998, the annual Victoria Prize for Science & Innovation program supports and recognises outstanding Victorian scientific research and innovation. In 2012, the Victorian Government doubled the number of Victoria Prizes awarded annually.

The prestigious \$50,000 tax-free Victoria Prize is awarded to outstanding Victorian researchers whose discovery or innovation, or potential discovery or innovation, has significantly advanced knowledge or has provided commercial or other benefits to the community.

The Victoria Prize for Science & Innovation honours the life-long commitment and achievements of the recipients.

## Victoria Fellowships

The Victoria Fellowships were established in 1998 to encourage innovation and the commercial application of research among researchers in the early stages of their careers. In 2012, the Victorian Government doubled the number of Victoria Fellowships awarded annually.

Up to 12 people will be awarded up to \$18,000 tax-free each for international study missions.

Overseas study missions offer Victoria Fellows the opportunity to broaden their experience, develop international networks and better understand where their activities fit into the local and international scene. The Victoria Fellowship also provides an opportunity to develop commercial ideas.

[veski](#), on behalf of the Victorian Government, is delivering the Victoria Prize for Science & Innovation and Victoria Fellowships in 2014.

## Australian French Association for Science and Technology (AFAS) Associate Award

Victoria Fellowship applicants can apply for an AFAS Associate Award.

AFAS Associate Awards support study missions to France, in conjunction with the Victoria Fellowship, and aim to facilitate science and technology innovations that mutually benefit Victoria and France.





[business.vic.gov.au/vicprize](http://business.vic.gov.au/vicprize)  
[business.vic.gov.au/vicfellows](http://business.vic.gov.au/vicfellows)  
August 2014