



**2016
VICTORIA PRIZE
FOR SCIENCE &
INNOVATION**

VICTORIA
FELLOWSHIPS



MESSAGE FROM THE MINISTER

2016 Victoria Prize for Science and Innovation and Victoria Fellowships

Victoria is a globally recognised hub for science, innovation and our research and development capabilities.

Our scientists and researchers are the driving force behind innovation in our industries, with a strong culture of collaboration locally and internationally.

Our reputation in scientific research, engineering and design, cyber security, life sciences and medical technologies stems from this and truly is a testament to the high quality of innovators and researchers that Victoria's universities and research institutions produce.

Right now in Victoria, innovation is playing a leading role in shaping the future of our economy – an economy where we have transitioned from traditional industries, like automotive and manufacturing, and are now investing in high growth industries that rely on our scientists and researchers to drive new ideas and products.

We need more people like you that will research, trial and develop the new technologies of the future that will boost the global competitiveness of our local companies as well as attract the world's leading brands to invest here in Victoria, creating more jobs for our state.

The Andrews Labor Government is proud to partner with **veski** for the Victoria Prize for Science and Innovation and the Victoria Fellowships to support our outstanding leaders in science and their contributions to the Victorian community.

The Victoria Prize for Science and Innovation provides two individual awards, valued at \$50,000 each, for work in the life sciences and the physical sciences. The 12 Victoria Fellowships, valued at \$18,000 each, also support researchers in science, engineering and technology, who are in the early stages of their career and would benefit from an international study mission.

We are giving our most promising young researchers global opportunities where they will create new networks and shine a light on Victoria's world-leading research capabilities.

The standard of applications was again exceptional this year, confirming the depth of talent and capability we have here in Victoria – I thank the panel for their diligence in selecting the successful candidates.

Congratulations to the 2016 Victoria Prize winners and Fellows for their unwavering dedication to their work and their contributions that make our community better.



Hon. Philip Dalidakis MP
Minister for Small Business,
Innovation and Trade



VICTORIA PRIZE FOR SCIENCE & INNOVATION

Life Sciences



Professors Jamie Rossjohn and James McCluskey

Professors Jamie Rossjohn and James McCluskey have been awarded the 2016 Victoria Prize jointly for their substantial and sustained contributions to our understanding of the human immune system. Their research has both fundamental and clinical importance in understanding infection and immunity.

During their 15 year collaboration, Professor Rossjohn from Monash University and Professor McCluskey from The University of Melbourne, have co-published over 125 research papers, translated their research for improved health outcomes and mentored a large number of next generation researchers.

Professors Rossjohn and McCluskey have made a number of key discoveries including uncovering how genetic variability between different individuals affects their immune responses to viruses and other microbes. Their groundbreaking discovery around pre-T-cell antigen receptors provides an enhanced understanding of how T cells develop in the thymus. They have provided a detailed molecular understanding of how T-cells recognise foreign tissues during transplant rejection, drug hypersensitivities and the wheat allergy that causes celiac disease. Their research has underpinned personalised genetic testing which has direct clinical significance across a range of medical conditions including avoidance of life threatening drug allergy and better matching of transplant donors and recipients.

The pair have provided novel insights into T-cell biology, specifically defining the basis of key immune recognition events by T-cells that sense peptide, lipid and other foreign molecules that trigger immunity. Their recent finding that a subset of T-cells respond to vitamin B-based precursors has shifted our understanding of the immune system by revealing an entirely new class of microbial targets in immunity.

This groundbreaking work may lead to new diagnostics and potential therapeutics to combat disorders of the bowel and other mucosal-based disease.

Both are Fellows of the Australian Academy of Science and have received numerous prizes, awards and international invitations for their long list of achievements, including the 2011 Roche Organ Transplantation Research Foundation Award, the 2013 Eureka Prize for Scientific Research jointly with Lars Kjer-Nielsen and the 2015 GSK Award for Research Excellence.

VICTORIA PRIZE FOR SCIENCE & INNOVATION

Physical Sciences



Professor Min Gu

Professor Min Gu is an internationally renowned physicist and expert in three-dimensional optical imaging theory. He is a world leading authority in the fields of nanophotonics, which includes nanofabrication, biophotonics, optical data storage and solar cells.

His groundbreaking research into super-resolution optical storage technology broke the Abbe's diffraction limit barrier, a fundamental law in optical imaging discovered by German physicist Ernest Abbe in 1873. Professor Gu's work has enabled the storage of huge amounts of optical data at a very low rate of energy consumption. His findings have meant data that would ordinarily fill a football field can now be stored onto a single DVD sized disc.

Professor Gu's revolutionary solar cell technology is set to reduce the greenhouse effect because it reduces energy consumption by 1000 times. His breakthrough makes building integratable solar cells cheaper and therefore more viable for the building sector. It could even mean that future skyscrapers will be self-powered using purely green solar energy.

Professor Gu has won external funding totalling more than A\$100 million from national and international science foundations, governments and industries.

He is an elected fellow of the Australian Academy of Science, the Australian Academy of Technological Sciences and Engineering, the Australian Institute of Physics, the Optical Society of America, the International Society for Optical Engineering and the Institute of Physics (UK).

Professor Gu was a member of the Prime Minister's 2014 Trade Delegation (Education) to China. He is a Laureate Fellow of the Australian Research Council (ARC), a University Distinguished Professor and former Director of the Centre of Micro-Photonics at Swinburne University of Technology. In 2015, Professor Gu was appointed Distinguished Professor and Associate Deputy Vice-Chancellor for Research Innovation and Technology at RMIT University.



VICTORIA FELLOWSHIPS

Life Sciences



Ms Sarah Baines

Peter Doherty Institute for Infection and Immunity

The pathogen *Staphylococcus aureus* or golden staph is a common cause of life-threatening infection in humans. Ms Baines' PhD research has focussed on understanding how genetic-subtypes of *S. aureus* evolve, and how antibiotic use influences the development and spread of these drug-resistant bacteria. Her study mission to the University of Bath, in England; and the Pasteur Institute, in France, will provide Ms Baines with specialised skills to identify genetic predictors of disease, explore the evolution and spread of drug-resistant *S. aureus* in Australia, and identify cases of Staphylococcal infection where patients may be at an increased risk of developing severe infections, complications or dying. Ms Baines will also attend the Gordon Research Conference on Staphylococcal Diseases, in the United States.



Dr Ryan De Cruz

Royal Melbourne Hospital

Australia has one of the highest rates of skin cancer in the world. This statistic is set to rise, with more patients receiving organ and bone marrow transplants and life-saving immunosuppressive drugs, which increase their risk of developing skin cancers and other complications. Dr De Cruz will work alongside haematologists and dermatologists at King's College Hospital and Guys and St Thomas' NHS Trust, in England, to develop his expertise on the effects of immunosuppression on the skin. He will attend clinics for patients who have had organ, bone marrow or stem cell transplantation, and are receiving treatments for organ rejection and other skin conditions. The study mission will enable Dr De Cruz to set up a multi-disciplinary oncodermatology clinic at the Royal Melbourne Hospital and Victorian Comprehensive Cancer Centre, where at-risk patients have access to innovative treatments.

VICTORIA FELLOWSHIPS

Life Sciences



Dr Hamish McWilliam

**Peter Doherty Institute for
Infection and Immunity**

The immune system uses various approaches to detect and destroy harmful pathogens. Dr McWilliam's research focuses on specialised immune cells called MAIT cells that are activated when they "see" key molecules produced by invading bacteria and yeast, triggering an immune response against the pathogens. His study mission to the Rockefeller University, in the United States, will enable Dr McWilliam to acquire the technical skills to monitor protein trafficking in cells and understand how foreign molecules are imported into human cells and presented to these immune cells. This information is vital for developing candidate drugs that can boost immunity to life-threatening infections. Dr McWilliam will also visit a biotechnology company in the United States and gain key insights about the commercialisation of medical discoveries.



Dr Thushara Perera

Bionics Institute

Implanted brain stimulators can alleviate symptoms for people living with Parkinson's disease when medications are ineffective. Dr Perera has developed devices that measure tremor, balance, posture and gait in movement disorders, and is using these instruments to develop a next-generation deep brain stimulator that can automatically adapt and adjust stimulation according to need. The study mission to the University of Oxford, University of Cologne, and University of Milan, will enable Dr Perera to learn how to precisely locate implanted brain electrodes from MRI and CT brain scans, and observe how clinical trials are conducted. He will also attend the IEEE Engineering in Medicine and Biology Society Conference in Korea and attend workshops on entrepreneurship and commercialisation. This knowledge will help him develop a deep brain stimulator and monitoring tools for the global market.

VICTORIA FELLOWSHIPS

Life Sciences



Ms Paola Vaz

University of Melbourne

Australian marsupials in wild and captive breeding populations are susceptible to herpes virus outbreaks, which can cause disease and death, especially when they are stressed. Ms Vaz's PhD research is focussed on sequencing marsupial herpes viruses to understand virus evolution and mammalian-viral interactions. She is also developing rapid and cost-effective diagnostic tests to detect these infections in marsupials. The study mission to the University of Bonn, in Germany; and Universidad Nacional de Colombia, in Colombia, will enable Ms Vaz to conduct specialised tests on marsupial herpes virus proteins, access tissue samples of unique and rarely studied South American marsupials, sequence herpes viruses if they are present and fill knowledge gaps. She will also gain a better understanding of how marsupial herpes viruses cause disease, which could lead to improved diagnostics tools, vaccines or anti-viral treatments.



Dr Peng-Yuan Wang

Swinburne University

Combining stem cells with biomaterial scaffolds, which control stem cell behaviour, is a promising approach to engineering tissues and stem cells for clinical use, modelling diseases and screening drugs. Dr Wang's research focuses on how fabricated nanostructures called binary colloidal crystals regulate stem cell function and reprogramming. The study mission to UCLA and University of Nebraska, in the US, and University of Toronto, in Canada, will enable him to collaborate with leading bioengineers, share knowledge, learn new techniques and advance the field. Dr Wang will gain new insights about stem cell development, use new nanostructured materials to improve stem cell differentiation into specific cells, and understand the role they play in this process. He will also attend the Society for Biomaterials Annual Meeting and Exposition, in the US; and Canadian Medical and Biological Engineering Conference.

VICTORIA FELLOWSHIPS

Physical Sciences



**Dr Ravichandar
Babarao**

CSIRO

Hybrid porous polymers called Metal-Organic Frameworks - which store molecules, remove pollutants or gases, and release target molecules - can benefit industry, the community and our environment. The study mission to the University of Cambridge and MOF Technologies, in the United Kingdom, will enable Dr Babarao to apply advanced computational modelling approaches and other techniques to test the stability of MOFs under different conditions, and see first-hand how industry manufactures them rapidly in large quantities and in an environmentally friendly way. This will help him predict mechanical properties and responses of MOFs, and design stable hybrid porous polymers that can withstand harsh conditions and be translated from the laboratory for commercial use. He will also visit leading researchers at the National Centre for Scientific Research (CNRS), in France.



Dr George Chen

University of Melbourne

Dairy is the largest agricultural industry in Victoria, contributing to 82 per cent of Australia's dairy exports. To remain internationally competitive, it is vital for the Australian dairy industry to adopt energy efficient technologies to reduce production costs and maximise returns. The study mission will enable Dr Chen to evaluate energy efficient forward osmosis membrane technology for the manufacture of dairy powder products at a pilot scale testing facility at the University of Surrey, in England. Through this international collaboration, Dr Chen will be able to apply for industry funding to help the Victorian dairy industry introduce this technology to optimise production processes. He will also attend the 3rd International Conference on Desalination using Membrane Technology, in Spain, and visit researchers at the French National Institute for Agricultural Research, who conduct pilot scale studies in membrane technologies for dairy applications.

VICTORIA FELLOWSHIPS

Physical Sciences



Dr Tamar Greaves

RMIT University

Protein molecules called enzymes are used as catalysts in the pharmaceutical, chemical and agricultural industries. To be effective, they need to withstand harsh processes. Dr Greaves' research into designer solvents called protic ionic liquids indicates that PILs could potentially increase enzyme stability, improve the efficiency of chemical reactions and lead to a broader range of catalysts being used by industry. The study mission to the Friedrich Schiller University Jena, in Germany; Swiss Federal Institute of Technology, in Switzerland; Rutgers University and Massachusetts Institute of Technology, in the US, will enable Dr Greaves to gain a better understanding of solvent-protein interactions, adopt new high-throughput methods and other approaches to advance her research, and provide intellectual property of commercial and industrial relevance. She will also attend the 7th International Congress on Ionic Liquids, in Canada.



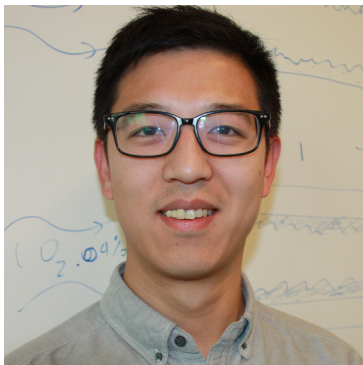
Dr Christian Gunawan

Circa Group

Millions of tonnes of crop and forestry waste containing cellulose are being converted into the chemical levoglucosenone in Australia. From this starting material, Dr Gunawan has used complex chemical processes to synthesize dairy lactone, a valuable flavour molecule that is present in trace amounts in cow's milk and milk products. The study mission will enable Dr Gunawan to synthesize and purify dairy lactone in industrial quantities at a pilot scale plant at AgroParisTech, in France, to assess the viability of this approach. If successful, dairy lactone could be produced locally from a renewable source for use by cheese and dairy confection makers to enhance the flavour of food products. Dr Gunawan will also visit the Biorenewables Development Centre at the University of York, in England, to identify the equipment needed to set up a facility in Victoria.

VICTORIA FELLOWSHIPS

Physical Sciences



Dr Kang Liang

CSIRO

Proteins called enzymes are used as catalysts by industry. As they are structurally unstable molecules, this limits their application for biomedical use. Dr Liang's research into porous and hybrid structures called Metal-Organic Frameworks indicates that MOFs are able to provide a protective shell around enzymes, shielding them from extreme conditions while remaining bioactive. The study mission to Graz University of Technology, in Austria; and the National Institute for Materials Science, in Japan, will enable Dr Liang to establish and strengthen international collaborations with experts in nano-biotechnology. He will explore the potential of using functional enzymes and MOF coatings to construct stable, sensitive, and cheap biosensors and diagnostic chips. Dr Liang will optimise MOF-protected enzyme particle systems, assess if MOF particles can be integrated in nanoengineered devices and enhance his ability to translate these technologies for commercial application.



Dr Subashani Maniam

Monash University

Batteries that store energy from solar panels can supply renewable energy on-site instead of exporting it to the power grid. To make them economically viable for households, batteries need to be affordable, efficient and deliver energy reliably when needed. Dr Maniam's research into novel Naphthalene Diimide-based polymers demonstrate their potential as next-generation energy storage and charge carriers in batteries, which are lighter and easier to manufacture. The study mission to a state-of-the-art battery research facility at Waseda University, in Japan, will enable her to design, synthesize, test and evaluate the efficiency of NDI-based polymers in batteries. Dr Maniam will gain a better understanding of these materials and also be exposed to the commercial challenges of the renewable energy field, which will inform her research.

PREVIOUS RECIPIENTS OF THE VICTORIA PRIZE FOR SCIENCE & INNOVATION

Year	Recipient	Research Area
2015	Professor Calum Drummond Professor John Hopper AM	(Physical) Chemistry (Life) Disease prevention
2014	Professor Frank Caruso Professor Ashley Bush	(Physical) Nanomedicines (Life) Translational neuroscience
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 or business.vic.gov.au/vicfellows

2016 VICTORIA PRIZE FOR SCIENCE & INNOVATION AND VICTORIA FELLOWSHIPS

Victoria Prize for Science & Innovation

Created in 1998, the annual Victoria Prize for Science & Innovation and Victoria Fellowships program supports and recognises outstanding Victorian scientific research and innovation.

The prestigious \$50,000 Victoria Prize is currently awarded to two outstanding Victorian researchers (one in life sciences, one in physical sciences) 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 encourage innovation and the commercial application of research among researchers in the early stages of their careers. Up to 12 researchers will be awarded up to \$18,000 each to undertake overseas study missions offering Victoria Fellows the opportunity to broaden their experience, develop international networks and better understand where their activities fit into the local and international scene. A Victoria Fellowship also provides an opportunity to develop commercial ideas.

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

Victoria Fellowship applicants planning to study in France are eligible to 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 are mutually beneficial.

OTHER VICTORIAN FELLOWSHIP AND AWARD PROGRAMS

Premier's Award for Health and Medical Research

The Premier's Award for Health and Medical Research recognises achievement by Victoria's early career health and medical researchers. The award is open to PhD students or recently completed postgraduates whose research has or is being undertaken in a Victorian research institution in a field of health and medical research. Next year will see the 23rd year of the award with applications opening in the first quarter of 2017. veski.org.au/pahmr

veski inspiring women fellowships

The **veski** inspiring women fellowships provide an opportunity for female leaders to remain competitive in their field, enhance the current talent pool and affect cultural change.

It is anticipated that a call for applications will open in late 2017 for early to mid-career female researchers and scientists who are experiencing difficulties balancing carer commitments or who may have compounding reasons for needing support. veski.org.au/inspiring-women/fellowships

veski innovation fellowships

The **veski** innovation fellowships bring Australian expatriates and leading researchers, with outstanding skills in science and innovative technology, typically in the top five percent of their respective fields, to Victoria.

Since 2004, **veski** has awarded 24 fellowships to scientists and researchers working across a range of basic, applied and clinical research fields from modern health issues such as cancer, dengue and obesity to innovative studies into nanotechnology and organic semiconductors.

Applications are sought from globally competitive individuals in the field of biotechnology, biomedical, advanced manufacturing including food science and bioengineering, environmental and energy technologies, or the enabling sciences and technologies. veski.org.au/vif



