# VICTORIA PRIZE FOR SCIENCE & INNOVATION

## VICTORIA FELLOWSHIPS

2019

VICTORIA
State Government

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# MESSAGE FROM THE MINISTER

## 22 YEARS OF EMPOWERING INNOVATION

Victoria is home to some of the world's leading scientists and a fast-developing new generation of research talent.

The Andrews Labor Government is proud to be awarding the Victoria Prize for Science and Innovation and the Victoria Fellowships for a 22nd year.

From the first recipient of the Victoria Prize in 1998, Andrew Martin, to the 2018 recipients, Professors Doug MacFarlane, Andrew Roberts and John Seymour, these prestigious awards have helped our state's innovators to advance their careers.

The innovation ecosystem we've helped to create in Victoria continues to play a key role in the state's future and paves the way for new opportunities throughout Australia and the world.

The Victoria Prize for Science and Innovation grants two $50,000 individual awards to outstanding scientists whose research has significantly advanced knowledge in the life sciences and the physical sciences.

Twelve Victoria Fellowships, valued at up to $18,000 each, support researchers in the fields of science, engineering and technology who are in the early stages of their career and would benefit from an international study mission.

These awards celebrate exceptional leadership, determination and creativity and recognise that advancing the research, development and trial of science and new technologies boosts the global competitiveness of businesses in Victoria.

And that encourages the world's leading organisations to invest here, creating more jobs for Victorians.

Victoria's future focus was acknowledged in November when Melbourne was named Australia's most innovative city in the annual 2thinknow Innovation Cities Global Index.

The Government has been proud to partner with **veski** for the delivery of the Victoria Prize for Science and Innovation and the Victoria Fellowships since 2013, supporting our outstanding leaders in science and their contributions to the global community.

I express my gratitude to the Australian French Association for Science and Technology for their support, and to the panel for their efforts in making the selections for the Victoria Prize and Victoria Fellowships.

Congratulations to the 2019 Victoria Prize winners and Victoria Fellows.

**The Hon. Martin Pakula MP**
**Minister for Jobs, Innovation and Trade**

# VICTORIA PRIZE FOR SCIENCE & INNOVATION

## Life Sciences

### Professor Michael Berk

**Deakin University**

Professor Michael Berk has been awarded the 2019 Victoria Prize for Science and Innovation in recognition of his research and discovery of risk factors, novel therapies, and preventative treatments for mental health problems.

Despite the rising prevalence and growing burden of a range of psychiatric disorders, there is a startling lack of new treatments. There is an urgent need for new medications, interventions, and preventative measures to improve the lives of people with psychiatric disorders.

Professor Berk has pioneered a novel research program aimed at treating and preventing psychiatric disorders, discovering therapies and understanding risk factors. Leading a team of diverse researchers, he has taken on the multi-faceted challenge of treatment discovery. His extensive experience in the translation of basic and epidemiological research into clinical outcomes has been vital to the success of one of the largest and most productive novel therapy clinical trial programs in the country. The program has delivered a number of first-in-kind treatments.

The breadth and depth of Professor Berk's contributions include pioneering clinical trials of N-acetyl cysteine (typically used in the treatment of paracetamol overdose) for individuals with schizophrenia. His team also developed the first targeted mitochondrial combination therapy for bipolar disorder focussed on its depressive phase, which is poorly addressed by available treatments.

He is a mentor for researchers from around the world in cutting edge areas such as diet and mental health. Investigations of diet quality and depression have suggested a radically new approach to treatment and prevention. He is also part of a global team of researchers studying the efficacy of aspirin in the prevention of depression. Most recently, Professor Berk led the Centre of Research Excellence for the Development of Innovative Therapies for Psychiatric Disorders, representing the first national, coordinated approach to treatment discovery in mental health care.

Through the Centre for Innovation in Mental and Physical Health and Clinical Treatment, Professor Berk's research and development of innovative treatments has had a substantial and positive impact on those who suffer from psychiatric disorders; removing stigma, supporting re-employment and reducing service utilisation.

Professor Berk is an NHMRC Senior Principal Research Fellow, and the Alfred Deakin Chair of Psychiatry at Deakin University & Barwon Health. He is an Honorary Professorial Research Fellow in the Department of Psychiatry, the Florey Institute for Neuroscience & Mental Health and Orygen Youth Health at the University of Melbourne, as well as in the School of Public Health and Preventive Medicine at Monash University.

# VICTORIA PRIZE FOR SCIENCE & INNOVATION

## Physical Sciences

### Professor Anthony Burkitt

**The University of Melbourne**

Professor Anthony Burkitt has been awarded the 2019 Victoria Prize for Science and Innovation in recognition of his work to develop a bionic eye and provide artificial vision to visually impaired people who could previously see.

Retinitis Pigmentosa (RP) is the major cause of inherited blindness, affecting 1 in 4000 people in the Western world, and as many as 1 in 400 in Southern India and parts of China. Usually diagnosed in early adulthood, there is no known effective treatment for this debilitating condition.

The bionic eye developed by Professor Burkitt's team can restore a sense of vision using a suprachoroidal retinal implant and an external camera. It offers significant hope for those affected with RP. Using cutting edge surgical techniques developed in Victoria, an electrode array is placed close behind the retina of the eye. It uses electrical stimulation to directly activate the surviving nerves in the patient's eye, which then carry the nerve signals to the vision processing centres of the brain, restoring a sense of vision.

A world leader in medical bionics and computational neuroscience, Professor Burkitt has advanced the world's understanding of how the brain works to provide therapeutic applications for patients with sensory or brain disorders. As Director of Bionic Vision Australia, Professor Burkitt led a cross-disciplinary team of researchers including clinicians, surgeons, neuroscientists, electrical engineers, biomedical engineers, and materials scientists to develop the bionic eye.

He continues to work on a range of innovative technologies that will enhance the performance of the bionic eye for patients. Additionally, his research has stimulated other exciting innovations. He was a member of the team that recently pioneered the new field of endovascular bionics through the development of a ground-breaking form of brain-computer interface for neurological disorders such as severe spinal cord injury. He has also developed devices for monitoring and controlling epilepsy through the recording of brain signals associated with seizures and the use of electrical stimulation for seizure abatement. His research achievements have already led to important real-world applications, and their ongoing development and commercialisation continues to support Melbourne's international leadership in medical bionics and bring academic and commercial progress to this fast-developing field.

Professor Burkitt is Chair of Bio-Signals and Bio-Systems at the University of Melbourne and Principal Honorary Research Fellow at The Bionics Institute.

# VICTORIA FELLOWSHIPS

## Life Sciences

### Dr Edward Chew

**Walter & Eliza Hall Institute of Medical Research**

Haematological cancers such as acute myeloid leukaemia (AML) are devastating illnesses. Addressing the lack of answers available to patients on the genetics of 'why' they develop AMLs and other blood disorders is a driving force in Dr Chew's career as a clinical and laboratory consultant haematologist.

Dr Chew's goal is to establish a clinical service in Victoria that will provide patients and their families with the best diagnostic and clinical care by integrating genetics research into the management of familial predispositions to AML.

By working with Professor Lucy Godley and her team at the Center for Clinical Cancer Genetics at the University of Chicago - USA, Edward will learn about a robust method of culturing skin fibroblasts for DNA extraction that can be used for familial genetic testing.

### Ms Annie Cox

**Hudson Institute of Medical Research**

Two key disorders of pregnancy – fetal growth restriction (FGR) and preeclampsia – share pathophysiology and often occur in concert. Early diagnosis is difficult and a delay in intervention often compromises maternal and fetal wellbeing.

Throughout her PhD studies, Ms Cox discovered a passion for obstetric research. Having observed the importance of communication between scientists and clinicians, Ms Cox has an interest in how highly sophisticated units incorporate fundamental science into clinical practice.

To gain knowledge of how to establish and run a placenta clinic in Victoria, Annie will work with Professor John Kingdom at Mount Sinai Hospital & Ontario University - Canada, where he uses ultrasonography & MRI to examine antenatal placental morphological indicators of abnormalities to bring leading techniques into Victorian obstetric practice.

# VICTORIA FELLOWSHIPS

## Life Sciences

### Dr Tracy Josephs

**Monash Institute of Pharmaceutical Sciences**

Understanding the class of cellular receptors called G protein-coupled receptors (GPCRs) can aid in the design of new therapeutics for moderating cellular behaviour in disease. GPCRs are involved in virtually all physiological processes and are the largest class of drug targets.

Dr Josephs' research has focussed on establishing the next-generation mass spectroscopy methodologies not utilised yet in GPCR research in Australia. These will offer important biological insight into the multiple GPCR structural-shapes that cannot be observed by any other techniques.

Tracy will undertake advanced training with experts at the University of Maryland - USA, in hydrogen-deuterium exchange (HDX) methodologies. These methodologies, which are currently underutilised in Australia, can be used for visualising the multiple structural shapes of therapeutically important GPCRs.

### Dr Gina Kusuma

**Hudson Institute of Medical Research**

Peripheral Artery Disease (PAD) is a debilitating condition estimated to affect approximately 200 million people worldwide. The disease may manifest in the forms of limb ischemia and skin ulceration, and in extreme cases requires amputation.

Dr Kusuma's current project is focussed on utilising a combination of biomaterials to deliver the next generation of regenerative medicine that will address underlying angiogenesis and tissue necrosis in patients with PAD.

Gina's project will be enhanced by visiting Professor Kishore Bhakoo's laboratory at the Agency for Science, Technology and Research (A*STAR) in Singapore to learn about multimodal imaging technologies. These will aid in the development of a therapy for PAD that can be easily and safely deployed without the need for complex surgical procedures.

# VICTORIA FELLOWSHIPS

## Life Sciences

### Dr Wee Loon Ong

**Olivia Newton-John Cancer Wellness & Research Centre / Austin Health**

MR-Linac is a new technology that offers the ability to 'see' inside patients during radiation therapy without unnecessary patient exposure to radiation.

The technology is set to be introduced to Austin Health in 2020 with the deployment of the first MR-Linac facility in Victoria. A multi-disciplinary team of experts and clinicians will be essential in developing and refining MR-Linac clinical trial protocols.

Dr Ong hopes to alleviate a clinician skills gap in the MR-Linac workflow by observing clinical oncology and MR-Linac experts at the Royal Marsden NHS Trust in London and the Christie NHS Trust in Manchester, UK. Gaining this institutional expertise will be helpful in developing and refining clinical trial protocols of the MRI-Linac facility in Victoria, including daily on-treatment MR imaging interpretation, and decision-making for daily adaptive radiotherapy.

### Dr Leigh Walker

**The Florey Institute of Neuroscience & Mental Health**

Alcohol is by far the most widely abused drug in the world. Current first line therapeutics for alcohol-related disorders are inadequate; suffering from low compliance, high rates of relapse and adverse side effects. Detailed knowledge of the neural circuits and brain chemicals responsible for aberrant behaviour patterns may facilitate the development of novel and effective treatments.

Dr Walker is seeking to implement innovative technologies for the investigation of the neural underpinnings of stress-induced relapse to alcohol seeking and other complex behaviours.

Leigh will visit Professor Luis de Lecea and his team at Stanford University - USA, who are pioneering new technologies as well as using CRISPR technologies to perform targeted genetic manipulations in living cells. This knowledge will be invaluable to the research of complex mental health disorders including those related to alcohol.

# VICTORIA FELLOWSHIPS

## Physical Sciences

### Dr Bita Bayatsarmadi

**CSIRO**

With Victoria's population expected to double by 2051, securing the state's water supplies is essential to supporting a healthy environment, a prosperous economy and thriving communities.

Challenges to supplying potable water to Victorians include the impact of blue-green algal toxins, increased salinity, and emerging pathogens and chemicals that pose a risk to human health. While Electrocoagulation offers a cost effective and reliable method for reducing pollutants, it is yet to be optimised for commercial use.

To optimise Electrocoagulation in water treatment applications, Dr Bayatsarmadi will visit Professor Majid Mohseni's lab at the University of British Columbia - Canada, one of the world's premier research labs in this field. Bita will also attend the 237th Electrochemical Society meeting in Montreal to learn about advances in industrial electrochemistry.

### Dr Shama Islam

**Deakin University**

The Victorian Government's commitment to be a leader in renewable energy cannot be achieved without a sustainable and reliable energy system. This goal will require innovative strategies for demand management enabled by Internet of Things (IoT) and energy storage.

With experience using IoT for smart microgrids, Dr Islam's goal is to promote sustainable energy systems by exploiting advanced technologies. This work will be furthered by building effective research networks and developing international collaborations.

Shama will work with researchers in the USA from the Power and Energy Centre at Virginia Polytechnic Institute and State University to bring new knowledge to Victoria for demand management through IoT enabled smart microgrids integrated with energy storage and advanced communication protocols.

# VICTORIA FELLOWSHIPS

## Physical Sciences

### Dr Stuart Johnston

**The University of Melbourne**

Mathematical Biology is valuable when applied to experimental data to extract insight that could not otherwise be determined experimentally.

Dr Johnston has conducted research into applied mathematical modelling techniques of biological and ecological processes capable of describing whale migration in response to rising levels of noise pollution.

Stuart will visit Dr Kit Yates at the University of Bath - UK, to learn more about stochastic modelling of biological processes. He will learn about new techniques to describe aggregation and segregation in ecological populations by visiting Dr Raluca Eftimie at Dundee University - UK, while Professor Kevin Painter at Heriot-Watt University - UK, will provide expertise in techniques for relating velocity-jump random walks to population-level models. This can be applied to whale species that migrate along the coast of Victoria which is of value for the whale watching industry.

### Dr Emily Kerr

**Deakin University**

The development of enhanced screening technologies and procedures for the early diagnosis and management of chronic kidney disease (CKD) is critical for reducing its economic and societal burdens.

Dr Kerr is focussed on developing a robust and cost-effective point-of-care diagnostic platform utilising an ultra-sensitive analytical technique called electrogenerated chemiluminescence (ECL).

Dr Kerr will visit Associate Professor Mahiar Hamedi at the KTH Royal Institute of Technology - Sweden, who specialises in the development of micro total analysis systems used in ECL. Dr Kerr will also attend the laboratory of Professor Neso Sojic at the University of Bordeaux - France, to learn about nano-fluidic confinement strategies for ECL enhancement. These fabrication and miniaturisation skills will assist Emily in overcoming the limitations of current diagnostic systems.

# VICTORIA FELLOWSHIPS

## Physical Sciences

### Dr Thuy (Kate) Nguyen

**RMIT University**

A comprehensive understanding of building fire dynamics is essential for improving the current Australian fire safety standards and increasing the safety of buildings in Victoria.

Dr Nguyen has been leading a research project to address the fire risk of buildings with combustible cladding. She hopes to develop testing facilities for advanced research to improve fire safety in new and existing buildings.

Thuy will visit the Structural Fire Laboratory at Michigan State University - USA, where they have created an inferno equivalent to catastrophic fire conditions to analyse the response of construction elements in fire. At the National Institute of Standards & Technology - USA, she will gain an understanding of the interaction between the dynamic fluid flow and building geometry to develop a versatile tool to predict vertical flame spread in existing building façades.

### Dr Mitchell Nothling

**The University of Melbourne**

Biodegradable plastics, which offer a potential reprieve to the escalating accumulation of plastic waste pollution, are currently derived from either petrochemical or converted biomass feedstocks, both of which are limited resources with their own detrimental effects on the environment.

Dr Nothling's research is looking to nature for inspiration on sustainable biomanufacturing and green chemistry. His research aims to develop an innovative approach for preparing biodegradable polymers using carbon dioxide and oxygen from the air as the key chemical ingredients.

Mitchell will visit researchers from the Technical University of Denmark and the Danish enzyme technology company Novozyme in order to advance his knowledge of the use of industrial enzymes for continuous, high-value manufacturing.

# RECIPIENTS OF THE VICTORIA PRIZE FOR SCIENCE & INNOVATION

| Year | Recipient | Research Area |
|---|---|---|
| 2018 | Professor Douglas MacFarlane<br>Professors Andrew Roberts & John Seymour | (Physical) Electromaterials<br>(Life) Leukemia research |
| 2017 | Professor Maria Forsyth<br>Professors Jane Visvader & Geoffrey Lindeman | (Physical) Electromaterials<br>(Life) Breast cancer research |
| 2016 | Professor Min Gu<br>Professors Jamie Rossjohn & James McCluskey | (Physical) Nanophotonics<br>(Life) Infection and immunity |
| 2015 | Professor Calum Drummond<br>Professor John Hopper AM | (Physical) Chemistry<br>(Life) Disease prevention |
| 2014 | Professor Frank Caruso<br>Professor Ashley Bush | (Physical) Nanomedicines<br>(Life) Translational neuroscience |
| 2013 | Professor Lloyd Hollenberg<br>Professor Alan Cowman | (Physical) Quantum sensing technology<br>(Life) Malaria research |
| 2012 | Professor Ana Deletic<br>Professor Terence (Terry) Speed | (Physical) Storm water management<br>(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 | Professor Peter Colman AC | A new class of anti-influenza viral drugs |
| 2007 | Professor Colin Masters AO | 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 | Professor David Vaux AO | 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 |

# 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 awarded to outstanding Victorian researchers (in the life sciences and in the 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 are 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.

**For further information on the Victoria Prize for Science & Innovation and Victoria Fellowship: www.business.vic.gov.au/support-for-your-business/awards.**

## 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

No AFAS Associate Award will be awarded in 2019.

# OTHER VICTORIAN FELLOWSHIP AND AWARD PROGRAMS

## Premier's Award for Health and Medical Research

The Premier's Award for Health and Medical Research recognises the exceptional contributions and capabilities of Victoria's emerging early career researchers in their PhD studies. The Premier's Awards include five category awards: Basic Science Researcher, Clinical Researcher, Aboriginal Researcher undertaking research in any field of health and medical research, Health Services Researcher, Public Health Researcher, with an additional award granted to the Premier's Excellence Award winner.

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 - 2020 will see the 26th announcement of the award.

**www.2.health.vic.gov.au/about/clinical-trials-and-research/premiers-award**

## **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 28 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), digital agriculture, cyber security, environmental and energy technologies, the enabling sciences and technologies, space and transportation.

**www.veski.org.au/vif**