VICTORIA PRIZE FOR SCIENCE & INNOVATION

VICTORIA FELLOWSHIPS

2022

VICTORIA
State Government

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MESSAGE FROM THE MINISTER

Victoria is home to some of the world's most talented scientists and innovators.

Each year, the Victoria Prize for Science and Innovation and the Victoria Fellowships shine a spotlight on the inspiring work of leading and emerging researchers in life and physical sciences.

The Victorian Government has proudly supported these awards since 1998 and is firmly committed to backing our state's best and brightest.

Through our bold and ambitious innovation agenda, we are investing in Victoria's future as a world-class destination for innovators and businesses to succeed.

Innovation is driving growth across every aspect of Victoria's economy and helping us overcome our greatest challenges.

We're harnessing our innovation potential by transforming our world-class research into commercial opportunities. And we're creating more opportunities for collaboration with a wide range of industries, research institutes and businesses through government projects and priorities.

But none of this would be possible without developing and nurturing our homegrown talent.

These prestigious awards provide the perfect opportunity to not only recognise the achievements of scientists and innovators, but to celebrate them.

And we have much to celebrate.

Victorian innovators are responsible for some of the world's major advances in technology, medicine, manufacturing and science.

Our state's innovation capabilities have helped build one of the strongest economies in Australia and made Victoria one of the best places to live, study, work and do business.

My thanks to veski for delivering these awards on behalf of the Victorian Government since 2013.

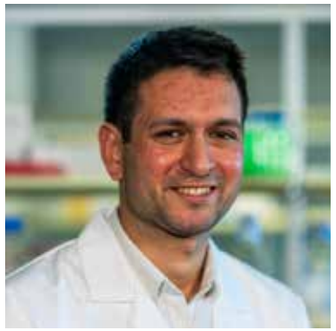
A very warm congratulations to all recipients of the 2022 awards, and thank you for your extraordinary contributions to Victoria.

I look forward to following your work as you make a difference in our community, across the country and the world.

The Hon. Ben Carroll MP
Minister for Industry & Innovation

VICTORIA PRIZE FOR SCIENCE & INNOVATION

Physical Sciences



Professor Brian Abbey & A/Professor Belinda Parker

La Trobe University and Peter MacCallum Cancer Centre

Researchers Professor Brian Abbey and Associate Professor Belinda Parker have been jointly awarded the 2022 Victoria Prize for Science and Innovation in Physical Sciences in recognition of their research and development of the NanoMslide – a nanofabricated microscope slide that detects cancer cells and could be used to improve the accuracy of early cancer diagnosis.

Professor Abbey, a physicist and Associate Professor Parker, a cancer biologist, have spent the past seven years working together to turn the 'NanoMslide', a simple microscope slide which has been modified using cutting edge nanofabrication, into a new medical diagnostic tool for detecting cancer cells.

The NanoMslide aids in the detection of cancer cells by using colour as a visual marker for disease. By modifying the surface of conventional microscope slides at the nanoscale, biological structures and cells take on a striking colour contrast. Using the NanoMslide, causes a colour change to occur, for example, from yellow to blue when comparing healthy cells to cancerous cells under the microscope. The technology is currently being trialled as an adjunct diagnostic to aid in the detection and staging of early breast cancer.

The key innovation behind the NanoMslide is that it completely removes the need for performing any chemistry or staining, generating full-colour images of optically transparent samples using nothing more than a 'garden-variety' optical microscope. Whereas previously tissue pathology has required significant technical expertise and resources, the mass production and application of this nanotechnology to the field of pathology means that anyone with access to a basic optical microscope can now generate full-colour tissue images.

Professor Abbey's group was able to develop the NanoMslide technology at La Trobe University by harnessing open access equipment and expertise made available by Melbourne Centre of Nanofabrication, part of the Australian National Fabrication Facility network.

Proof of concept data at the Peter MacCallum Cancer Centre indicates that breast cancer may be the first of many medical applications that will benefit from the NanoMslide. For pathologists, using the colorimetric changes that occur in cancer cells could help with the early detection of a range of other cancers including skin, colorectal, and prostate cancer where there is also an unmet clinical need. Preliminary data in lung cancer is already supporting this assertion and researchers are working with hospitals and publicly funded clinics across Australia and internationally to realise the significant opportunity that this medical nanotechnology represents.

Professor Abbey is Deputy Director at the La Trobe University Institute for Molecular Science and Professor of Physics. Associate Professor Parker is Co-Head of the Cancer Evolution and Metastasis Program, and Laboratory Head of the Microenvironmental Crosstalk and Therapeutics Laboratory, both at Peter MacCallum Cancer Centre.

Professor Abbey and Associate Professor Parker's research has resulted in the publication of two high impact papers which directly relate to the NanoMslide technology, in Nature and Nature Photonics in the field of cancer and optics research. In September 2022, the pair led the interdisciplinary team which received the Australian Museum ANSTO Eureka Prize for Innovative Use of Technology.

VICTORIA PRIZE FOR SCIENCE & INNOVATION

Life Sciences

A/Professor Joshua Ooi & Professor Eric Morand

Monash University

Associate Professor Joshua Ooi and Professor Eric Morand have been jointly awarded the 2022 Victoria Prize for Science and Innovation in Life Sciences in recognition of their research into targeted cell therapies to treat autoimmune diseases, in particular Lupus.

These researchers have devised a highly innovative therapy based on single cell sequencing and genetic engineering that could specifically switch off the 'mis-directed' immune response in patients with lupus. Lupus is a disease that occurs when the body's immune system attacks its own tissues and organs. Inflammation caused by lupus can affect many body systems including joints, skin, kidneys, blood cells, brain, heart and lungs.

Autoimmune diseases like lupus and rheumatoid arthritis collectively affect 5% of the world's population. Although in each of these diseases the mis-directed immune response is very specific, current treatments are not. Instead, all treatment for these diseases relies on non-specific global immune suppressant drugs.

One of these researchers' key discoveries is that naturally occurring cells which function to temper the activity of the immune system, known as regulatory T cells (Tregs), can be specific to individual proteins such as those that trigger lupus. If harnessed therapeutically this could result in highly targeted, effective, and safe control, or even cure, of autoimmune disease.

Associate Professor Ooi and Professor Morand, who are a scientist and clinician respectively and work collaboratively, studied blood samples from lupus patients to identify the key pathogenic mis-directed immune response. They isolated the regulatory Tregs, genetically engineering them, and then tested their therapeutic efficacy in a world-first model which precisely mimics the patient autoimmune response.

The researchers showed in these models that their novel Treg product effectively stopped the course of disease and prevented the development of kidney failure, which is a major cause of morbidity and mortality in lupus patients.

Success in lupus will pave the way for this approach to be used across the autoimmune disease spectrum, with profound scientific and clinical impact and huge potential implications on health outcomes.

Associate Professor Joshua Ooi is Head of the Regulatory T cell Therapies group, and Professor Eric Morand is Head of the School of Clinical Sciences, at Monash University.

Both Associate Professor Ooi and Professor Morand have each had research papers published in prestigious scientific magazines such as Nature and the New England Journal of Medicine. They have filed patents to protect the use of their lupus specific Treg product and Monash has signed a collaboration and commercialisation deal with an international pharmaceutical company.

VICTORIA FELLOWSHIPS

Life Sciences

Dr Dinh Bui

The University of Melbourne

Chronic obstructive pulmonary disease (COPD) is a non-reversible airway obstruction that is associated with shortness of breath, disability and premature death. COPD is the leading cause of preventable hospitalization in Australia and one of the most preventable of the major chronic illnesses. COPD is currently diagnosed too late when the lungs are irreversibly damaged, and treatment is ineffective.

Dr Dinh Bui's pioneering research at the University of Melbourne, has led to a new field of research known as 'pre-COPD'; an early phase where lung damage has started but COPD has not been diagnosed.

Using world-class cohort data from Australia and the US, Dr Bui will lead the development of an innovative method to identify people with pre-COPD and create opportunities to intervene early to effectively delay or prevent the onset of COPD. He will take part in the American Thoracic Society conference in 2023 and visit Harvard Medical School, and the University of Michigan in the USA.

Dr Sarah McColl-Gausden

The University of Melbourne

Australia, USA and Canada are all world leaders in fire science. All three countries face similar climate change driven fire challenges, with increasing frequency and intensity of wildfires and changing fire seasonality.

While fire will not be removed from the landscape, research by Dr Sarah McColl-Gausden from the University of Melbourne will improve outcomes by giving researchers and governments more information on where and when wildfire risk is at its highest, and options of how to best manage that risk. Better understanding around the drivers of wildfire risk will vastly improve our chances of reducing the loss of life, property, or ill-health from smoke.

Dr McColl-Gausden will visit the University of Washington in the US and the Canadian Forest Service in British Colombia, aiming to improve the scientific knowledge around fire simulation modelling, particularly in relation to combining a vegetation dynamics model with a fire regime model, something that is yet to be fully operationalised in Australia.

VICTORIA FELLOWSHIPS

Life Sciences

Dr Remika Mito

The Florey Institute

Epilepsy is one of the most common chronic neurological disorders, affecting an estimated 50 million people worldwide. Currently a one-size-fits-all approach is dominant in epilepsy management, when in fact epilepsy is a highly heterogeneous condition where each individual patient is unique.

Dr Remika Mito from the Florey Institute of Neuroscience and Mental Health aims to develop tools that can accurately diagnose the specific cause of epilepsy in an individual using specialised brain imaging techniques. Neuroimaging plays a key role in epilepsy diagnosis and management, but in many individuals, standard magnetic resonance imaging (MRI) cannot detect these brain abnormalities.

Dr Mito's research group has developed technologies using an advanced neuroimaging method known as diffusion MRI, which can detect very specific changes to the brain's wiring. The aim of Dr Mito's study mission is to translate advanced diffusion MRI technologies into clinical practice in epilepsy. Dr Mito will visit University College London in the UK.

Dr Leona Pascoe

Monash University

Preterm birth (prior to 37 weeks' gestation) remains a major obstetric challenge and a leading cause of perinatal mortality in Australia. Victoria has one of the highest rates of preterm births nationally. Whilst these children are at risk for a range of neurodevelopmental challenges, families with lived experience of preterm birth, have identified education as the top international research priority.

Monash University researcher, Dr Leona Pascoe's study mission is timely, acknowledging there is little local understanding of how parent and teacher knowledge and perceptions influence the educational outcomes of Australian children born preterm. Children born preterm can be up to three times more likely to enter the school system with developmental deficits.

Through the study mission to the University of Leicester in the UK and Bloorview Research Institute in Canada, Dr Pascoe, aims to establish international collaborations to help develop integrated knowledge that has the capacity for effective and meaningful future implementation.

VICTORIA FELLOWSHIPS

Life Sciences

Dr Zhuoting (Lisa) Zhu

Centre for Eye Research Australia

The ageing population places a huge burden on healthcare systems and there is a marked variation in the rates of biological ageing across the population. Accurate quantification of biological ageing is important to enable targeted interventions (for example smoking cessation).

In 2020, Dr Lisa Zhu from the Centre for Eye Research Australia developed an Artificial Intelligence technology to accurately predict chronological age based on retinal images in a healthy population. She found that the gap between the predicted age and the chronological age (Retinal Age Gap Estimation or RetinaAGE) is a novel biomarker of mortality and age-related diseases.

Dr Zhu has collaborated with industry partner Eyetelligence to develop the first low-cost and self-testing retinal camera prototype to assess RetinaAGE. Dr Zhu will present her findings at a conference at the Dunedin Multidisciplinary Health & Development Research Unit in New Zealand and also visit Aegis Ventures in New York, USA.

Physical Sciences

Dr Wenyi Li

The University of Melbourne

Infections caused by superbugs are rapidly increasing worldwide with 106 million new cases annually. The area of antimicrobial peptides (AMPs) is a promising therapeutic family to tackle the shortage of effective antibiotics. Antimicrobial peptides widely exist in nature and are an important part of the immune system and have a wide range of inhibitory effects against bacteria and viruses.

Research by Dr Wenyi Li, from the University of Melbourne, covers the chemical synthesis of antimicrobial peptides and biomimetics and pioneers a better understanding of the antibacterial mechanism of AMPs.

During his study mission, Dr Wenyi Li will visit Germany's Leipzig University and the University of Pennsylvania, in the USA to train in high throughput screening technology of peptide library chemical synthesis (collections of peptide sequences) and computational strategies for antimicrobial peptides development to combat disease-causing bacteria. This knowledge will assist in developing new weapons to fight against infections caused by multi-drug resistant pathogens.

VICTORIA FELLOWSHIPS

Physical Sciences

Dr Tuan Nguyen

The University of Melbourne

Dr Tuan Nguyen is a research engineer at the University of Melbourne, with a prime focus on improving the performance, resilience and sustainability of future infrastructure, in particular fostering the emerging hydrogen economy.

His study mission aims to develop a Multiscale, Multiphysics Model framework for material degradation challenges in hydrogen infrastructure (4M4H2). The modelling will be used to understand and predict the effects of hydrogen on material degradation in certain metallic components, durability failure of polymer components and fatigue failure due to the repeated stress cycles.

The study mission to the UK and Luxembourg will provide an experimental understanding of any hydrogen degradation effects on steel, high-density polyethylene and concrete through the state-of-the-art material testing facilities at the Imperial College London and the University of Luxembourg. This work will contribute to the Victorian Government Renewable Hydrogen Industry Development Plan, which provides enormous economic, social and environmental benefits to Victoria.

Dr Sampa Sarkar

RMIT University

Vaccine delivery is a field of research into the development of new materials or carrier systems for disease preventing therapies.

RMIT University researcher, Dr Sampa Sarkar's study expects to develop a fundamental understanding of how the lipidic system (the fatty, waxy, or oily compounds that are essential to many body functions) interacts with a vaccine and its performance.

Dr Sarkar will study the interface between lipid nanoparticles and vaccine candidates for a protective tailor-designed lipid-based delivery system. Recently, mRNA-Lipid Nano Particles (LNPs) have taken a centre stage due to the success of the SARS-CoV-2 mRNA LNP vaccines, such as the Pfizer and Moderna COVID-19 vaccines.

The expected outcomes will benefit future vaccine research, improve Victoria's capabilities in biotechnology and vaccine development, and lead to better vaccines. Dr Sarkar will visit the Massachusetts Institute of Technology and the Houston Methodist Research Institute in the USA, as part of her research.

VICTORIA FELLOWSHIPS

Physical Sciences

Dr Amin Soltani

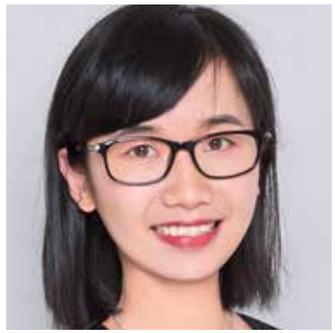
Federation University Australia

Imagine if soils can be transformed into 'smart and reliable' engineering materials; with no cement/lime needed.

Researcher Dr Amin Soltani, from Federation University Australia, hopes to improve the quality and longevity of Australian roads by introducing innovative sustainable materials during construction. Dr Soltani's research focuses on geotechnical engineering, and he has been trialling products to minimise the reliance on conventional cement and lime for soil stabilisation applications – mainstays of road construction for decades.

Dr Soltani describes the bio-inspired polymer technology (BIPT) as the next exciting chapter in his research journey.

Through his study mission to Canada, he will visit the University of Ottawa, Queen's University, University of Toronto, and the Royal Military College of Canada. He hopes his research will go beyond solving road engineering problems and can also be applied to increasing water retention of soils and groundwater control.



Dr Wei Tong

The University of Melbourne

Research and clinical necessity have raised an urgent need for a safe and effective method of chronically measuring neurotransmitter levels and electrophysiology signals in patients as they go about their daily lives.

University of Melbourne researcher Dr Wei Tong's project has developed a diamond electrode for reliable, chronic neural recording and neurotransmitter sensing in the brain. The electrodes will help to better understand brain function and improve treatments of neurological disorders such as epilepsy and Parkinson's disease. Existing electrodes for neurotransmitter sensing have limited lifetimes and are not suitable for long-term implantation.

Dr Tong's project will bring together the patented diamond-coated carbon fibre electrodes with the most advanced electrochemical techniques from the Mayo Clinic during her study mission to the USA where innovative researchers are pioneers in the field of brain computer interfaces. Her project will lead to the development of a world-first implantable electrode for long-term neural recording and neurotransmitter sensing.

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 $25,000 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 10 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: www.veski.org.au/victoria-prize-fellowships/

Australian-French Association for Research and Innovation (AFRAN) Associate Awards

Victoria Fellowship applicants planning to study in France are eligible to apply for an AFRAN Associate Award (formerly the AFAS Associate Award).

AFRAN Associate Awards - valued at up to $5,000 - support study missions to France in conjunction with a Victoria Fellowship, and aim to facilitate science and technology innovations that are mutually beneficial to Victoria and France.

The AFRAN Associate Awards are supported by the Australian-French Association for Research and Innovation (AFRAN) and the Embassy of France, Australia.

RECIPIENTS OF THE VICTORIA PRIZE FOR SCIENCE & INNOVATION

Year	Recipient	Research Area
2021	Dist. Professor Christopher Berndt Prof. Anne Voss & A/Prof Tim Thomas	(Physical) Surface engineering (Life) Cancer research
2020	Professor Yi-Min (Mike) Xie Professor Kay Crossley AM	(Physical) Architectural engineering (Life) Clinical sports physiotherapy
2019	Professor Anthony Burkitt Professor Michael Berk	(Physical) Artificial vision (Life) Mental health
2018	Professor Douglas MacFarlane Professors Andrew Roberts AM & John Seymour AM	(Physical) Electromaterials (Life) Leukemia research
2017	Professor Maria Forsyth Professors Jane Visvader FRS & Geoffrey Lindeman	(Physical) Electromaterials (Life) Breast cancer research
2016	Professor Min Gu Professors Jamie Rossjohn & James McCluskey AO	(Physical) Nanophotonics (Life) Infection and immunity
2015	Professor Calum Drummond AO 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 AC	(Physical) Quantum sensing technology (Life) Malaria research

RECIPIENTS OF THE VICTORIA PRIZE FOR SCIENCE & INNOVATION

Year	Recipient	Research Area
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	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

OTHER VICTORIAN FELLOWSHIP AND AWARD PROGRAMS

Premier's Awards for Health and Medical Research

The Premier's Awards for Health and Medical Research recognise 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.

Current PhD candidates within a health and medical field who are at least two years into candidature at a Victorian academic or research institute, and post-doctoral researchers within health and medical field who have completed a PhD at a Victorian academic or research institute in the last two years, are encouraged to apply:

https://djpr.vic.gov.au/medical-research/strengths/premiers-awards

veski fellowships

Since 2004, **veski** has delivered a dynamic program of fellowships, awards and international networks - recognizing 46 talented researchers across Victoria through expanded fellowships programs, developing solutions to address modern challenges facing health and medicine, the environment, technology and society more broadly.

veski plays a unique role by ensuring the people, skills and community are in place to support Victoria's innovation and research ecosystems to sustainably deliver the talent and leadership to create maximum impact, whilst promoting inclusive and culturally diverse opportunities.

veski has also positioned itself as a leader in the delivery of innovative programs and activities, on a fee for service basis, for and on behalf of various government departments, the private sector, peak bodies and philanthropic organisations.

https://www.veski.org.au/