



The Graeme Clark Oration  
**Neurotechnology Workshop**  
23 JULY 2019

Melbourne Exhibition Centre  
Clarendon Room A, Level 4  
2 Clarendon Street, South Wharf

# Neurotechnology Workshop

## OUR PRESENTERS



Professor Timothy Denison



Dr Tatiana Kameneva



Dr Nicholas Opie



Dr Brooke Farrugia



Dr Dean Karantonis



Dr Thushara Perera



Professor Paul Fitzgerald



Dr Phillipa Karoly



Assoc. Prof. Wes  
Thevathasan

### PROFESSOR TIMOTHY DENISON

Professor Denison holds a joint appointment in Engineering Science and Clinical Neurosciences at Oxford, where he explores the fundamentals of physiologic closed-loop systems in collaboration with the MRC Brain Network Dynamics Unit. Prior to that, Tim was a Technical Fellow at Medtronic PLC and Vice President of Research & Core Technology for the Restorative Therapies Group, where he helped oversee the design of next generation neural interface and algorithm technologies for the treatment of chronic neurological disease. In 2012, he was awarded membership to the Bakken Society, Medtronic's highest technical and scientific honor, and in 2014 he was awarded the Wallin leadership award, becoming only the second person in Medtronic history to receive both awards. In 2015, he was elected to the College of Fellows for the American Institute of Medical and Biological Engineering (AIMBE). Tim received an A.B. in Physics from The University of Chicago, and an M.S. and Ph.D. in Electrical Engineering from MIT. He recently completed his MBA and was named a Wallman Scholar at The University of Chicago.

### DR BROOKE FARRUGIA

Dr Brooke Farrugia was awarded her PhD in 2010 from UNSW Sydney under the supervision of Professor Laura Poole-Warren. She went on to carry out a post-doctoral position within the Institute of Health and Biomedical Engineering within Queensland University of Technology, where she was a member of the Tissue Repair and Regeneration group. In 2013 she returned to the Graduate School of Biomedical Engineering and joined Professor John Whitelock's research team investigating the response to implanted materials and developing biomimetic materials for the delivery of growth factors. In January 2019 Dr Farrugia joined the Department of Biomedical Engineering at The University of Melbourne.

Dr Farrugia has a multifaceted research background with an overarching theme of investigating the response to biomaterials and how they interact with various biological environments, with research strengths in biomaterials development and characterisation, biochemistry, cellular biology and glycobiology. Specifically, her research activities and interests lie in the fields of wound healing and tissue regeneration; the molecular mechanisms behind their occurrence, and the development of new therapeutics.

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### PROFESSOR PAUL FITZGERALD

Professor Paul Fitzgerald is Professor of Psychiatry at Epworth Healthcare, Monash University and deputy director of Monash Alfred Psychiatry Research Centre. He has been conducting research with transcranial magnetic stimulation and other brain stimulation treatments for 20 years including conducting over 20 clinical trials in depression, schizophrenia, OCD and other disorders. He has published over 400 journal articles, been cited over 14,000 times and has held 3 consecutive NHMRC Practitioner Fellowships. He has received over 5 million dollars in grant funding in the last 5 years from the NHMRC, ARC and a number of US based organisations. He has established multiple clinical TMS programs, set up Australia's first TMS training program and is a founder and board member of TMS Clinics Australia.

### DR TATIANA KAMENEVA

Dr Tatiana Kameneva received PhD in Electrical and Electronic Engineering from the University of Melbourne in 2008. After obtaining her PhD, Tatiana held a research position in National ICT Australia's (NICTA) Victoria Research Lab and ARC DECRA Fellowship at the University of Melbourne. In 2017, Tatiana joined Swinburne University as a faculty member at the Faculty of Science, Engineering and Technology. Tatiana's research interests include control theory tools and their applications to life sciences and neuroprosthetic implants. She contributes to the understanding of neural information processing and studies how electrical and optical stimuli affect neuronal responses. Tatiana works on the development of new stimulation methods that can be used across a broad range of medical bionics applications.

### DR DEAN KARANTONIS

Dean M Karantonis graduated with the BE (Hons) degree in computer engineering and the MBIomedE degree in biomedical engineering from the University of New South Wales (UNSW), Sydney, Australia. He completed a PhD degree with the Graduate School of Biomedical Engineering at UNSW in collaboration with industry partner Ventracor, with the research focussed on simulation and control of an implantable rotary blood pump. He was part of initial Implant Systems research team at NICTA responsible for developing the world's first closed-loop neuromodulation system and had been focused on engineering an implantable version of and commercializing this system as part of Saluda Medical. Dr Karantonis has authored numerous journal papers and conference proceedings, co-authored a book chapter on physiological measurement, is a co-inventor of several patents, and is an IEEE member.

### DR PHILLIPA KAROLY

Philippa's research develops an innovative, patient-specific approach to seizure forecasting. Using sophisticated computational techniques, long-term data from brain recordings, environmental, behavioural and physiological factors can be combined and converted into useful seizure likelihood models. For the past two years, Philippa has also worked as a software developer for the Australian medical technology company, Seer. At Seer she developed a mobile app that provides people with epilepsy insight into their seizure patterns. Soon, this app will be combined with wearable devices and technology for brain recordings to deliver real-time updates of seizure likelihood. To achieve this goal, Philippa works part-time in industry and part-time as a post-doctoral fellow at the Graeme Clark Institute, providing the optimal balance to translate her medical research into innovative clinical solutions.

### DR NICHOLAS OPIE

Dr Nicholas Opie is a biomedical engineer with experience in neural prostheses. Dr Opie completed his BE (Hons) and BSc undergraduate degrees at Monash University in 2007 and was awarded his PhD in 2012 for research developing a bionic eye. He was employed as the Surgical Program Coordinator on Bionic Vision Australia's retinal prosthesis project and was integral in development and preclinical validation of the technology designed to restore rudimentary vision to the profoundly blind. This device was implanted in three patients in 2014 with great success. In 2012, Dr Opie was awarded a \$1.33M grant from US defense organization DARPA to develop a minimally invasive brain machine interface. This funding, and subsequent funding totaling more than \$7.7M has enabled Dr Opie to establish and co-lead the Vascular Bionics Laboratory within the Department of Medicine at The University of Melbourne; a laboratory which has grown to support more than 20 graduate and undergraduate researchers. Dr Opie is leading the research team conducting preclinical safety and efficacy trials on a device capable of recording neural information from within a blood vessel, which may enable direct brain control of wheelchairs, exoskeletons and computers to people with paralysis as early as 2018. Dr Opie is the founding CTO of SmartStent, a company incorporated to translate endovascular bionic technology into clinical application.

### DR THUSHARA PERERA

Dr Thushara Perera has a Bachelors in Electronic Engineering (Hons) and a Masters's in Biomedical Engineering from La Trobe University (Melbourne, Australia), where he won the Tad Szental Prize for best graduating engineer and the Hooper Memorial Prize for best final-year project. Dr Perera completed his PhD in neuroscience and joined the Bionics Institute as a Postdoctoral Research Fellow in 2012. Here, he worked as part of the Bionic Vision team that successfully trialled Australia's first bionic eye. At present, his research focusses on cutting-edge therapies for neurological disorders such as Parkinson's disease. Dr Perera's role in innovation was recognised in 2016 with a prestigious veski Victoria Fellowship.

### ASSOC PROF WES THEVATHASAN

I am a neurologist specialising in Movement Disorders and Deep Brain Stimulation (DBS). I was trained in Melbourne, London and Oxford. I work with Neurosurgeon Kristian Bulluss, running a successful and collaborative DBS practice which spans University of Melbourne affiliated public hospitals in addition to private practice. My research is based at the Bionics Institute of Australia and is focussed on developing next generation DBS through the use of novel biomarkers to automate target localisation and enact feedback control.



# Neurotechnology Workshop

## PROGRAM

### **0930 Registration**

- 1000 Welcoming comments – Professor Mark Cook (Chair)
- 1010 Keynote address: Professor Timothy Denison (University of Oxford)
- 1045 A revolution in Deep Brain Stimulation for Parkinson's disease arising from Melbourne, Associate Professor Wesley Thevathasan (St Vincent's Hospital, Melbourne)
- 1115 Clinical applications of Bionic Devices, Dr Thushara Perera (Bionics Institute)
- 1145 Forecasting epileptic seizures, Dr Phillipa Karoly (University of Melbourne)
- 1215 Endovascular bionics, Associate Professor Nicolas Opie (Synchron)

### **1245 Lunch break**

- 1345 Closed-loop neuromodulation, Dr Dean Karantonis (Saluda Medical)
- 1415 Computational neuroscience approaches to the challenges of retinal prostheses, Dr Tatiana Kameneva (Swinburne University of Technology)
- 1445 Understanding how our body interacts with medical devices, Dr Brooke Farrugia (University of Melbourne)

### **1515 Break**

- 1545 Professor Timothy Denison (University of Oxford)
- 1615 Closing remarks
- 1645 Workshop concludes.  
Networking over drinks

### **1745 Drinks close.**



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