



Shaping The Future of Closed-loop Neuromodulation Workshop

November 11th to 13th at Fitzwilliam College in Cambridge

| Day 1 – Nov 11th | Event |
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| 10:30-11:00 | Registration & coffee |
| 11:00-11:15 | Intro |
| 11:15-11:45 | Ice breaker activity |
| 11:45-12:15 | Work groups 1 – Keyword brainstorming |
| 12:15-13:00 | Work groups 2 – State-of-the-art |
| 13:00-14:00 | Lunch |
| 14:00-14:45 | Talk 1 - Electrodes/interfaces: <i>Prof George Malliaras, University of Cambridge</i> |
| 14:45-15:30 | Career development - Life outside academia: <i>Dr Ben Woodington, Opto Biosystems</i> |
| 15:30-16:00 | Break |
| 16:00-17:00 | Work groups 3 - From challenges to bottlenecks |
| 18:00 | Formal dinner at Fitzwilliam College |
| Day 2 – Nov 12th | |
| 9:00-9:30 | Coffee break |
| 9:30-10:15 | Talk 2 - Electronics/back end : <i>Prof Emm (Manos). Mic. Drakakis, Imperial College London</i> |
| 10:15-11:00 | Talk 3 - Signal processing: <i>Prof Marcus Kaiser, University of Nottingham</i> |
| 11:00-11:30 | Break |
| 11:30-12:15 | Talk 4 - Materials: <i>Prof Rylie Green, Imperial College London</i> |
| 12:15-13:00 | Work groups 3 (cont'd) - From challenges to bottlenecks |
| 13:00-14:00 | Lunch |
| 14:00-14:45 | Talk 5 - Clinical applications: <i>Dr Antonio Valentin, King's College London</i> |
| 14:45-15:30 | Talk 6 - Non-clinical and cognitive research: <i>Prof Tamar Makin, University of Cambridge</i> |
| 15:30-16:00 | Career development – Panel discussion: experiences in academia |
| 16:00-16:15 | Break |
| 16:15-17:15 | Work groups 4 - Addressing common bottlenecks across topics |
| 19:00 | Social networking at Churchill College |
| Day 3 – Nov 13th | |
| 9:00-9:30 | Coffee break |
| 9:30-10:15 | Work groups 5 – Start drafting your section |
| 10:15-11:00 | Career development – Shaping your academic profile: <i>Vicki Tipton, University of Cambridge</i> |
| 11:00-11:30 | Break |
| 11:30-13:00 | Work - All together |
| 13:00-14:00 | Lunch |
| 14:00-14:30 | Final remarks and farewell notes |

About the organisers and speakers

Organisers and moderators

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| Dr Amparo Güemes Gonzalez, University of Cambridge  | Dr Amparo Güemes González is a Royal Academy of Engineering / Rosetrees Research Fellow specializing in closed-loop neurotechnology systems for neuro-metabolic control. She earned her B.S. in Biomedical Engineering (2016) from the Polytechnic University of Madrid (Madrid, Spain) and her M.S. in Biomedical Engineering (2017) and PhD in Electrical Engineering (2021) from Imperial College London (London, UK). Her doctoral research focused on designing mathematical models for the neural regulation of glucose homeostasis. During this time, she was also a visiting PhD research fellow in the Computational Sensory-Motor Systems Lab at Johns Hopkins University, where she gained expertise in the in vivo effects of neural stimulation on blood glucose levels. After completing her PhD, she was awarded the Royal Commission for the Exhibition of 1851 Research Fellowship to conduct a 3-year postdoc at the Bioelectronics Lab, where she has developed advanced algorithms and neurotechnology for interfacing with the vagus nerve to enhance glucose control. In 2023 Amparo's work has been recognized with the Engineering Award from the <i>L'Oréal-UNESCO UK and Ireland For Women in Science Rising Talent Programme</i> , which encourages the contribution of women pursuing their research careers. |
| Ruben Ruiz-Mateos Serrano, University of Cambridge  | Ruben Ruiz-Mateos Serrano is a PhD student at the University of Cambridge and part of the joint Cambridge/UCL Connected Electronics and Photonics CDT program. He received his MEng in Biomedical Engineering from Imperial College London (2021) where he was supervised by Prof. Drakakis. His final year masters project focused on the design of neuromorphic biomimetic circuits which replicate the exact dynamics of the Nobel Prize winning Hodgkin Huxley equations on neuronal dynamics by means of ultra-low-power, microelectronic integrated circuits. As part of the CDT, Ruben received a MRes from the University of Cambridge (2022) during which he worked in a joint project with Prof. Demosthenous from UCL to implement an ultra-low-power, microelectronic chip that performs analogue signal processing of photoplethysmography measurements to predict blood pressure. His interests include the design of ultra-low power microelectronic biocircuits, that is, topologies which replicate the behaviour of biological systems with very high power and area constraints. His current research involves the design and implementation of a non-invasive and portable diagnostics device for ECG imaging based on body surface potential mapping. |

Topic 1 - Materials (Talk 4)

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| Prof Rylie Green, Imperial College London  | Professor Rylie Green joined the Bioengineering department at Imperial College London in 2016. She received her PhD (Biomedical Engineering) from the University of New South Wales, Australia in 2008. Prof. Green has developed a range of innovative materials to address the limitations that hinder the development of next-generation bioelectronic devices. Her focus has been in developing bioelectronic technologies that are soft, stretchable and mediate improved electrical charge transfer with the body. This has included pioneering work on living bioelectronics, which are designed to grow into the body. This research has initiated collaborations with Galvani Bioelectronics, Cochlear Ltd and the US Department of Defence. Prof. Green holds Editorial roles with APL Bioengineering, Frontiers in Medical Technology, IEEE OAJMB, Advanced Bionanomedicine and Biomaterials. She has received a number of awards including an EPSRC Healthcare Technologies Challenge Award (2018), winner of the Royal Society for Chemistry Emerging Technologies: Materials and Enabling Technologies (2018) and a Suffrage Science Award (2017). |
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Topic 2 - Electrodes/interfaces (Talk 1)

Prof George Malliaras,
University of Cambridge



Prof. George Malliaras is the Prince Philip Professor of Technology at the University of Cambridge. He received a BS in Physics from the Aristotle University (Greece) in 1991, and a PhD in Mathematics and Physical Sciences, cum laude, from the University of Groningen (the Netherlands) in 1995. After postdocs at the University of Groningen and at the IBM Almaden Research Centre (California), he joined the faculty in the Department of Materials Science and Engineering at Cornell University (New York) in 1999. From 2006 to 2009 he served as the Lester B. Knight Director of the Cornell NanoScale Science & Technology Facility. He moved to the Ecole des Mines de St. Etienne (France) in 2009, where he started the Department of Bioelectronics and served as Department Head. He joined the University of Cambridge in 2017. Prof. Malliaras' research on organic electronics and bioelectronics has been recognized with awards from the European Academy of Sciences (Blaise Pascal Medal), the Materials Research Society (Mid-Career Researcher Award), the New York Academy of Sciences (Blavatnik Award for Young Scientists), the US National Science Foundation (Faculty Early Career Development Award), and DuPont (Young Professor Award). He was awarded an Honorary Doctorate from the University of Linköping (Sweden), and is a Fellow of the Royal Society, the Materials Research Society, Academia Europaea and the European Academy of Sciences.

Topic 3 - Electronics/back end (Talk 2)

**Prof Emm (Manos).
Mic. Drakakis,** Imperial
College London



Prof. Emmanuel (Manos) Drakakis is a faculty member in the Department of Bioengineering at Imperial College London. He holds a first-class degree in Physics and an MPhil in Electronic Physics and Radioelectronics from Aristotle University of Thessaloniki, followed by a PhD in VLSI design from Imperial under Dr. Alison Payne, where he also conducted EPSRC-funded postdoctoral research. At Imperial, Prof. Drakakis founded the Bioinspired VLSI Circuits and Systems Group, focusing on: (a) "Circuits for Biology" (designing innovative instrumentation for biological and medical needs) and (b) "Circuits from Biology" (developing circuits inspired by natural information-processing systems). His honours include the Alexander the Great Award (1986), multiple Hellenic State Scholarships, a Ministry of Defence Prize for service in the Hellenic Army, sponsorship from LM Ericsson's MERC (1996-1998), and Imperial's Rector's Award for Excellence in Research (2006). He was also awarded Lecturer of the Year by his department in 2012. His group has received accolades such as the Live Demo Special Session Prize (IEEE ISCAS 2007) and a Finalist Award (IEEE Midwest Symposium 2005). Prof. Drakakis has served in multiple IEEE editorial roles, including as an associate editor for IEEE Transactions on Biomedical Circuits and Systems.

Topic 4 - Signal processing (Talk 3):

Prof Marcus Kaiser,
University of Nottingham



Prof. Kaiser studied biology and computer science, did a PhD in Neuroscience, and is now Professor of Neuroinformatics, working on computational approaches to inform diagnosis and interventions for brain network or connectome disorders. His research interest is to develop novel ways for brain stimulation, informed by neuroimaging and computer models, to improve cognition in health and disease. He is actively promoting the use of simulations and models in the areas of computational neurology and computational psychiatry. He leads Neuroinformatics UK, representing more than 600 researchers in the field, and is member of the editorial boards of Network Neuroscience and PLOS Computational Biology. His current work is focused on predicting the effects of brain stimulation, either invasive approaches such as optogenetics or stimulation through implanted electrodes or non-invasive approaches such as focused ultrasound stimulation. For this, he uses a combination of techniques from machine learning and network analysis to computer simulations. The aim is to improve the treatment of brain disorders and mental health conditions.

Topic 5 - Clinical applications (Talk 5)

Dr Antonio Valentin, King's College London



Dr. Antonio Valentín Huete is a neurologist and neuroscientist, recognized for his expertise in epilepsy and intraoperative neurophysiology. His medical and doctoral training took place at Universidad Complutense in Madrid, and his research has contributed significantly to neuromodulation techniques and pre-surgical epilepsy assessments. Dr. Valentin is currently based at the Institute of Psychiatry, Psychology & Neuroscience (IoPPN) at King's College London, where he specializes in single pulse electrical stimulation (SPES) and deep brain stimulation (DBS) to help map brain function in patients with epilepsy. His research includes developing advanced intraoperative monitoring techniques and pioneering new applications for brain stimulation to treat complex forms of epilepsy, such as super-refractory status epilepticus. Dr. Valentin has published extensively, with over 50 peer-reviewed articles in neuroscience, specifically focusing on brain stimulation and neuromodulation strategies. His current projects involve collaborating with institutions to improve wireless intracranial neuromonitoring devices for drug-resistant epilepsy and advancing neurotechnologies through patient-centred research initiatives.

Topic 6 - Non-clinical and cognitive research (Talk 6)

Prof Tamar Makin, University of Cambridge



Prof. Makin is a professor of Cognitive Neuroscience at the MRC Cognition and Brain Unit. Her main interest is in understanding the key drivers and limitations of reorganisation in the adult brain. Her primary model for this work is studying differently abled individuals. A particular focus is on how habitual behaviour, such as prosthesis usage or motor augmentation, shapes brain reorganisation. For this purpose, she integrates methods from the fields of neuroscience, experimental psychology, engineering and rehabilitation. Her research will enable clinical populations and those relying on motor augmentation to take advantage of the benefits of brain plasticity, rather than to suffer from their adverse effects. Tamar graduated from the Brain and Behavioural Sciences programme at the Hebrew University of Jerusalem in 2009. She was then awarded several career development fellowships to establish her research programme on brain plasticity at the University of Oxford, first as Research Fellow and later as a Principle Investigator. In 2016 Tamar joined the faculty of UCL where she was later appointed Professor of Cognitive Neuroscience. In 2022 she moved to Cambridge to continue her research. She is currently supported by the European Research Council (Starting Grant), UKRI (Horizon Europe guarantee to underwrite her successful ERC Consolidator Grants), the Wellcome Trust (Senior Research Fellow) and EPSRC.

Career development – Shaping your academic profile

Vicki Tipton, University of Cambridge



Vicki is an experienced Careers Consultant supporting researchers in the Life Sciences here at Cambridge as well as being the point of contact for Wolfson and Clare College. She was previously a Careers Consultant for Researchers at King's College London where she worked across a number of faculties. She delivers 1-1 appointments covering career guidance and management, application reviews and practice interviews. As well as designing and delivering workshops for a range of researchers, Vicki created and produced the podcast 'Careers in Your Ears', now in its 11th series.

