NEUROSCIENCE ANNIVERSARY SYMPOSIUM & RESEARCH DAY 2025

EARLY TO LATE LIFE

TCIN | INSLB11

TBSI | KNOWLEDGE EXCHANGE & TERCENTENARY HALL

3rd and 4th of June 2025

General information

To reduce the amount of waste generated during the event, **please remember to bring reusable cups and water bottles.** There is a water fountain as well as coffee and tea available.

Posters must be a maximum size of **A0 in portrait** orientation. Velcro tape, scissors, pins, and posterboards will be provided on the day. Please put your poster up on your assigned posterboard number. Posters should be mounted no later than 11:00 for the first poster viewing session.

A total of **six prizes of €100 each** will be awarded during the event, three oral prizes (session 1, 3 and 5), and three poster prizes. These prizes are sponsored by Trinity College Institute of Neuroscience, and the Schools of Medicine, Genetics & Microbiology, and Psychology. Two additional poster prizes will be awarded for the best poster in Vision Neuroscience, sponsored by Fighting Blindness.

Beidh comórtas as Gaeilge ann fosta! Cuir do phóstaer i láthair as Gaeilge agus beidh seans agat duais a bhuachant. Beidh duais ann don chur i láthair as Gaeilge is fearr, agus cuirtear gach rannpháirtí isteach i raifil. Mar sin, fiu tá cúpla focail amháin agat, bain trial as!

There will be a competition in Irish also! Present your poster in Irish and you will have a chance to win a prize. There will be a prize for the best presentation in Irish, and each participant will be entered in a raffle. So, even if you only can manage a couple of phrases, give it a go!

SPECIAL THANKS TO THE FOLLOWING SPONSORS:

Trinity College Institute of Neuroscience, TCD
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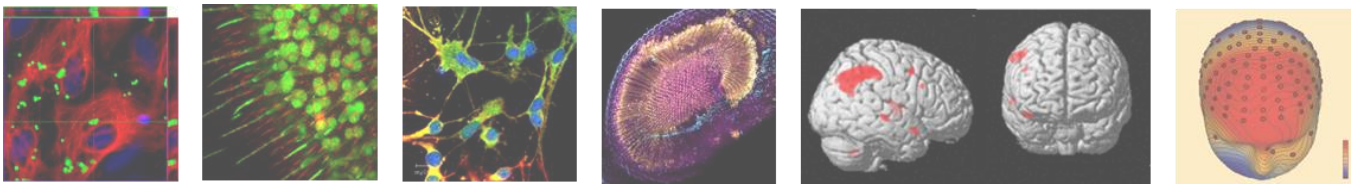
The Alzheimer Society of Ireland

Members of the Neuroscience Research Day Working Group and Organising Committee: Marie Santillo, Andrew Breen, Joshua Bolam, Janeen Laabei, Hugh Delaney, Louisa Zielke, Kieva Byrne, Avril Watson, Jessica Kingston, Guillaume Thuéry, Christopher Sheridan, Patricia Iusan, Jens Hillebrand, Anneliese Walsh, Antje De Boer, Esteban Urrieta Chávez, James Bradshaw, Daniela Tropea, and Andrew Harkin

Trinity College Institute of Neuroscience
25th Anniversary Symposium
June 3rd, Location: INSLB11, Lloyd Building



18:00 – 18:20: Welcome and Introduction

- Prof. Andrew Harkin, Deputy Director TCIN, Professor in Pharmacology, School of Pharmacy & Pharmaceutical Sciences | *Anniversary Symposium Programme and Schedule*
- Prof. Rhodri Cusack, Thomas Mitchell Professor of Cognitive Neuroscience, School of Psychology, Director of TCIN | *TCIN 2025*
- Prof. Shane O'Mara, Professor of Experimental Brain Research, Co-founding Director TCIN | *Introduction to Prof. Michael Rowan, Professor of Neuropharmacology, School of Medicine*

18:20 – 18:50: Neuroscience Anniversary Lecture, Prof. Michael Rowan

Title: TCIN (Targeting Culprits that Induce Neurodegeneration): from amyloid-ß to tau and beyond

Bio: Michael Rowan, BSc (UCD) 1976, PhD (TCD) 1981, Professor Emeritus, Pharmacology & Therapeutics, School of Medicine and TCIN. Professor Rowan was appointed to a lectureship in Pharmacology at Trinity College in 1989 and was made a Fellow of Trinity College in 1991. He was appointed to a personal chair in Neuropharmacology in 2007. Prof Rowan's research has focused on our understanding of the mechanisms underlying the regulation of synaptic plasticity in vivo by behavioural stress, learning and Alzheimer's disease ß-amyloid (Aß) protein. The first accounts of the inhibition of long-term potentiation (LTP) in the rat hippocampus by Aß were published by his group. He continues to study disruptive effects of patient-derived Aß and the other key pathological protein of Alzheimer's disease, tau, with international collaborators.

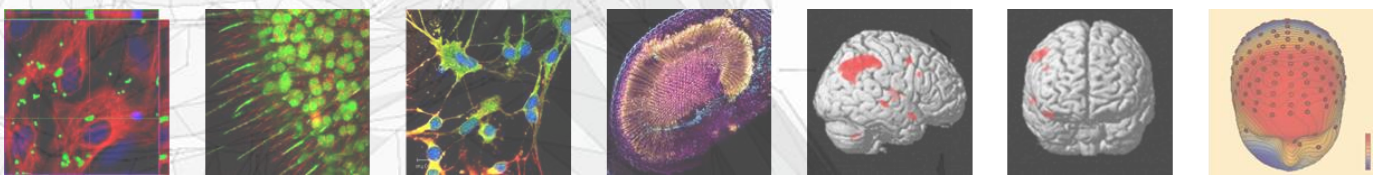
18:50 – 19:30: Reception (Lloyd Building)

TRINITY COLLEGE
INSTITUTE OF NEUROSCIENCE
FROM MOLECULES TO MIND

Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

NEUROSCIENCE RESEARCH DAY
JUNE 4TH, TRINITY BIOSCIENCES INSTITUTE (TBSI)
MORNING SESSIONS

	Knowledge Exchange	Tercentenary Hall
08:30 – 09:00	Registration at the entrance of the Knowledge Exchange	
09:00 – 09:10		**Prof. Andrew Harkin** | Opening words
09:00 – 09:50		*Chairperson: Prof. Daniela Tropea* Guest Lecture 1: **Prof. Colin Doherty:** Concussion: Science & Policy **Prof. Matthew Campbell**: Transcriptomic Analysis of Blood Brain Barrier Function and Integrity
	Translational Research: Markers, Models and Interventions (*Chairperson: Prof. Nengwei Hu*)	Emerging Technologies (*Chairperson: Prof. Redmond O'Connell*)
10:00 – 10:15	**Magdalena Imiolek**: The effect of phytocannabinoids and PPARγ (ant)agonists on reactivity in human-induced pluripotent stem cell-derived astrocytes	***10:00 – 10:10*** **Prof. Redmond O'Connell**: Magnetoencephalography
10:15 – 10:30	**Rachel Dalton**: Investigating the effects of TLR2/MyD88 deficiency in mouse models of age-related macular degeneration	***10:10 – 10:20*** **Prof. Rhodri Cusack**: 3 Tesla magnetic resonance imaging
10:30 – 10:45	**Dieter Waschbüsch**: The structure of the tandem RING-like domain of TMEM55B in complex with a RILPL1 C-terminal peptide reveals the mechanism of binding at lysosomes	***10:20 – 10:30*** **Prof. Alejandro López Valdés**: Electroencephalography
10:45 – 11:00	**Sahil Threja**: Dynamics and reactivity of brain tissue-resident memory T cells following experimental traumatic brain injury and subsequent infection challenge	***10:30 – 10:40*** **Prof. Shane O'Mara**: Functional near-infrared spectroscopy
		10:40 – 10:50 **Prof. Robert Whelan**: GPU cluster and secure store
11:00 – 11:15	**Rebecca Maher**: Formoterol-PLGA-PEG nanoparticles produce anti-inflammatory effects in primary glial cultures and in the rat brain following intranasal delivery	***10:50 – 11:15*** Q&A | Open Discussion
11:15 – 11:45	Coffee and poster session *Sponsored by Thermofisher Scientific*	
11:45 – 12:15	Poster viewing	Guest Lecture 2: **Prof. Abhi Banerjee** Reprogramming sensory cortex for adaptive learning
12:15 – 12:45		Guest Lecture 3: **Dr. Cian O'Donnell** Biophysical constraints on synaptic learning
12:45 – 14:00	Lunch and poster session	



TRINITY COLLEGE
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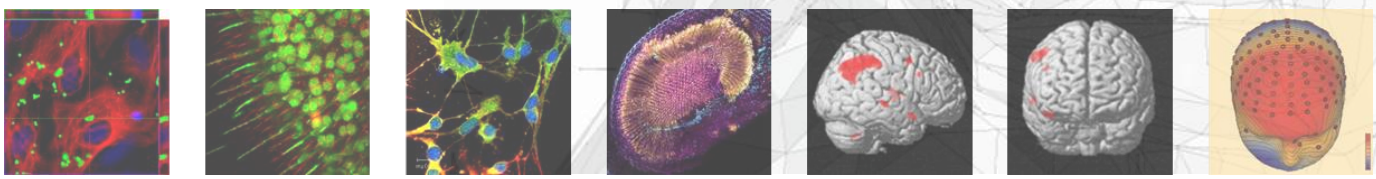
Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

JUNE 4TH, TBSI

AFTERNOON SESSIONS

	Knowledge Exchange	Tercentenary Hall
	Clinical Neuroscience, Psychiatry and Aging (*Chairperson: Prof. John Kelly*)	New Investigators (*Chairperson: Prof. Andrew Harkin*)
14:00 – 14:15	**James Brashaw**: Electrophysiological characterisation of commercial ear-EEG devices	**14:00 – 14:20** **Prof. Michael Dolan**: Glial state diversity, formation and function during remyelination
14:15 – 14:30	**Benjamin Bond**: Cannabis use cessation and the risk of psychotic disorders	**14:20 – 14:40** **Prof. Mohammed Hankir:** Brain feeding circuits targeted by weight loss surgery
14:30 – 14:45	**Anneliese Walsh**: Classifying neurodegenerative diseases from temporal EEG electrodes: towards wearable brain health monitoring	**14:40 – 15:00** **Prof. Kate Connor:** Exploring tumour microenvironment vulnerabilities for the treatment of brain tumours and related epilepsy
14:45 – 15:00	**Hugh Delaney**: The effects of neuroinflammation on neuronal oscillations in Alzheimer's disease	
15:00 – 15:30	Coffee and poster session *Sponsored by Thermofisher Scientific*	
	Neural Systems, Development and Behaviour (*Chairperson: Prof. Eva Jimenez-Mateos*)	Global Brain Health Institute (GBHI) Fellows (*Chairperson: Prof. Alejandro López Valdés*)
15:30 – 15:45	**Katie Marquand**: Modulating olfactory representations: a connectomic analysis of the PPL2 dopaminergic cluster in Drosophila melanogaster	A number of GBHI Fellows will present research they are undertaking with GBHI, details to follow.
15:45 – 16:00	**Áine T. Dineen**: Does the infant ventral visual stream encode global shape or local object features?	
16:00 – 16:15	**Natalie Hudson**: CLDN5 mediated regulation of the blood brain barrier and Alternating Hemiplegia of Childhood	
16:40 – 17:10	Poster viewing	Guest Lecture 4: **Prof. Lim Kah Leong** Identification of Glycerol 3-phosphate acyltransferase as a potent modifier of α-synuclein-induced toxicity.
17:15 – 17:30		**Prof. Rhodri Cusack** | Prize giving & closing words
17:30 – 18:30	Reception in Knowledge Exchange *Networking Opportunity Sponsored by Ulysses Neuroscience*	



Detailed programme and abstracts

Guest Lecture 1

Location: Tercentenary Hall

Chairperson: Prof. Daniela Tropea, Department of Psychiatry, School of Medicine

9:10 – 9:30: Prof. Colin Doherty, Professor Consultant, Clinical Medicine, and Head of School of Medicine

Concussion: Science and Policy

Colin Doherty is the Head of School of Medicine and holds the Ellen Mayston Bates Chair in Epileptology at Trinity College Dublin. He trained in Medicine and Neurology at St Vincent's and Beaumont Hospitals, Dublin and later at the Partners Neurology Residency Programme at Harvard Medical School, Boston (Brigham and Women's Hospital and Massachusetts General Hospital) where he was Chief Resident in 2001. He completed Fellowships in Epilepsy and Cognition at MGH (2001-2003). He has been a consultant neurologist at St James's hospital for 15 years from 2005 until the summer of 2020 when he joined the staff of TCD in the Academic Unit of Neurology. He has clinical and research interests in the areas of brain imaging, clinical epileptology, Traumatic Brain Injury and Digital Health. He is also a Principal investigator at the SFI FutureNeuro Research Centre in Dublin.

9:30 – 9:50: Prof. Matthew Campbell, Professor of Genetics

Transcriptomic analysis of blood brain barrier function and integrity

Matthew Campbell is Professor in Genetics and Head of Department at the Smurfit Institute of Genetics in Trinity College Dublin. He graduated with a degree in Biochemistry from UCD in 2002 and went on to complete his PhD in 2006 at the same institution. In the same year, he moved to Trinity College and conducted postdoctoral research on the role of the blood brain barrier in health and disease. In 2013, he was awarded Science Foundation Ireland's (SFI) President of Ireland Young Researcher Award (PIYRA) which allowed him to establish his own research group. Since then, he has received numerous additional awards for his research which focuses on understanding the role of the so-called blood-brain barrier (BBB) in healthy and diseased states. In 2020 he was awarded one of Europe's most prestigious grants from the European Research Council (ERC). In the same year he was elected Science Foundation Ireland's early career researcher of the year. He is founder and Director of the Neurovascular Genetics Unit at TCD and has over 18 years of research expertise in the area of blood brain and blood retina barrier biology.

Session 1: Translational Research: Markers, Models and Interventions

Location: Knowledge Exchange

Chair: Prof. Nengwei Hu, Assistant Professor, Department of Pharmacology and Therapeutics, School of Medicine

10:00 – 10-15: Magdalena Imiolek, School of Medicine (Caldwell Lab)

Title: The effect of phytocannabinoids and PPARγ (ant)agonists on reactivity in human-induced pluripotent stem cell-derived astrocytes

Abstract: There is growing evidence that inflammation plays a role in neurodegenerative diseases, including Multiple Sclerosis. Astrocytes and microglia are thought to play a central role in neuronal dysfunction and death. This study utilises a human-induced pluripotent stem cell-derived astrocytes to assess possible anti-inflammatory candidates - cannabinoids and PPARγ (ant)agonists. Astrocytes were pre-treated with PPARγ agonist, antagonist and cannabinoids, then stimulated with IL-1α. Astrocyte reactivity profile was examined via ELISA. qPCR analysis was conducted to assess the expression of reactivity genes and expression levels of PPARγ receptors. Our data suggest that treatment with cannabinoids can downregulate astrocyte reactivity via different signalling pathways, while the inhibition of PPARγ receptors further enhanced this shift to a more anti-inflammatory environment. qPCR analysis revealed that in reactive astrocytes, treatment with cannabinoids resulted in a significant downregulation in reactive gene expression. The effect of PPARγ agonist and antagonist is yet to be further analysed via ELISA and qPCR. However, given preliminary results, we expect the antagonist to further downregulate the expression of reactive genes. To conclude, cannabinoids and PPARγ (ant)agonists may have a therapeutic effect on astrocyte reactivity in response to specific pro-inflammatory stimuli, thus modulating inflammation in neurodegenerative diseases.

10:15 – 10:30: Dr. Rachel Dalton, School of Medicine (Doyle Lab)

Title: Investigating the effects of TLR2/MyD88 deficiency in mouse models of age-related macular degeneration

Abstract: The retina, as an extension of the CNS, maintains immune-privileged to protect its neuroepithelium. Age-related macular degeneration (AMD), the leading cause of vision loss, disrupts this balance, triggering sterile inflammation and neurodegeneration. TLRs mediate CNS innate immunity by detecting damage-associated molecular patterns (DAMPs). DAMPs can accumulate and aberrantly activate TLRs. While low-level TLR activation aids tissue repair, excessive signalling promotes sustained neuroinflammation. Modulating TLR pathways may be a therapeutic strategy to attenuate immune-mediated neurodegeneration. We focused on TLR2 for its broad DAMP recognition. Using mouse models of AMD induced by inner blood-retina barrier disruption, we assessed the roles of TLR2 and its adaptor MyD88 in modulating immune cell infiltration and retinal degeneration. We integrated in vivo analysis with bulk RNA sequencing and in vitro assays to explore TLR2's effect on immune cell chemotaxis and infiltration. TLR2/MyD88 deficiency significantly mitigated hallmarks of retinal degeneration, like retinal pigment epithelium loss, retinal thinning and immune cell infiltration. We identified a TLR2-induced transcription factor regulating cell migration; its pharmacological inhibition reversed TLR2-driven migratory responses. This implicates TLR2/MyD88 signalling as a key driver of retinal neurodegeneration. The transcription factor identified offers a novel target to modulate neuroimmune interactions.

10:30 – 10:45: Dr. Dieter Waschbüsch, School of Biochemistry (Khan Lab)

Title: The structure of the tandem RING-like domain of TMEM55B in complex with a RILPL1 C-terminal peptide reveals the mechanism of binding at lysosomes

Abstract: Mutations in the Leucine Rich Repeat Kinase 2 (LRRK2) are a major cause of heritable Parkinson's disease (PD). This leads to hyperphosphorylation of a subset of Rab-GTPases, which profoundly alters their function. Previously, we identified the structural basis for the binding of phosphorylated Rab8a to RILPL2, uncovering a new mechanism for how phosphorylated Rabs bind RH2-domain proteins. Recent findings suggest that upon VPS35 and LRRK2-mediated Rab-phosphorylation, RILPL1 is recruited to the lysosome, leading to association with TMEM55B. TMEM55B is a 384-residue integral membrane protein with a 218-residue cytosolic domain followed by two C-terminal TM-domains. It has been shown to regulate lysosomal positioning under various stress conditions. Here, we report the crystal structure of the RILPL1-binding cytosolic region of TMEM55B in complex with a RILPL1 peptide. This TMEM55B region consists of a tandem of RING-like domains of a 40-residue beta-sandwich stabilized by Zn ions that are coordinated by cysteines. This provides a platform for the tight binding of RILPL1. The TMEM55B binding of RILPL1 shows characteristics we defined as a TMEM55B Binding Motif (TBM). The structural work described here provides a mechanistic understanding of how RILPL1 recruitment to lysosomes by Rab-phosphorylation enables binding to TMEM55B. The work links LRRK2 phosphorylation to TMEM55B functions in the lysosomal stress response and is important for our understanding of the LRRK2 role in PD.

10:45 – 11:00: Sahil Threja, School of Biochemistry (Loane Lab)

Title: Dynamics and reactivity of brain tissue-resident memory T (TRM) cells following experimental traumatic brain injury and subsequent infection challenge

Abstract: Traumatic brain injury (TBI) increases susceptibility to hospital-acquired infections, complicating recovery. Adaptive immune cell infiltration occurs post-TBI, and recent studies indicate that tissue-resident memory T (TRM) cells reside in the brain of naïve mice. These cells have a dual role—either exacerbating damage or promoting repair, depending on their activation and cytokine profiles. This preclinical study phenotypically characterized TRM cells across acute (3 DPI), subacute (10, 21 DPI), and chronic (60 DPI) phases following controlled cortical impact in male C57BL/6J mice, and their reactivation after secondary infection. Anti-CD45 antibody was administered intravenously 10 minutes before euthanasia to discriminate circulating and resident populations. A separate cohort received LPS or saline intraperitoneally at 10 DPI to mimic infection. Brain mononuclear cells were isolated via Percoll gradient, and flow cytometry identified TRM cells (CD44, CD62L, CD69, CD103) among CD4+, CD8+, and TCRγδ+ populations. TRM cells increased post-TBI, peaking at 21 DPI; only CD8+ TRM cells persisted at 60 DPI. LPS significantly increased TRM cells and Ki67 expression in CD4+ and CD8+ subsets, indicating enhanced proliferation. These findings suggest that TRM cells adopt a resident phenotype subacutely and persist long-term, especially CD8+ cells. Their activation post-infection highlights their potential as therapeutic targets for managing immune complications in TBI

11:00 – 11:15: Rebecca Maher, School of Pharmacy (Harkin Lab)

Title: Formoterol-PLGA-PEG nanoparticles produce anti-inflammatory effects in primary glial cultures and in the rat brain following intranasal delivery

Abstract: The aim of this research is to develop polymeric nanoparticles (NPs) using the FDA-approved PLGA polymer to deliver anti-inflammatory therapies in vitro prior to further assessment in vivo models of neuroinflammation via the intranasal route of administration. NPs were synthesised by nanoprecipitation, loaded with anti-inflammatory drug Formoterol (Form) and characterised for size, surface charge and drug release. Form-PLGA-PEG were applied to primary Wistar rat glial cultures stimulated by IFNγ. PCR was performed to quantify the expression of inflammation associated genes. The resulting conditioned media (CM) was transferred to primary rat neurons for assessment of neuronal complexity. Form-PLGA-PEG NPs were incorporated into a hydrogel and administered intranasally to adult Wistar rats daily for 3 or 7 days prior to an intraperitoneal injection of lipopolysaccharide (LPS) to induce a systemic and neuroinflammatory

response. Brain tissue was processed for PCR analysis of pro-inflammatory markers. Form-PLGA-PEG reduced the expression of inflammatory markers TNF α, CD40 and iNOS in IFNγ-stimulated glia. Form-PLGA-PEG protected against the loss of neuronal complexity associated with IFNγ CM. Intranasal administration of Form-PLGA-PEG protected against LPS induced expression of TNFα, iNOS and CD40 in both the cortex and striatum of the rat brain.Form-PLGA-PEG is a promising candidate for further testing in models of inflammation associated neurodegenerative diseases

Session 2: Emerging Technologies

Location: Tercentenary Hall

Chairperson: Prof. Redmond O'Connell, Professor in Decision Neuroscience, School of Psychology

10:00 – 10:10: Prof. Redmond O'Connell

Redmond's research has been focused on elucidating the neurophysiological underpinnings of attention and the processes that give rise to failures of attention. This work comprises investigations of spatial and non-spatial attention, response inhibition and self-awareness and has interrogated a variety of clinical and non-clinical groups including ADHD, mild cognitive impairment and normal aging.

Title: Magnetoencephalography

10:10 – 10:20: Prof. Rhodri Cusack – Thomas Mitchell Professor of Cognitive Neuroscience, School of Psychology, and Director of TCIN

Rhodri uses neuroimaging to study the emergence of cognition in infants, to understand how our minds develop, and to provide new solutions to a number of pressing clinical needs.

Title: Magnetic resonance imaging

10:20 – 10:30: Prof. Alejandro López Valdéz – Assistant Professor in Neural Engineering and Brain Health, School of Engineering and GBHI

An Assistant Professor in Neural Engineering and Brain Health, Alejandro contributes to the creation of applicable and scalable methods and solutions to support brain health throughout the lifespan. His research focuses on applied neural engineering supporting, aging, sensory dysfunction and cognition.

Title: Hyperscanning electroencephalography

10:30 – 10:40: Prof. Shane O'Mara, Professor of Experimental Brain Research, School of Psychology

Shane is Professor of Experimental Brain Research in Trinity College Dublin, and am a Principal Investigator in, and was the Director of, the TCIN from 2009-2016; Shane's academic research concerns the brain systems supporting learning and memory, and how they are affected by stress and depression; he also explores the intersection of psychology and neuroscience with policy, evidence-based policy-making and related areas.

Title: Functional near-infrared spectroscopy

10:40 – 10:50: Prof. Robert Whelan, Professor in Psychology, School of Psychology

Rob's research primarily focuses on relating psychological constructs to real-world outcomes. He does this from a cognitive neuroscience perspective, using structural and functional magnetic resonance imaging and electroencephalography, typically utilizing a combination of theory- and data-driven approaches in large samples.

Title: GPU cluster and secure store

10:50 – 11:15: Q&A | Open Discussion

Guest Lecture 2: Reprogramming sensory cortex for adaptive learning

Location: Tercentenary Hall

Chairperson: Prof. Daniela Tropea, Department of Psychiatry, School of Medicine

11:45 – 12:15: Prof. Abhi Banerjee, Professor of Neuroscience at Queen Mary University, London and Wellcome Trust Career Development Fellow at University of Oxford

Bio: Abhi did D.Phil. in Physiology at the University of Oxford as a Felix Scholar in the laboratory of Professor Ole Paulsen. Abhi studied spike timing-dependent learning rules and the roles of NMDA receptors in cortical development and plasticity. During his postdoctoral training, Abhi worked as a Simons Foundation Fellow at MIT with Professor Mriganka Sur, focusing on inhibitory mechanisms in cortical plasticity. Furthermore, he investigated cellular and circuit mechanisms of inhibitory dysfunctions in Rett syndrome, a neurodevelopmental disorder in the autism spectrum. He postulated functional mechanistic rescue using recombinant human IGF1, the only drug now approved by the FDA for Rett Syndrome. During his time at MIT, he was also an Instructor at the Department of Biology and a Teaching Fellow in Neurobiology at the Department of Molecular and Cellular Biology, Harvard University. He moved to the University of Zürich as a Marie Skłodowska-Curie Fellow and NARSAD Young Investigator to work with Professor Fritjof Helmchen, where he developed assays to study flexibility of learning and prefrontal-sensory interactions that guide such ability. After a brief stint at Newcastle University as an Associate Professor, Abhi joined Queen Mary University of London and Oxford as a Professor of Neuroscience with a Wellcome Career Development Award.

Abstract: Animals adapt their behaviour in response to variable changes in reward reinforcement. The prefrontal areas of the mammalian neocortex, particularly the orbitofrontal cortex (OFC), play a crucial role in implementing rule-based strategies to facilitate flexible learning. However, the neural circuit mechanisms in OFC and its interactions with different hierarchical cortical areas underlying such processes remain elusive. In my talk, I will discuss the interactions between the orbitofrontal and somatosensory cortices that enable flexible decision-making in a tactile reversal-learning task in mice, and also briefly highlight similar circuit mechanisms at work in humans. I also argue that such circuits are key targets for behavioural inflexibility in neurological disorders.

Guest Lecture 3: Biophysical constraints on synaptic learning

Location: Tercentenary Hall

Chairperson: Prof. Daniela Tropea, Department of Psychiatry, School of Medicine

12:15 – 12:45: Dr. Cian O'Donnell, Lecturer in Data Analytics, School of Computing, Eng & Intel. Sys, Ulster University

Bio: Cian is a computational neuroscientist and Senior Lecturer in Data Analytics at Ulster University, Derry/Londonderry campus. He first did a BSc in Applied Physics at Dublin City University, then MSc and PhD in Neuroinformatics at University of Edinburgh, and postdoctoral work at the Salk Institute for Biological Studies, San Diego, USA. From 2015-2021 he was a Lecturer and Senior Lecturer in Computer Science at University of Bristol, before moving to Derry. His research group works on mechanisms of learning and memory, autism, and NeuroAI.

Abstract: Understanding how brains learn requires bridging evidence across scales—from behaviour and neural circuits to cells, synapses, and molecules. In our work, we use computational modelling and data analysis to explore how the physical properties of neurons constrain synaptic plasticity. These include limits imposed by energy availability, molecular noise, spatial wiring, and the 3D structure of dendritic spines. I will focus on a recent project investigating whether stochastic gene expression can account for empirically observed day-to-week fluctuations in synaptic strength. More broadly, we ask whether these biophysical constraints are limitations or guide rails that shape brain learning—are they bugs or features?

Session 3: Clinical Neuroscience, Psychiatry and Aging

Location: Knowledge Exchange

Chair: Prof. John Kelly, Department of Psychiatry, School of Medicine

14:00 – 14:15: James Bradshaw, School of Engineering (López-Valdés Lab)

Title: Electrophysiological Characterisation of Commercial Ear-EEG devices

Abstract: Ear-EEG devices are advanced wearables revolutionizing EEG technology by combining comfort and portability. With the increasing availability of commercial ear-EEG devices, there is a need for an independent characterisation of the electrophysiological performance to guide users and researchers. Here, we evaluate the performance of the IDUN Guardian Earbuds (IGEB, IDUN Technologies AG) by analysing electrophysiological responses to several well-established EEG paradigms, including event-related potentials (ERPs), auditory steady-state response (ASSR), steady-state visually evoked potential (SSVEP), and alpha block, and comparing them to standard scalp-based EEG recordings acquired simultaneously from eight participants utilizing a validation toolkit previously developed in our lab. Results indicate that the in-ear device is capable of detecting SSVEPs. However, we did not observe ERPs, ASSRs, or alpha blocking. Simulating in-ear EEG with electrode T8 referenced to T7 slightly improved the quality of the signal, which was further enhanced with midline reference electrodes. Characterising this technology marks a step forward providing independent assessment of commercially available devices in view of expanding EEG applications, from long-term monitoring and wearable health solutions to advanced brain-machine interfaces (BMI).

14:15 – 14:30: Benjamin Bond, School of Psychology (FutureNeuro)

Title: Cannabis Use Cessation and the Risk of Psychotic Disorders

Abstract: Aims: To establish whether the risk of psychotic disorders in cannabis users changes following cannabis cessation. Methods: The EU-GEI study collected data from first episode psychosis patients and controls across sites in Europe and Brazil. Adjusted logistic regressions were applied to examine whether the odd of psychosis case status changed after cannabis cessation and across different cannabis use groups. Results: Psychosis risk declined following cessation of cannabis use (β=−0.002; 95%CI −0.004 to 0.000; P=0.067). When accounting for duration of use, this effect remained (β=−0.003; 95%CI −0.005 to −0.001; P=0.013). However, in models adjusting for frequency and potency of use the result was not significant. Analysis of different cannabis use groups indicated that ex-users who stopped 1-4 weeks previously had the highest risk for psychotic disorders compared to never users (OR=6.89; 95%CI 3.91–12.14; P<0.001); risk declined for those who stopped 5-12 weeks previously (OR = 2.70; 95% CI 1.73–4.21; P<0.001) and 13-36 weeks previously (OR=1.53; 95%CI 1.00–2.33; P=0.050). Ex-users who stopped 37-96 weeks (OR=1.01; 95%CI 0.66–1.57; P=0.949), 97 to 180 weeks (OR=0.73; 95%CI 0.45–1.19; P=0.204), and 181 weeks previously or more (OR=1.18; 95% CI 0.76–1.83; P=0.456) had similar psychosis risk to those who had never-used cannabis. Conclusion: Risk of psychotic disorders declines following cannabis cessation, reversing after 37 weeks or more of abstinence.

14:30 – 14:45: Anneliese Walsh, School of Engineering (López-Valdés Lab)

Title: Classifying Neurodegenerative Diseases from Temporal EEG Electrodes: Towards Wearable Brain Health Monitoring

Abstract: Ear-EEG presents an interesting opportunity to enable regular, accessible brain health monitoring through integration into wearable devices. This study examines the classification performance of neurodegenerative diseases, Alzheimer's Disease (AD) and Fronto-temporal Dementia (FTD), from temporal

EEG electrodes to inform the feasibility of ear-EEG-based brain health monitoring. EEG recordings from 88 participants (29 control, 36 AD and 23 FTD) at rest with eyes closed were analysed. Models were built with temporal electrode (T3, T4, T5, T6, F7, F8) features, including sub-band power characteristics and band power ratios. Classification of healthy vs. AD achieved 81.8% accuracy, while multiclass classification of healthy, AD and FTD achieved 63.8% accuracy, indicating a challenge for distinguishing between dementias. Results suggest that temporal EEG data can support dementia classification, highlighting the potential for ear-EEG in brain health assessment. Future work will focus on developing an ear-EEG-based brain health metric, enabling proactive brain health monitoring.

14:45 – 15:00: Hugh Delaney, School of Biochemistry (Cunningham Lab)

Title: The Effects of Neuroinflammation on Neuronal Oscillations in Alzheimer's Disease

Abstract: Gamma frequency neuronal oscillations are rhythmic neuronal network activities which underpin many higher order cognitive functions. Using brain slice electrophysiology these oscillations were shown to be disrupted in the Alzheimer's model, APP/PS1 mice. Given the known role that neuroinflammatory processes have in Alzheimer's disease, the proliferation and reactivity of microglia was reduced by treatment with an inhibitor of the CSF1 receptor. While this treatment effectively reduced microglial proliferation and reactivity, it did not reverse cognitive deficits in APP/PS1 mice or rescue the disruptions in gamma frequency oscillations. In fact, treatment with a CSF1R inhibitor in APP/PS1 mice increased neuronal network hyperactivity and the incidence of epileptiform activity. This may be caused by alterations in the ability of treated microglia to maintain the inhibitory-excitatory balance of neuronal networks, supported here by an observed reduction in the lysosomal protein CD68 in microglia after treatment. Overall, this study indicates the complexity of immune interventions in Alzheimer's disease and the potential to interfere with critical microglia functions while attempting to reduce neuroinflammation.

Session 4: New Investigators

Location: Tercentenary Hall

Chairperson: Prof. Andrew Harkin, School of Pharmacy and Pharmaceutical Sciences

14:00 – 14:20: Prof. Michael Dolan, Assistant Professor in Genetics

Bio: Michael Dolan is an Assistant Professor in the Department of Genetics at Trinity College Dublin. His research focuses on the intricate relationship between the brain and immune system, particularly through the study of microglia — the brain's resident macrophages. His work explores how these cells respond to injury and disease, adopting several coexisting subtypes, called "states". Despite recent advances, the formation and specific roles of these microglial states remain unclear. To address these questions, his lab leverages molecular and genomic technologies, aiming to deepen our understanding of microglia in brain health, repair, and disease.

Title: Glial state diversity, formation and function during remyelination

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14:20 – 14:40: Prof. Mohammed Hankir, Assistant Professor in Biochemistry

Bio: I completed a BSc in Neuroscience at the University of Leeds and then an MSc in Neuroscience at University College London. I next undertook a PhD in Metabolism at Imperial College London during which I characterised novel gut hormone analogues for weight loss and their central mechanisms of action. This was followed by postdoctoral appointments at the University of Oxford, University of Leipzig, University Hospital Wuerzburg and the University of Zurich. Over my career, I have developed a research identity on gut-brain communication, adipose tissue thermogenesis and the gut barrier, and how these are modified by Roux-en-Y gastric bypass surgery (RYGB). I have presented at international conferences throughout the world and have published research and review articles in prestigious journals including Cell Metabolism, Trends in Endocrinology and Metabolism, EMBO Reports, EMBO Molecular Medicine, the Journal of Nuclear Medicine and JCI Insight.

Title: Brain feeding circuits targeted by weight loss surgery

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14:40 – 15:00: Prof. Kate Connor, Assistant Professor in Physiology

Bio: I specialise in the study of difficult-to-treat malignancies with unmet clinical needs, with a particular focus in the neuro-oncology setting. I have significant expertise in the development of advanced preclinical models of Glioblastoma (GBM), interrogation of tumour microenvironment contexts of vulnerability, development of novel pre-clinical radiomic pipelines and investigation of mechanisms of response to immunotherapy. My research currently aims to develop a novel gene therapy approach for the treatment of brain tumour-related epilepsy using state-of-the-art preclinical GBM models and ex vivo electrophysiological techniques.

Title: Exploring tumour microenvironment vulnerabilities for the treatment of brain tumours and related epilepsy

Session 5: Neural Systems, Development and Behaviour

Location: Knowledge Exchange

Chairperson: Prof. Eva Jimenez-Mateos, Department of Physiology, School of Medicine

15:30 – 15:45: Katie Marquand, School of Medicine (Boto & Ramaswami Lab)

Title: Modulating olfactory representations: a connectomic analysis of the PPL2 dopaminergic cluster in Drosophila melanogaster

Abstract: Pattern separation is an important process present across species which allows for stimulus discrimination, sensory acuity, and recall of similar but distinct memories. In the fruit fly Drosophila melanogaster, ~2,000 Kenyon cells (KCs) respond sparsely to odors, allowing for formation of specific memories associated with similar odors. KCs receive odor information from projection neurons via synaptic structures called microglomeruli. These structures increase in number after long-term memory consolidation in an odor specific manner, however it is not known what effect this has on the encoding of learnt odors. KC activity is modulated by the inhibitory neuron APL to maintain the sparse coding, but the dendritic region is also innervated by the dopaminergic cluster PPL2. Activation of PPL2 during aversive associative conditioning enhances memory strength and physiological responses to the learnt odor, suggesting a role modulating sensory representation. Here we give a detailed connectomic analysis of PPL2. Firstly, we identified APL and a specific subtype of KC, KCγ, as major post-synaptic targets of PPL2. Secondly, we examine whether PPL2 synapses contribute to microglomeruli. Finally, we investigate the effect of dopamine on odor-evoked calcium responses in KCγ dendrites by systematically knocking down each dopamine receptor expressed in KCs. Overall, the data suggests a role for modulating KC activity either directly by the Dop2R receptor or multisynaptically via APL.

15:45 – 16:00: Áine T. Dineen, School of Psychology (Cusack Lab)

Title: Does the infant ventral visual stream encode global shape or local object features?

Abstract: When an infant views an object, what features does their visual system encode? Does it simply capture the gist of the object, encoding coarse, global features without using fine details (local features)? Does it make use of local features without forming a coherent global shape? Or does it integrate information across spatial scales, combining local features into a holistic, global percept? To investigate, we used fMRI to acquire responses from the ventral visual stream of n=103 2-month-olds, n=38 9-month-olds and n=17 adults while they viewed images of 36 objects. We devised a novel method to disentangle these possibilities using deep neural network models trained and tested on images across a range of blurs. The object representations of the models then were compared to developing ventral stream responses. Strikingly, between 9-months and adulthood, we found a significant increase in correlations with the models trained on blurry images but tested on sharper images, showing that object information is being integrated across spatial scales. This trend was not found between 2- and 9-months suggesting a protracted time course for learning to integrate local object features into global object shape that is not simply driven by developing visual acuity. Our work provides insight into the nature of developing object responses in the ventral visual stream, and provides a novel use case of deep neural networks to investigate the development of visual feature tuning.

16:00 – 16:15: Dr. Natalie Hudson, School of Genetics and Microbiology (Campbell Lab)

Title: CLDN5 mediated regulation of the blood brain barrier (BBB) and Alternating Hemiplegia of Childhood (AHC)

Abstract: The blood-brain barrier (BBB) is essential to regulate the movement of nutrients, toxins and cells from blood to brain and vice versa. The presence of tight junctions helps to maintain the barrier properties

and a key component of the tight junctions is claudin-5. Changes in the expression levels of claudin-5 have been implicated in a number of neurodegenerative conditions. Previous work from the laboratory identified a novel de novo mutation (c.178G>A) in the CLDN5 gene (G60R mutation) that causes claudin-5 function to be greatly changed from its usual barrier forming properties. The G60R mutation has been described in two unrelated cases of alternating hemiplegia with microcephaly. We have recently developed a novel mouse model with this G60R claudin-5 mutation. We wish to characterise these mice to determine if there are any observable phenotypic changes and alterations in the barrier properties of these mice. Behavioural testing to assess for motor coordination, gait, memory function, and anxiety. Post-mortem analysis of brain tissue will enable us to determine changes in BBB function and permeability via perfusion of fluorescent markers. Assessing these novel transgenic mice will allow us to determine the severity of this mutation compared to well established models of alternating hemiplegia of childhood (AHC) which have mutations in the Atp1a3 gene.

Session 6: GBHI Fellows

Location: Tercentenary Hall

Chairperson: Prof. Alejandro López Valdés, School of Engineering and GBHI

A number of GBHI Fellows will present research they are undertaking with GBHI, details to follow.

Guest Lecture 4: Identification of Glycerol 3-phosphate acyltransferase as a potent modifier of α-synuclein-induced toxicity.

Location: Tercentenary Hall

Chairperson: Prof. Daniela Tropea, Department of Psychiatry, School of Medicine

16:40 – 17:10: Prof. Lim Kah Leong

Bio: Kah-Leong Lim is Professor and Associate Vice President (Biomedical and Life Sciences) at the NTU President's office as well as Director of the Neuroscience and Mental Health Programme at the NTU- Lee Kong Chian School of Medicine, where he is also the President's Chair in Translational Neuroscience. He is a Visiting Professor at the Department of Brain Sciences, Imperial College London (UK), a Distinguished Visiting Academic at the National Neuroscience Institute (Singapore) and Research Director (Honorary Joint) at IMCB.

Dr. Lim obtained his Ph.D. from the Singapore Institute of Molecular & Cell Biology in 1999. Thereafter, he did his postdoctoral training firstly at the Department of Pathology in Harvard Medical School (2000-2001) with Azad Bonni, and subsequently at the Department of Neurology in Johns Hopkins University School of Medicine (2001-2002) where he worked on the topic of Parkinson's disease with Ted Dawson. Dr Lim joined the National Neuroscience Institute of Singapore (NNI) as Head of Neurodegeneration Research Laboratory in July 2002 and became the Deputy Research Director of NNI before he left in 2018 to join the National University of Singapore (NUS) as the Head/Chair of the Department of Physiology at the Yong Loo Ling School of Medicine. From 2019-2023, he was the Vice Dean for Research at the LKCMedicine.

His research work focuses on unravelling the molecular basis of neurodegenerative diseases, with the view to develop novel therapeutics for these debilitating disorders.

Abstract: Although multiple cellular pathways have been implicated in a-Synuclein (a-syn)-associated Parkinson's disease (PD), the role of lipid metabolism remains elusive. Using the Drosophila system as a genetic screening tool, we identified mino, which encodes the mitochondrial isoform of the lipid synthesis enzyme glycerol 3-phosphate acyltransferase (GPAT), as a potent modifier of α-syn. Silencing the expression of mino significantly suppresses α-syn-induced PD phenotypes in Drosophila, including dopaminergic neuronal loss and locomotion defects as well as circadian rhythm-related activities, whereas mino overexpression yields opposite effects. Mechanistically, we found that mino modulates the levels of mitochondrial reactive oxygen species and lipid peroxidation. Importantly, treatment of a-syn-expressing flies with FSG67, a GPAT inhibitor, reproduces the benefits of mino knockdown. FSG67 also inhibited α-syn aggregation and lipid peroxidation in mouse primary neurons transfected with a-syn preformed fibrils. Our study elucidates an important factor contributing to α-syn toxicity and offers a novel therapeutic direction for PD.

Posters

	Full name	*Poster Title*
	Theme 1: Translational Research: Markers, Models and Interventions	
1	Javier Cuitavi	Age-related changes in the metabolic and cognitive effects of systemic TNFα
2	Almudena Otálora Alcaraz	Plant-derived cannabinoids as regulators of NLRP3 inflammasome signaling in immune cells with relevance to multiple sclerosis
3	Carly Douglas	Pro-inflammatory signalling along the P2X7R/NOX2 inflammatory axis in microglia.
4	Nathan Shields	Identification and validation of a biomarker for tinnitus
5	Myles Corrigan	Disease-relevant in vitro models of inflammatory-driven neurodegeneration
6	Kieran Byrne	Investigating the interactions between Natural Killer Cells and Endothelial Cells in Retinal Neovascular Diseases
7	Janeen Laabei	NOX2-mediated regulation of NLRP3 inflammasome activation in resident and infiltrating cells in traumatic brain injury.
8	Sarah Palko	Dual Inhibition of VEGF/Ang2 reduces markers of subretinal fibrosis in the two-stage laser induced choroidal neovascularization model of wet AMD
9	Vincent Healy	Electrophysiological and pharmacological interrogation of peritumoral tissue in brain tumour-related epilepsy (BTRE)
10	Nathan Strogulski	Microglial NADPH oxidase (NOX2) rewires mitochondrial and pentose phosphate metabolism following experimental traumatic brain injury in mice.
11	Gloria Vegliante	Microglial Phenotype Across the Lifespan in TREM2 R47H Mice Following Traumatic Brain Injury
12	Jessica Pinto	Plastogenic Effects of NMDA receptor antagonist ketamine on primary mouse cortical neurons: establishing a platform for novel antidepressant discovery
13	Bríd Murphy	The Interplay Between Traumatic Brain Injury and Inflammatory Responses
14	Gudo Rietman	Blood-brain barrier permeability in Alzheimer's mouse model following systemic inflammation
	Theme 2: Clinical Neuroscience, Psychiatry and Aging	
15	Maitreyee Purnapatre	Blood-brain barrier in concussions
16	Saoirse Bodnar	Accelerating Habits: The Role of Reaction Time in Habit Acquisition and Expression
17	Ellie Noone	Loss of Bmal1 in Myeloid Cells Accelerates Age-Related Migration of Immune cells to the Outer Retina.
18	Adam McGlinchey	Characterising the blood-brain-tumour barrier in GBM
19	Kieva Byrne	Integrity of the inner Blood Retinal Barrier in Inherited Retinopathies
20	Dara O'Boyle	Natural Killer Cell and Macrophage Interactions in Age-Related Macular Degeneration
21	Davide Selleri	Validation of novel microtubule modulators for the treatment of CDKL5 deficiency disorder
22	Christopher Sheridan	Psilocin attenuates the type-1 interferon response to the viral-mimetic immunostimulus poly I:C in human peripheral blood mononuclear cells

23	Kathryn Duff	Elucidating pathological CSF1R signalling in disease
	Theme 3: Neural Systems, Development and Behaviour	
24	Ronan Murphy	Using MRI to evaluate neurodevelopment in a mouse model of neonatal hypoxia
25	Serena Pugliano	Natural forgetting through memory engram competition
26	Bente Wijnands	Tractography in neonates - building connectomes
27	Lucia Celkova	Endothelial IL-36 receptor activation promotes vascular stability to limit pathological microvessel permeability in the CNS
28	Denis O'Brien	Determination of the pA2 value of paroxetine on carbachol-mediated contraction in the rat ileum preparation
29	Paul Conway	Evolution of an olfactory behavior in Mus musculus
30	Daniel McLoone	Normative Brain Development in Male and Female Rats: A Longitudinal Neuroimaging Study
31	Joern Huelsmeier	Ataxin2 mechanisms in mRNP condensation
32	Cian Gavin	Psychadelics as microtubule modulators: behavioural and molecular insights
33	Alma O'Donnell	Recording High Frequency Oscillations (HFO's) during functional cortical mapping for tumour resection – A Beaumont Hospital trial
34	Joshua William Bolam	Identifying Movement-Independent Evidence Accumulation Signals in the EEG of Non-Human Primates
35	Henry Frost	Pharmacological Characterisation of Delta Rhythms in an Ex Vivo Model of Infantile Spasms
36	Eoin O'Neill	Blood-brain barrier permeability and neurological impairment during critical pertussis in infancy
37	Cliona O'Doherty	Features learned from an infant's perspective are more aligned with the infant brain
38	Marie Santillo	Early Engagement of the Multiple Demand Network in Infancy