

NeuroFutures2017

Brain Connectivity in Health and Disease
University of British Columbia Forest Science Building
July 9-11th 2017



ALLEN INSTITUTE *for*
BRAIN SCIENCE



Sponsored by: Leica Microsystems, Allen Institute for Brain Science, Univ. of Washington, and Oregon Health and Science University, and University of British Columbia.

Special thanks to the UBC faculty of medicine for supporting the “Dynamic Brain Circuits and Connections in Health and Disease: research cluster.

July 9-11th, 2017 Forest Sci. Bldg UBC

Sunday, July 9

- 6:00pm **Public Lecture & Discussion - Neuroscience and Artificial Intelligence**
- Auditorium
- Tim Murphy, *University of British Columbia* / Amy Bernard, *Allen Institute for Brain Science* Introduction and moderators
 - Gary Marcus, *New York University*, "What artificial intelligence can learn from the brain and vice versa"
- 7:00-8:30PM **Reception** - Atrium

Monday, July 10

- 7:45-8:45am **Registration and continental breakfast Forest Sci. Atrium**
- 9:00am **Welcome and introductory remarks Tim Murphy University of British Columbia, NeuroFutures2017 committee** – Forest Sci. Auditorium
- Ann Marie Craig, Ph.D., *University of British Columbia*
 - Sheri Mizumori, Ph.D., *University of Washington*
 - Terri Gilbert Allen Inst for Brain Science
 - Amy Bernard Allen Inst for Brain Science
 - Rad Roberts, Ph.D., *University of Washington*
 - Bill Rooney, Ph.D., *Oregon Health & Science University*
 - Jane Roskams, Ph.D., *UBC*
- 9:05-10:00am **Opening keynote - Engineering fluorescent protein probes** - Auditorium
Moderator: Tim Murphy, *University of British Columbia*
- Loren Looger, *Janelia Research Campus*
 "Tools to follow the brain in action"
- 10:00-10:30am **Morning break** - Atrium

- 10:30am-12:00noon **“Recombinant probes and protein/small molecule engineering for neuroscience”** – Auditorium
Moderator: Rad Roberts, *University of Washington*
- 10:30-11:00am Robert Campbell, *University of Alberta*
“Engineering of red-shifted genetically encoded neurophotonics probes”
- 11:00-11:30am Axerio-Cilies, *University of British Columbia*
"In silico drug design for selecting NMDA receptor subtype specific modulators"
- 11:30am-12noon Lance Stewart, *University of Washington*
"De novo protein design: binders, switches, and channels for future neuroscience applications".
- 12noon-1pm **Lunch** - Atrium
- 1:00-3:00pm **“Circuits in behavior”** - Auditorium
Moderator: Sheri Mizumori, *University of Washington*
- 1:00-1:30pm Richard Palmiter, *University of Washington*
"A neural circuit that controls appetite and responds to threats."
- 1:30-2:00pm David Gire, *University of Washington*
"Neural circuits for processing natural odor scenes".
- 2:00-2:30pm Jonathan Epp, *University of Calgary*
"Regulation of circuit stability and memory persistence by adult neurogenesis".
- 2:30-3:00pm Eric Turner, *University of Washington*
"The lawless frontiers of the Habenula"
- 3:00-3:30pm **Coffee and afternoon break** - Atrium
- 3:30-5:00pm **“Mesoscale connectivity new methods and approaches”** - Auditorium
Moderator: Bill Rooney, *Oregon Health & Science University*
- 3:30-4:00pm Jack Waters, *Allen Institute for Brain Science*
"An extended map of retinotopy in mouse neocortex"
- 4:00-4:30pm Tianyi Mao, *Oregon Health and Science University*
"Integration of multiple mesoscopic maps for analyzing functional circuit properties and its plasticity".
- 4:30-5:00pm Jennifer Whitesell, *Allen Institute for Brain Science*
"Anatomical correlates for the mouse default mode network and its vulnerability in Alzheimer's disease".

5:00-7:00pm **Poster session 1 and Happy Hour reception** - Atrium

Tuesday, July 11

7:45-8:45am **Registration and Continental Breakfast** – Forest Sci. atrium

9:00-10:00am **“Brain clearing, expansion, and super-resolution technologies”**
Auditorium

Moderator: Ann Marie Craig, *University of British Columbia*

9:00-9:30am Kwanghun Chung, *Massachusetts Institute of Technology*
"Integrated multiscale imaging and phenotyping of intact biological systems".

9:30-10:00am Joshua Vaughan, *University of Washington*
Super-resolution microscopy made simple".

10:00-10:30am **Coffee and morning break, poster session 2** - Atrium

10:30-12noon **“Exploring brain circuitry by leveraging cell class identity: Approaches in genetic engineering and structural biology”** -
Auditorium

Moderator: Amy Bernard, *Allen Institute for Brain Science*

10:30-11:00am Tanya Daigle, *Allen Institute for Brain Science*
"New genetic tools for functional analysis of cell types"

11:00-11:30am John Mich, *Allen Institute for Brain Science*
"Marker discovery and modeling of human brain development".

11:30-12:00am Michelle Naugle, *Allen Institute for Brain Science*
"Exploring the synaptic networks of human cortex".

12noon-1:30pm **Lunch and poster session 2** - Atrium

1:30-3:30pm **“Circuits in disease models and memory systems”** - Auditorium
Moderator: Allen Chan, *University of British Columbia*

1:30-2:00pm Jodi McBride, *Oregon Health and Science University*
"Changes in brain connectivity in Huntington's disease".

2:00-2:30pm Shernaz Bamji, *University of British Columbia*
"The X-linked intellectual disability gene DHHC9 and the formation of neural circuits".

- 2:30-3:00pm Majid Mohajerani, *University of Lethbridge*
"In vivo optical imaging assessment of mouse cortical-hippocampal dialogue during rest".
- 3:00-3:30pm Cathy Rankin, *University of British Columbia*
"High throughput, high resolution machine vision analyses of C.elegans behavior lead to new insights about learning".
- 3:30-3:45pm **Break** - Atrium
- 3:45-4:45pm **"Closing Keynote - Imaging Brain Metabolism"** - Auditorium
Jane Roskams, *University of British Columbia Moderator*
Brian MacVicar, *University of British Columbia Speaker*
- 4:45-5:00PM **Final wrap-up and Poster awards** - Auditorium

Poster Session 1. July 10th, 2017 please put posters up before 9 AM remove at end of evening poster session.

- 1) Duration dependency of monocular deprivation induced visual plasticity. Seung Hyun Min, Alex Baldwin, Alexandre Reynaud, Robert F. Hess McGill Vision Research, Dept. Ophthalmology, McGill University, Montreal PQ, Canada.
- 2) The X-linked disability Gene, DHHC9, regulates neural circuit formation. Jordan J. Shimell, Bhavin S. Shah, Blair Jovellar, Stefano Brigidi, Igor Tatarnikov, Naila Kuhlmann, Austen Milnerwood, Shernaz X. Bamji. University of British Columbia, Vancouver, BC, Canada.
- 3) Molecular signaling pathways in synaptogenesis. Claire Bomkamp & Ann Marie Craig Department of Psychiatry, University of British Columbia, Vancouver, BC, Canada.
- 4) Functionalization of ASD variants of PTEN in rat and Xenopus. Matthew Edwards^{1,4*}, Riki Dingwall^{1,4*}, Kathryn Post^{1,4}, Paul Pavlidis^{2,4}, Timothy O'Connor^{1,4}, Catherine Rankin^{3,4}, Douglas Allan^{1,4}, Christopher Loewen¹, Shernaz Bamji^{1,4}, Kurt Haas^{1,4} 1) Department of Cellular and Physiological Science, 2) Department of Psychiatry, 3) Department of Psychology, 4) Centre for Brain Health, The University of British Columbia, Vancouver, BC, Canada
- 5) Investigation of the role of APP in developmental axonal pruning. Andres de Leon^{1,2}; Aaron Johnstone^{1,2}; Mark Cumming^{1,2}; Julien Gibon¹, Philip Barker¹. 1) University of British Columbia – Okanagan, BC; 2) McGill University, Montreal, QC, Canada.
- 6) Expand your mind! Super-resolution imaging of brain tissue with conventional microscopes using expansion microscopy. Tyler J. Chozinski, Aaron R. Halpern, Haruhisa Okawa, Hyeon-Jin Kim, Grant J. Tremel, Chenyi Mao, Nan Jiang, Jay Z. Parrish, Rachel O. L. Wong, Joshua C. Vaughan. Departments of Chemistry, Physiology and Biophysics, Biology, and Biological Structure, University of Washington, Seattle, WA, USA.
- 7) Measuring glutamate release in Huntington Disease using iGluSnFr, an optogenetic probe. Ellen T Koch, Cameron L Woodard, Lynn A Raymond. Department of Psychiatry, University of British Columbia, Vancouver, BC, Canada.
- 8) A novel automated home-cage system to assess learning and performance of a skilled motor task in a mouse model of Huntington's disease. Cameron L. Woodard¹, Federico Bolaños¹, James D. Boyd², Greg Silasi², Timothy H. Murphy², Lynn A. Raymond² 1) Graduate Program in Neuroscience 2) Department of Psychiatry and Djavad Mowafaghian Centre for Brain Health, University of British Columbia, Vancouver, BC, Canada.
- 9) Movement initiation in GCaMP6 mice is preceded by stereotyped, multi-second dorsal cortex dynamics. Catalin C. Mitelut^{1,2,3}, Anna X. Luo^{1,2}, Greg Silasi¹, Yuki Sekino⁴, Jamie D. Boyd^{1,2}, Federico Bolanos^{1,2}, Nicholas V. Swindale³, Timothy H. Murphy^{1,2} 1) Dept. of Psychiatry, Kinsmen Lab of Neurological Research, University of British Columbia, Vancouver, BC, Canada. 2) Djavad Mowafaghian Centre for Brain Health, University of British Columbia, Vancouver, BC, Canada. 3) Dept. of Ophthalmology and Visual Sciences, University of British Columbia, Vancouver, BC, Canada. 4) Dept. of

Otorhinolaryngology, Kyushu University, Fukuoka, Japan.

- 10) Automated optogenetic and mesoscopic brain imaging system for the mouse home-cage, Federico Bolanos, Jeffrey Ledue, James D. Boyd, Timothy H. Murphy. Djavad Mowafaghian Centre for Brain Health, University of British Columbia, Vancouver, BC, Canada.
- 11) Mesoscale Brain Explorer, a flexible Python-based image analysis and visualization tool; Authors: Dirk Haupt, Matthieu Vanni, Federico Bolanos, Jeffrey LeDue, Catalin Mitelut, Timothy Murphy; All Authors are affiliated with both 1) Department of Psychiatry, Kinsmen Laboratory of Neurological Research, University of British Columbia, Vancouver, BC, Canada. 2) Djavad Mowafaghian Centre for Brain Health, University of British Columbia, Vancouver, BC, Canada.
- 12) Mesoscale cortical calcium imaging reveals functional hypoconnectivity and region-specific changes in activity fluctuations in a mouse model of electroconvulsive therapy D. Blair Jovellar, Jeffrey LeDue, Fidel Vila-Rodriguez, Timothy H. Murphy, University of British Columbia, Vancouver, BC, Canada
- 13) Sub-cortical or peripheral nerve spike-triggered cortical mesoscale activity associated with specific actions in awake chronic mice. Dongsheng Xiao^{1,2}, Timothy H Murphy^{1,2*} 1) Department of Psychiatry, Kinsmen Laboratory of Neurological Research, 2) Djavad Mowafaghian Centre for Brain Health, University of British Columbia, Vancouver, BC, Canada.
- 14) Spatiotemporal mapping of spontaneous activity in GCaMP6 mice reveals new anatomofunctional boundaries, symmetries and pinwheels of cortical dynamics. Vanni MP, Chan AW, Balbi M, Silasi G, Murphy TH. Department of Psychiatry, University of British Columbia, Vancouver, BC, Canada.
- 15) Using single cell widefield to characterize the spatiotemporal properties of the mouse visual cortex. Natalia Mesa. University of Washington, Seattle, WA, USA.
- 16) AAV-PHP.B mediates gene delivery throughout the CNS of mice and rhesus macaques via intra-CSF or intra-vascular administration. Jacqueline Domire¹, William Liguore¹, Yun Wang¹, Dana Button¹, Brett Dufour^{1,2}, Darla Jacob³, Ted Hobbs³, Drew Martin³ and Jodi McBride^{1,2,4} Divisions of 1) Neuroscience and 3) Comparative Medicine, Oregon National Primate Research Center, Departments of 2) Behavioral Neuroscience and 4) Neurology, Oregon Health and Science University, Portland, OR, USA.
- 17) Multiple measures of short-term tap habituation. Aram Bernardos, James Wong, Catharine Rankin. University of British Columbia, Vancouver, BC, Canada.
- 18) Stress habituation and sex modulate the effects of the 5-HT 1A receptor agonist, 8-OH DPAT, on pre- and post- synaptic function. Presented by Philippe, T. J., Ferland, A., Chang, J., Yang, Y., Viau, V. University of British Columbia, Vancouver, BC, Canada.
- 19) Stress hormone CORT induced neuroplasticity in the ventral tegmental area. Shuai Liu, Min Qiao and Stephanie Borgland Hotchkiss Brain Institute, University of Calgary, AB, Canada.

- 20) BiolD reveals the robust signaling complexity of neuronal TNF receptors Authors: Mark J. Cumming, University of British Columbia Okanagan, BC, McGill University, QC, Estelle Laurent University of Toronto, ON, Etienne Coyaud University of Toronto, ON, Genevieve Dorval, McGill University, Montreal, QC, Brian Raught University of Toronto, ON, and Philip A. Barker, McGill University, Montreal, QC, Canada.

Poster session 2. July 11th, 2017 please put posters up before 9 AM remove at 5PM.

- 1) Expression analysis of mouse models and patients of neurodegenerative diseases; Thatra, Nivretta, University of British Columbia, Vancouver; Pavlidis, Paul, University of British Columbia, Vancouver ; Riess, Olaf, University of Tübingen, Germany; Gsponer, Joerg, University of British Columbia, Vancouver, BC, Canada.
- 2) Biomarkers for injury severity in patients with acute traumatic spinal cord injury. Seth Tigchelaar¹, Femke Streijger¹, Sunita Sinha², Stephane Flibotte², Michael A Rizzuto¹, John Street⁴, Scott Paquette⁵, Michael Boyd⁵, Tamir Ailon⁵, Charles Fisher⁴, Marcel Dvorak⁴, Jean-Marc Mac-Thiong⁶, Stefan Parent⁷, Christopher Bailey⁸, Sean Christie⁹, Kendall Van Keuren-Jensen³, Corey Nislow², Brian K. Kwon^{1,4}. 1) International Collaboration on Repair Discoveries (ICORD), University of British Columbia, Vancouver, British Columbia, Canada; 2) Faculty of Pharmaceutical Sciences, University of British Columbia, Vancouver, British Columbia, Canada; 3) Translational Genomics, Phoenix, Arizona, USA. 4) Department of Orthopedics, Vancouver Spine Surgery Institute, Vancouver, British Columbia, Canada. 5) Division of Neurosurgery, Vancouver Spine Surgery Institute, Vancouver, British Columbia, Canada. 6) Hôpital du Sacré-Coeur de Montréal, Montreal, Quebec, Canada. 7) Department of Surgery, Chu Sainte-Justine, University of Montreal, Montreal, Quebec, Canada. 8) Division of Orthopaedic Surgery, Schulich Med. & Dentistry, Victoria Hospital, London, Ontario, Canada. 9) Division of Neurosurgery, Halifax Infirmary, Dalhousie University, Halifax, Nova Scotia, Canada.
- 3) Enteroviral infection leads to cytoplasmic mislocalization of TDP-43 in mouse brain. Yuan Chao (Tim) Xue^{1,2}, Gabriel Fung^{1,2}, Yasir Mohamud^{1,2}, Eric Deng^{1,2}, Jingchun Zhang^{1,2}, Ralph Feuer³, Neil Cashman⁴, Honglin Luo^{1,2}. 1) Centre for Heart Lung Innovation, St. Paul's Hospital, Vancouver, BC. 2) Department of Pathology and Laboratory Medicine, University of British Columbia, Vancouver, BC. 3) Department of Biology, San Diego State University, CA, USA. 4) The Centre for Brain Research, University of British Columbia, Vancouver, BC, Canada.
- 4) Acute fasting alters dopamine release in a region and sex-dependent manner. Sophie Guo and Stephanie L. Borgland, Hotchkiss Brain Institute, Department of Physiology & Pharmacology, the University of Calgary, AB, Canada.
- 5) Fasting induced plasticity in dopamine neurons of the ventral tegmental area. Nathan Godfrey, Stephanie Borgland. University of Calgary, AB, Canada.
- 6) High-throughput behavioural characterization and precise structure-function analyses of genes and gene variants associated with autism spectrum disorder. Troy McDiarmid. Djavad Mowafaghian Centre for Brain Health, University of British Columbia, Vancouver, BC, Canada.

- 7) How alterations in prefrontal cortex activity can lead to working memory deficits and compensatory behaviors in an animal model of schizophrenia. Nathaniel J. Powell and Jeremy K. Seamans. Department of Psychiatry, University of British Columbia, Vancouver, BC, Canada.
- 8) Memory enhances search strategies during odor-guided foraging. Brian J. Jackson¹, Sujean Oh¹, Venkatesh Gopal², Agnese Seminara³, Gusti Lulu Fatima¹, David H. Gire¹. 1) Department of Psychology, University of Washington, Seattle, WA, USA. 2) Department of Physics, Elmhurst College, Elmhurst, IL, USA. 3) Laboratoire de physique de la matière condensée, CNRS, Parc Valrose, Nice, France.
- 9) Parameterization of electrical stimulation for modulating intensity of a sensory percept D.A. Bjanec^{1,2,5}, S Kassegne^{6,7}, C.T. Moritz^{1,2,3,4,5}. 1) Electrical Engineering, University of Washington, Seattle, WA, USA. 2) University of Washington, Institute for Neuro-engineering, Seattle, WA, USA. 3) Physiology and Biophysics, University of Washington, Seattle, WA, USA. 4) Rehabilitation Medicine, University of Washington, Seattle, WA, USA. 5) Center for Sensorimotor Neural Engineering 6 Mechanical Engineering, San Diego State University, CA, USA. 7) Bioengineering, San Diego State University, CA, USA.
- 10) Temporal anatomical and diffusion MRI fetal brain templates of rhesus macaque integrated with high-resolution post mortem MRI. Zheng Liu¹, Xiaojie Wang^{1,2}, Colin Studholme³, Christopher D. Kroenke^{1,2}. 1) Division of Neuroscience, Oregon National Primate Research Center, Portland, OR, USA; 2) Advanced Imaging Research Center, Oregon Health and Science University, Portland, OR, USA; 3) Pediatrics, Bioengineering and Radiology, University of Washington, Seattle, WA, USA.
- 11) Neuronal swelling during spreading depression involves the new Cl⁻ channel, slc26a11. YQ Liu, B. A. MacVicar, University of British Columbia, Vancouver, BC, Canada.
- 12) Trauma-induced alterations of cerebral excitability and cortical reorganization in a porcine model of SCI. A. Fong¹, K. Shortt¹, C.R. Jutzler^{1,2}, F. Streijger¹, N. Manouchehri¹, K. So¹, J. Kramer^{1,4}, B. K. Kwon^{1,3}. 1) International Collaboration on Repair Discoveries, Vancouver, BC, Canada; 2) Spinal Cord Injury Center Balgrist, University of Zurich, Switzerland; 3) Vancouver Spine Surgery Institute, Dept. of Orthopaedics, University of British Columbia, Vancouver, BC, Canada; 4) School of Kinesiology, University of British Columbia, Vancouver, BC, Canada.
- 13) High spatial resolution mapping of trans-capillary water exchange in progressive multiple sclerosis Ian Tagge¹, Manoj Sammi¹, Rebecca Spain², Dennis Bourdette³, Randy West¹, John Grinstead⁴, Katherine Powers¹, Xin Li¹, Charles Springer Jr.¹ and William D Rooney¹. 1) Oregon Health & Science University, Portland, OR, USA. 2) Portland VA Medical Center, Portland, OR, USA. 3) Neurology, Oregon Health and Science University, Portland, OR, USA. 4) Siemens Medical Solutions, Portland, OR, USA.
- 14) Prolonged, mesoscale, cortical quiescence following discrete peripheral sensory stimulation revealed by voltage imaging Allen W. Chan, Alexander McGirr, Jeffrey M. LeDue, Timothy H. Murphy. University of British Columbia, Vancouver, BC, Canada
- 15) Discovering mesoscopic spatiotemporal patterns in calcium imaging that predict cortical

and subcortical neuron spiking: a machine learning perspective. Anna Xiao Luo¹, Dongsheng Xiao¹, and Tim Murphy¹, ¹) Department of Psychiatry, University of British Columbia, Vancouver, BC, Canada.