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EMPLOYMENT

2020.07 –	Professor, Department of Physiology and Institute of Biomedical Engineering, University of Toronto
2018.01 – 2021.08	Lead, Neuroscience Platform, Department of Physiology, University of Toronto
2015.07 –	Senior Scientist, Program in Neurosciences and Mental Health, The Hospital for Sick Children
2015.07 – 2020.07	Associate Professor, Department of Physiology and Institute of Biomedical Engineering, University of Toronto
2014.07 – 2015.07	Assistant Professor, Institute of Biomedical Engineering, University of Toronto. *Cross-appointment*
2012.10 – 2015.10	Adjunct Professor, Department of Anesthesiology, University of Pittsburgh
2012.07 – 2015.07	Scientist, Program in Neurosciences and Mental Health, The Hospital for Sick Children
2012.07 – 2015.07	Assistant Professor, Department of Physiology, University of Toronto
2008.05 – 2012.08	Assistant Professor, Department of Neurobiology, University of Pittsburgh

EDUCATION

2005.09 – 2008.06	Post-doctoral fellow, Computational Neurobiology Lab, The Salk Institute for Biological Studies, La Jolla, CA, USA. *Supervisor:* Terrence J. Sejnowski. Computational neuroscience
1999.01 – 2005.04	PhD, Department of Pharmacology and Therapeutics, McGill University, Montreal, QC, Canada. *Supervisor:* Yves De Koninck. *Thesis title:* Signal processing by single neurons: biophysical mechanisms and implications for nociception
1997.09 – 2005.04	MD CM, Faculty of Medicine, McGill University, Montreal, QC, Canada. MD/PhD program
1996.05 – 1997.12	MSc, Department of Biology, McGill University, Montreal, QC, Canada. *Supervisor:* Ronald Chase. *Thesis title:* Interactions of habituation and sensitization at the network level illustrated by the tentacle withdrawal reflex of a snail
1992.09 – 1996.04	BSc (Hons), Department of Biology, McGill University, Montreal, QC, Canada. *Major:* Biology, *Minor:* Psychology

HONOURS AND AWARDS

2021.12	Excellence in Graduate Teaching Award, Department of Physiology University of Toronto
2021.01	Janet Rossant Research Innovation Prize for Interdisciplinary Collaboration, The Hospital for Sick Children. Co-recipient with James Ellis, Stephen Scherer, Seema Mital, Binita Kamath, Norman Rosenblum
2019.12	Excellence in Graduate Teaching Award, Department of Physiology University of Toronto
2014.07 – 2017.06	Early Researcher Award. Ontario Ministry of Research and Innovation *Title:* The neural basis of somatosensation and pain. *Total Amount:* $140,000 CAD
2013.07 – 2018.06	New Investigator Salary Award. CIHR *Title:* Computational deconstruction of pain processing. *Total amount:* $300,000 CAD
2011.10 – 2014.09	53rd Mallinckrodt Scholar Award. Edward Mallinckrodt, Jr. Foundation (Glen Carbon, IL, USA) *Title:* Using optogenetics to probe how disruption of neural coding causes neuropathic pain. *Total Amount.* $210,000 USD
2009.09 – 2012.08	Rita Allen Foundation Scholar in Pain Award. Rita Allen Foundation (Princeton, NJ, USA) *Title:* Pain processing by neural networks: a critical link between the molecular and perceptual changes associated with neuropathic pain. *Total Amount:* $150,000 USD
2006.04 – 2008.05	Long Term Fellowship. Human Frontiers Science Program (Strasbourg, France) *Title:* Encoding dynamic stimuli under noisy conditions: an information theory approach to neural coding. (LT00239). *Total Amount:* $102,600 USD (only 25.5 months of funding used)
2005.09 – 2006.04	Fellowship. CIHR (Ranked 4th out of 190 applicants) *Title:* Impact of intrinsic currents and background synaptic noise on the encoding of dynamic stimuli by neurons: an information theory approach. *Total Amount:* $38,750 CAD (7 months of funding used)

OVERVIEW OF RESEARCH

My lab studies the neural basis of sensation. We seek to decipher how somatosensory information is normally processed and how disruption of that processing causes chronic pain in order to identify novel and fundamentally more effective pain therapies. Reflecting my own combined training as a clinician, theorist and experimentalist, my lab synergistically combines computational simulations, mathematical analysis and diverse experimental techniques including *in vitro* and *in vivo* electrophysiology, calcium imaging and optogenetics. By pursuing multiple intersecting projects with foci ranging from fundamental processes (e.g. how neurons regulate their excitability) to topics with immediate clinical impact (e.g. how to optimize spinal cord stimulation), my lab has made important advances in several areas:

Spiking mechanisms and neural coding: My early research on spike generation (*PLoS Comput Biol* 2008) demonstrated how distinct spiking patterns arise from subtle biophysical differences; the key lies in how ionic currents interact. Capitalizing on my initial discoveries, we have since shown how spike generation dynamics affect synchronization (*J Neurosci* 2012; *Neuron* 2013) and computations like integration and differentiation (*Front Cell Neurosci* 2015). Understanding the basis for such computations is crucial for explaining the representation and transformation of sensory information (*Cerebral Cortex* 2016; *J Neurosci* 2018; *J Physiol* 2018; *PNAS* 2019; *J Neurosci* 2019) and has led to exciting new research on axonal excitability (*BioRxiv* 2021) and the implications of synchronized spiking for spinal cord stimulation (in preparation).

Pathological disruption of spike generation: Expertise in spike generation helped us recognize that pathological spiking patterns arise through specific changes in spike generation. Using modeling and nonlinear dynamical analysis, we showed how a well described but misunderstood pattern of afferent hyperexcitability arises from such changes (*PLoS Comput Biol* 2012) and subsequently confirmed those predictions through innovative dynamic clamp experiments (*eLife 2014*; *J Physiol* 2018). This work led me to introduce the concept of degeneracy to pain research, and to highlight its implications for pain research and drug development (*Curr Opin Neurobiol* 2016; *Cell Rep* 2019; *eLife* 2022). This line of research includes several additional publications (*PNAS* 2010; *J Neural Eng* 2011; *PLoS Comput Biol* 2016) and has prompted collaborations to which we contributed by measuring changes in neuronal excitability (*Sci Adv* 2018; *Pain* 2018; *Nature* 2019).

Pathological disruption of chloride regulation: I participated in the seminal study showing that intracellular chloride becomes dyresgulated after nerve injury (*Nature* 2003) and have continued to elucidate how this dysregulation occurs and how it impacts cell function (*Molec Pain* 2006; *PLoS Comput Biol* 2011, 2016; *J Neurosci* 2011; *Front Cell Neurosci* 2016). Regulation of intracellular chloride has been the source of much confusion, prompting me to write several chapters and review articles to make this important topic accessible to a broad audience (*Brain Res Rev* 2009; *Molec Biol Pain* 2015; *Neuron* 2016). We have also conducted experiments (*Pain* 2015; *eLife* 2019) and simulations (*J Neurosci* 2022) in the spinal dorsal horn to decipher how disinhibition disrupts circuit-level processing of pain signals.

Theory of combinatorial coding: Many features of neuropathic pain are incompatible with prevailing theories of pain coding. We developed a novel theory, combinatorial coding, which emphasizes the combination of afferents activated by a stimulus – especially their relative activation – as opposed to which single type of afferent is activated, as espoused by labeled lines (*Curr Opin Neurobiol* 2012). These ideas prompted an invited review in *Nature Neuroscience* for a special issue on pain (*Nat Neurosci* 2014). We have since demonstrated combinatorial coding experimentally (*Cell Rep* 2018). In related work, we showed how differentially synchronized spiking (*PNAS* 2019) and irregular skipping during periodic stimuli (*BioRxiv* 2021) allow rate and temporal coding to be combined (multiplexed), enabling sets of neurons to represent >1 stimulus feature.

New tools in pain research: My lab has introduced several new tools to pain research. We were the first to use dynamic clamp to study neuropathic changes in excitability (*eLife* 2014). Though optogenetics has become very popular, our application of it to study excitability is truly novel *(J Neurophysiol* 2015). Building on this, we are developing new technology to enable high-throughput testing of neuronal excitability and have combined similar technology with machine learning to standardize and automate optogenetic pain behavior testing in mice. We continue to pioneer the use of simulations and mathematical analysis to study diverse aspects of pain processing (*PNAS* 2010; *J Neural Eng 2011*; *PLoS Comput Biol* 2012; *Front Cell Neurosci* 2015; *PLoS Comput Biol* 2016; *J Physiol* 2018; *J Neurosci* 2019; *eLife 2022*; *J Neurosci 2022*).

PUBLICATIONS – Journal Articles

Trainee names underlined

1. Tian J, Yang J, Joslin WC, Flockerzi V, **Prescott SA**, Birnbaumer L, Zhu MX. TRPC4 and GIRK channels underlie neuronal coding of firing patterns that reflect $G_{q/11}$-$G_{i/o}$ coincidence signals of variable strengths. *Proc. Natl. Acad. Sci. USA* 2022, 119: e2120870119.
2. Yang J, Shakil H, Ratté S, **Prescott SA**. Minimal requirements for a neuron to co-regulate many properties and the implications for ion channel correlations and robustness. *eLife* 2022, 11: e72875.
3. Medlock L, Sekiguchi K, Hong S, Dura-Bernal, Lytton WW, **Prescott SA**. Multiscale computer model of the spinal dorsal horn reveals changes in network processing associated with chronic pain. *J. Neurosci.* 2022, 42: 3133-3149. *Research Spotlight in April 26 issue http://prescottlab.ca/images/pdf/2022MedlockFeatured.jpg*

4. Lee KY, Ratté S, **Prescott SA**. Excitatory neurons are more disinhibited than inhibitory neurons by chloride dysregulation in the spinal dorsal horn. *eLife* 2019, 8: e49753.
5. Hildebrandt MR, Reuter MS, Wei W, Tayebi N, Liu J, Sharmin S, Mulder J, Lesperance LS, Brauer PM, Kinnear C, Piekna A, Romm A, Howe J, Pasceri P, Mok R, Meng G, Rozycki M, de Carvalho Rodrigues D, Martinez EC, Szego MJ, Zúñiga-Pflücker JC, Anderson MK, **Prescott SA**, Rosenblum ND, Kamath BM, Mital S, Scherer SW, Ellis J. Control iPSC lines with clinically annotated genetic variants for versatile multi-lineage differentiation. *Stem Cell Rep.* 2019; 13: 1126-1141.
6. Al Basha D, Prescott SA. Intermittent failure of spike propagation in primary afferent neurons during tactile stimulation. *J. Neurosci*. 2019, 39: 9927-9939.
7. Kemaladewi D, Bassi P, Erwood S, Al-Basha D, Gawlik K, Lindsay K, Hyatt E, Kember R, Place K, Marks R, Durbeej M, **Prescott SA**, Ivakine EA, Cohn R. A mutation-independent approach via transcriptional upregulation of a disease modifier gene rescues muscular dystrophy in vivo. *Nature* 2019, 572: 125-130.
8. Mapplebeck JCS, Lorenzo L-E, Lee KY, Gauthier C, Muley MM, De Koninck Y, **Prescott SA**, Salter MW. Chloride dysregulation through downregulation of KCC2 mediates neuropathic pain in both sexes. *Cell Rep.* 2019, 28: 590-596.
9. Lankarany M, Al-Basha D, Ratté S, **Prescott SA**. Differentially synchronized spiking enables multiplexed neural coding. *Proc. Natl. Acad. Sci. USA* 2019, 116: 10097-10102.
10. FallahRad M, Zannou AL, Khadka N, **Prescott SA**, Ratté S, Zhang R, Estellar R, Hershey B, Bikson M. Electrophysiology equipment for reliable study of kHz electrical stimulation. *J. Physiol.* 2019, 597: 2131-2137.
11. Mousseau M, Burma NE, Lee KY, Leduc-Pessah H, Kwok CHT, Reid AR, O'Brien M, Sagalajev B, Stratton JA, Patrick N, Stemkowski PL, Biernaskie J, Zamponi GW, Salo P, McDougall JJ, **Prescott SA**, Matyas JR, Trang T. Microglial pannexin-1 channel activation is a spinal determinant of joint pain. *Sci. Adv.* 2018, 4: eaas9846.
12. Mouchbahani-Constance S, Lesperance LS, Petitjean H, Davidova A, Macpherson A, **Prescott SA**, Sharif-Naeini R. Lionfish venom elicits pain predominantly through the activation of non-peptidergic nociceptors. *Pain*, 2018, 159: 2255-2266.
13. Takkala P, **Prescott SA**. Using dynamic clamp to quantify pathological changes in the excitability of primary somatosensory neurons. *J. Physiol.* 2018, 596: 2209-2227.
14. Wang F, Bélanger E, Côté S, Desrosiers P, **Prescott SA**, Côté D, De Koninck Y. Sensory afferents use different coding strategies for heat and cold. *Cell Rep.* 2018, 23: 2001-2013.
15. Balachandar A, **Prescott SA**. Origin of heterogeneous spiking patterns from continuously distributed ion channel densities: A computational study in spinal dorsal horn neurons. *J Physiol* 2018, 596: 1681-1697.

    Highlighted by Perspectives article by MA Tadros, BA Graham, and RJ Callister entitled "Moving functional classification of dorsal horn neurons from art to science"
16. Ratté S, Karnup S, **Prescott SA.** Nonlinear relationship between spike-dependent calcium influx and TRPC channel activation enables robust persistent spiking in neurons of the anterior cingulate cortex. *J. Neurosci.* 2018, 38: 1788-1801.
17. Lesperance LS, Lankarany M, Zhang TC, Estellar R, Ratté S, **Prescott SA**. Artifactual hyperpolarization during extracellular electrical stimulation: Proposed mechanism of high-rate neuromodulation disproved. *Brain Simul.* 2018, 11: 582-591.
18. Bells S, Lefebvre J, **Prescott SA**, Dockstader C, Bouffet E, Skocic J, Laughlin S, Mabbott DJ. Changes in white matter microstructure impact cognition by disrupting the ability of neural assemblies to synchronize. *J. Neurosci.* 2017, 37: 8227-8238.
19. Takkala P, Zhu Y, **Prescott SA**. Combined changes in chloride regulation and neuronal excitability enable primary afferent depolarization to evoke spiking without compromising its inhibitory effects. *PLoS Comput. Biol.* 2016; 12: e1005215.
20. Khubieh A, Ratté S, Lankarany M, **Prescott SA**. Regulation of cortical dynamic range by background synaptic noise and feedforward inhibition. *Cereb. Cortex* 2016; 26: 3357-3369.
21. Doyon N, Vinay L, **Prescott SA**, De Koninck Y. Chloride regulation: a dynamic equilibrium crucial for synaptic inhibition. *Neuron* 2016; 89: 1157-1172.
22. Doyon N, ***Prescott SA**, *De Koninck Y (*equal contribution). Mild KCC2 hypofunction causes inconspicuous chloride dysregulation that degrades neural coding. *Front. Cell. Neurosci.* 2016; 6: 516.
23. Ratté S, **Prescott SA**. Afferent hyperexcitability in neuropathic pain and the inconvenient truth about its degeneracy. *Curr. Opin. Neurobiol.* 2016; 36: 31-37.
24. Lee K, **Prescott SA**. Chloride dysregulation and inhibitory receptor blockade yield equivalent disinhibition of spinal neurons yet are differentially reversed by carbonic anhydrase blockade. *Pain* 2015; 156: 2431-2437.

25. Coggan JS, Bittner S, Stiefel KM, Meuth SG, **Prescott SA**. Physiological dynamics in demyelinating diseases: Unraveling complex relationships through computer modeling. *Int. J. Mol. Sci.* 2015; 16: 21215-21236.
26. Coggan JS, Sejnowski TJ, **Prescott SA**. Cooperativity between remote sites of ectopic spiking allows afterdischarge to be initiated and maintained at different locations. *J Comput Neurosci* 2015; 39: 17-28.
27. Price TJ, **Prescott SA**. Inhibitory regulation of the pain gate and how its failure cause pathological pain. *Pain* 2015; 156: 789-792.
28. Yi Z, Feng B, Schwartz ES, Gebhart GF, **Prescott SA**. Novel method to assess axonal excitability using channelrhodopsin-based photoactivation. *J. Neurophysiol*. 2015; 113: 2242-2249.
29. Ratté S, Lankarany M, Rho Y-A, Patterson A, **Prescott SA**. Subthreshold membrane currents confer distinct tuning properties that enable neurons to encode the integral or derivative of their input. *Front. Cell. Neurosci.* 2015; 8: 452.
30. Ratté S, Zhu Y, Lee KY, **Prescott SA**. Criticality and degeneracy in injury-induced changes in primary afferent excitability and the implications for neuropathic pain. *eLife* 2014; 3: e02370.

    Editor's choice with accompanying Insight article by J Goaillard and MA Dufour entitled "The pros and cons of degeneracy". Selected for eLife Podcast interview with Christopher Smith, http://elifesciences.org/podcast/episode11.
31. **Prescott SA**, Ma Q, De Koninck Y. Normal and abnormal coding of painful sensations. *Nat. Neurosci.* 2014; 17: 183-191.
32. Ratté S, Hong SH, De Schutter E, **Prescott SA**. Impact of neuronal properties on network coding: roles of spike initiation dynamics and robust synchrony transfer. *Neuron* 2013; 78: 758-772.
33. **Prescott SA**, Ratté S. Pain processing by spinal microcircuits: afferent combinatorics. *Curr. Opin. Neurobiol.* 2012; 22: 631-639.
34. Rho Y-A, **Prescott SA**. Identifying molecular pathologies sufficient to cause neuropathic change in primary somato-sensory afferent excitability using dynamical systems theory. *PLoS Comput. Biol.* 2012; 8; e1002524.
35. Hong S, Ratté S, *__Prescott SA__, *De Schutter E (*equal contribution). Single neuron firing properties impact correlation-based population coding. *J. Neurosci.* 2012; 32: 1413-1428.
36. Ratté S, **Prescott SA**. ClC-2 channels regulate neuronal excitability, not intracellular chloride levels. *J. Neurosci*. 2011; 31: 15838-15843.
37. Coggan JS, Ocker GK, Sejnowski TJ, **Prescott SA**. Explaining pathological changes in axonal excitability through dynamical analysis of conductance-based models. *J. Neural Eng*. 2011; 8: 065002.
38. Doyon N, **Prescott SA**, Castonguay A, Godin AG, Kröger A, De Koninck Y. Efficacy of synaptic inhibition depends on multiple, dynamically interacting mechanisms implicated in chloride homeostasis. *PLoS Comput. Biol.* 2011; 7; e1002149.
39. Coggan JS, **Prescott SA**, Bartol TM, Sejnowski TJ. Imbalance of ionic conductances contributes to diverse symptoms of demyelination. *Proc. Natl. Acad. Sci. USA* 2010; 107: 20602-20609.
40. Price TJ, Cervero F, Gold MS, Hammond D, Prescott SA. Chloride regulation in the pain pathway. *Brain Res. Rev.* 2009; 60: 149-170.
41. **Prescott SA**, Sejnowski TJ. Spike-rate coding and spike-time coding are affected oppositely by different adaptation mechanisms. *J. Neurosci*. 2008; 28: 13649-13661.
42. **Prescott SA**, Ratté S, De Koninck Y, Sejnowski TJ. Pyramidal neurons switch from integrators *in vitro* to resonators under *in vivo*-like conditions. *J. Neurophysiol.* 2008; 100: 3030-3042.
43. **Prescott SA**, De Koninck Y, Sejnowski TJ. Biophysical basis for three distinct dynamical mechanisms of action potential initiation. *PLoS Comput. Biol*. 2008; 4: e1000198.
44. Ratté S, **Prescott SA**, Collinge J, Jefferys JGR. Hippocampal bursts caused by changes in NMDA receptor-dependent excitation in a mouse model of variant CJD. *Neurobiol. Dis.* 2008; 32: 96-104.
45. **Prescott SA**, Sejnowski TJ, De Koninck Y. Reduction of anion reversal potential subverts the inhibitory control of firing rate in spinal lamina I neurons: towards a biophysical basis for neuropathic pain. *Mol. Pain* 2006; 2: 32.
46. **Prescott SA**, Ratté S, De Koninck Y, Sejnowski TJ. Nonlinear interaction between shunting and adaptation controls a switch between integration and coincidence detection in pyramidal neurons. *J. Neurosci*. 2006; 26: 9084-9097.

    Feature article in Sept 6 issue of J Neurosci and rated "must read" by Leonard Maler (Faculty of 1000 Biology, Sept 26, 2006, http://www.f1000biology.com/article/id/1043059/evaluation).
47. **Prescott SA**, De Koninck Y. 2005. Integration time in a subset of spinal lamina I neurons is lengthened by sodium and calcium currents acting synergistically to prolong subthreshold depolarization. *J. Neurosci.* 2005; 25: 4743-4754.
48. Coull JAM, Boudreau D, Bachand K, **Prescott SA**, Nault F, Sik A, De Koninck P, De Koninck Y. Trans-synaptic shift in anion gradient in spinal lamina I neurons as a mechanism of neuropathic pain. *Nature* 2003; 424: 938-942.

49. **Prescott SA**, De Koninck Y. Gain control of firing rate by shunting inhibition: roles of synaptic noise and dendritic saturation. *Proc. Natl. Acad. Sci. USA* 2003: 100; 2076-2081.
50. **Prescott SA**, De Koninck Y. Four cell types with distinctive membrane properties and morphologies in lamina I of the spinal dorsal horn of the adult rat. *J. Physiol.* 2002: 539; 817-836.
51. **Prescott SA**, Chase R. Sites of plasticity in the neural circuit mediating tentacle withdrawal in the snail *Helix aspersa*: implications for behavioral change and learning kinetics. *Learning & Mem.* 1999; 6: 363-380.
52. **Prescott SA.** Interactions between depression and facilitation within neural networks: updating the dual-process theory of plasticity. *Learning & Mem.* 1998; 5: 446-466.
53. **Prescott SA**, Gill N, Chase R. The neural circuit mediating tentacle withdrawal in *Helix aspersa*, with specific reference to the competence of the motoneuron C3. *J. Neurophysiol.* 1997; 78: 2951-2965.
54. **Prescott SA**, Chase R. Two types of plasticity in the tentacle withdrawal reflex of *Helix aspersa* are dissociated by tissue location and response measure. *J. Comp. Physiol. A* 1996; 179: 407-414.

PUBLICATIONS – Book Chapters

1. Stinson JN**, Prescott SA**. Pain and Its Assessment. In: *Textbook of Pediatric Rheumatology, 8th Edition.* Petty R, Laxer R, Lindsley C, Wedderburn L, Fuhlbrigge RC, Mellins ED (eds). Elsevier. 2020.
2. Ratté S**, Prescott SA**. Somatosensation and Pain. In: *Conn's Translational Neuroscience*. Conn PM (ed). Elsevier. 2016.
3. **Prescott SA**. Synaptic inhibition and disinhibition in the spinal dorsal horn. In: *Molecular Biology of Pain, Progress in Molecular and Translational Science*. Price TJ, Dussor G (eds). Elsevier. 2015.
4. **Prescott SA**. Chloride channels and transporters. In: *Encyclopedia of Computational Neuroscience*. Springer. Jaeger D, Jung R (eds). Springer. 2014.
5. **Prescott SA**. Excitability: Hodgkin's classes I, II, and III. In: *Encyclopedia of Computational Neuroscience*. Jaeger D, Jung R (eds). Springer. 2014.
6. **Prescott SA**. Pathological changes in peripheral nerve excitability. In: *Encyclopedia of Computational Neuroscience*. Jaeger D, Jung R (eds). Springer. 2014.
7. **Prescott SA**. Pain processing pathway models. Chapter 250 In: *Encyclopedia of Computational Neuroscience*. Jaeger D, Jung R (eds). Springer. 2014.
8. **Prescott SA**, De Koninck Y. Impact of background synaptic activity on neuronal response properties revealed by stepwise replication of *in vivo*-like conditions *in vitro*. In: *Dynamic Clamp: From Principles to Applications*. Destexhe A, Bal T (eds). Springer. 2009.

PUBLICATIONS – Preprints

1. Kamaleddin MA, Shifman A, Sigal DMW, **Prescott SA**. Physiological noise optimizes multiplexed coding of vibrotactile-like signals in somatosensory cortex. https://www.biorxiv.org/content/10.1101/2021.09.11.459897v1.
2. Kamaleddin MA, Abdollahi N, Ratté S, **Prescott SA**. Spike initiation properties in the axon support high-fidelity signal transmission. https://www.biorxiv.org/content/10.1101/2021.12.13.472435v1.

INVENTION DISCLOSURES

1. OPTEx: A new platform for high-throughput longitudinal measurement of neuronal excitability. RDLP# 1108. Submitted to SickKids IP&C Sept 13, 2016.
2. Photostimulator for pain testing in rodents. ID21-019. Submitted to SickKids IP&C June 11, 2021.

RESEARCH FUNDING – Active

2019.07.01 – 2026.06.30 **PI.** Foundation Grant. CIHR
Title: Neuropathic pain through misregulated excitability and abnormal neural coding. *Total amount:* $2,874,498 CAD

2019.02.27 **PI.** John R. Evans Leaders Fund, CFI
Title: Imaging and electrophysiology equipment for multi-neuron stimulation and recording. *Total amount:* $1,142,529 CAD

2019.02.01 – 2024.01.31 **Co-I.** Project Grant. CIHR
Title: Regulation of microglial pannexin-1 channels in arthritis pain. *Principal Investigator:* Tuan Trang. *Other Co-investigators:* John Matyas, Jason McDougall. *Total amount:* $875,925 CAD

RESEARCH FUNDING – Completed

2016.09.01 – 2021.08.31 **Co-PI**. SPOR Project. Chronic Pain Network
Title: Improving personalized medicine through discovery of pain mechanisms using patient-derived neurons. *Principal Investigators*: Steven A Prescott and Michael W Salter. *Co-Investigators*: James Ellis. *Total amount:* $463,700 CAD

2017.04.01 – 2019.07.01 **PI.** Project Grant. CIHR - Terminated early because of Foundation Grant
Title: Chloride dysregulation and neuropathic pain: Linking molecular mechanisms with altered pain processing via identification of cellular and circuit level changes. *Co-Investigators: Mike Salter, Yves De Koninck. Total amount used:* $394,477 CAD (from original $876,615 CAD)

2017.04.01 – 2019.07.01 **PI.** Project Grant. CIHR - Terminated early because of Foundation Grant
Title: Probing spike initiation properties of primary somatosensory neurons using optogenetics. *Total amount used:* $475,495 CAD (from original $845,324)

2013.05.01 – 2019.04.30 **PI**. Discovery Grant. NSERC. RGPIN 436168.
Title: Neural dynamics: their nonlinear basis and computational consequences. *Total amount:* $150,000 CAD

2017.09.01 – 2018.08.31 **PI.** Industry Sponsored Research. Boston Scientific.
Title: Role of synaptic inhibition and the network-level effects of conventional and high-frequency spinal cord stimulation. *Total amount:* $115,871 USD

2016.08.01 – 2017.07.30 **PI.** Industry Sponsored Research. Boston Scientific
Title: Measurement of SCS-induced hyperpolarization using independent electrophysiological and optical methods. *Total amount:* $255,159 USD

2014.07.01 – 2017.06.30 **PI**. Early Researcher Award. Ontario Ministry of Research and Innovation. ER13-09-068
Title: The neural basis of somatosensation and pain. *Total amount:* $140,000 CAD

2011.10.01 – 2015.09.30 **PI**. R01. NIH. NS076706
Title: Biophysical mechanisms regulating synchrony transfer in somatosensory cortex.
Total amount: $638,750 USD

2011.10.01 – 2014.09.30 **PI**. 53rd Mallinckrodt Scholar Award. Edward Mallinckrodt, Jr. Foundation (Glen Carbon, IL, USA)
Title: Using optogenetics to probe how disruption of neural coding causes neuropathic pain.
Total Amount. $210,000 USD

2011.09.15 – 2013.09.14 **PI**. R21. NIH. NS074146
Title: Computational investigation of neuropathic changes in primary afferent excitability.
Total amount: $215,000 USD

2009.09.01 – 2012.08.31 **PI.** Rita Allen Foundation Scholar in Pain Award. Rita Allen Foundation (Princeton, NJ, USA)
Title: Pain processing by neural networks: a critical link between the molecular and perceptual changes associated with neuropathic pain. *Total* Amount: $150,000 USD

2009.09.01 – 2010.08.31 **PI**. International Association for the Study of Pain Early Career Grant
Title: Pain processing by neural networks: a critical link between the molecular and perceptual changes associated with neuropathic pain. *Total amount:* $20,000 USD

ADMINISTRATIVE ACTIVITIES – National and International

2020.07 – Selection Committee, CIHR Vanier Canada Graduate Scholarships
Role: Select recipients of Canada's most prestigious graduate scholarship

2019.10 – Leadership Committee, Rita Allen Foundation Pain Scholars
Role: Organize videoconference series for past and present scholar to network

2019.07 – 2022.05 Board of Directors, Canadian Association for Neuroscience
Role: Help oversee association of ~1000 members and promote Canadian neuroscience

2018.07 – 2021.09 Program Committee, Organization for Computational Neuroscience
Role: Set program for annual meeting

2013.08 – Scientific Advisory Board, Boston Scientific Neuromodulation
Role: Evaluate the scientific literature and proprietary data in order to advise on potential mechanisms by which conventional and high-frequency spinal cord stimulation alleviate pain

2012.09 – 2013.11 Task Force on the Future of the International Association for the Study of Pain
Role: Review all current programs of the IASP and make recommendations to Council for future growth and development