

## Mark Steven Cembrowski

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Assistant Professor • Dept. of Cellular and Physiological Sciences • University of British Columbia  
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### Citizenship

Canada and United States

### Education

#### **Ph.D. in Applied Mathematics, Northwestern University, 2011**

Thesis: “Realistic modeling of rod bipolar and All amacrine cells: synaptic and intrinsic properties of neurons comprising a retinal microcircuit”

Advisors: William Kath (Dept. of Engineering Sciences and Applied Mathematics), Hermann Riecke (Dept. of Engineering Sciences and Applied Mathematics), and Joshua Singer (Depts. of Ophthalmology and Physiology)

#### **M.S. in Applied Mathematics, Northwestern University, 2008**

#### **B.Sc. in Mathematics, University of British Columbia, 2007**

Project: “Evolution Equations for Coupled Patterns and Mean-Flow Dynamics” (as part of an Undergraduate Student Research Award from the Natural Sciences and Engineering Research Council of Canada, 2007, advised by Rachel Kuske in the Dept. of Mathematics)

### University of British Columbia affiliations

**Assistant Professor**, Department of Cellular and Physiological Sciences, Faculty of Medicine  
(2019-current; primary affiliation)

**Investigator**, Djavad Mowafaghian Centre for Brain Health (2019-current)

**Associate Member**, School for Biomedical Engineering (2020-current)

**Associate Member**, Institute for Applied Mathematics (2020-current)

**Associate Member**, Department of Mathematics (2020-current)

### Other current affiliations

**Scholar**, Michael Smith Foundation for Health Research (2020-current)

**Visiting Scientist**, Janelia Research Campus, Howard Hughes Medical Institute (2019-current)

**Next Generation Leader**, Allen Institute for Brain Science (2018-current)

### Previous employment

**Research scientist** (2015-2018) and **postdoctoral associate** (2012-2015)

Janelia Research Campus, HHMI. Laboratory Head: Nelson Spruston

### Major awards, distinctions, and fellowships

- **Distinguished Achievement Award for Foundational Science Research.** UBC Faculty of Medicine. 2021.
- **Cortical Explorer Prize.** Cajal Club. 2020. (sole recipient in 2020 worldwide competition)
- **Scholar Award.** Michael Smith Foundation for Health Research. 2020.
- **1907 Trailblazer Competition Institutional Nominee.** 2020. (1 of 2 selected at UBC)
- **Azrieli Future Leader of Canada Brain Research.** Brain Canada Foundation. 2019.
- **Visiting Scientist.** Janelia Research Campus, Howard Hughes Medical Institute. 2019.
- **Next Generation Leader.** Allen Institute, 2018. (1 of 6 selected worldwide in 2018)
- **Top nominated speaker award,** Janelia Research Campus Annual Symposium. 2017.
- **Graduate Research Fellowship,** National Science Foundation. 2009.

- **Postgraduate Scholar Award - Doctoral**, Natural Sciences and Engineering Research Council of Canada. 2009.
- **University Scholar**, Northwestern University Graduate School. 2009.
- **Multidisciplinary Visual Sciences Training Grant**, National Institutes of Health. 2008.
- **Royal E. Cabell Fellowship**, Northwestern University. 2007.
- **Science Scholar**, University of British Columbia. 2007.
- **Undergraduate Student Research Award**, Natural Sciences and Engineering Research Council of Canada. 2007.

Publications (\*: co-first, #: corresponding, ^: mentee)

21. Erwin, S.R.<sup>^\*</sup>, Bristow, B.N.<sup>^\*</sup>, Sullivan, K.E.<sup>^</sup>, Kendrick, R.M.<sup>^</sup>, Marriott, B., Wang, L., Clements, J., Lemire, A., Jackson, J., **Cembrowski, M.S.**<sup>#</sup>. Spatially patterned excitatory neuron subtypes and circuits of the claustrum. *eLife*, 10:e68967, 2021.
20. Sullivan, K.E.<sup>^\*</sup>, Kendrick, R.M.<sup>^\*</sup>, **Cembrowski, M.S.**<sup>#</sup>. Elucidating memory in the brain via single-cell transcriptomics. *Journal of Neurochemistry*, 2020: doi: 10.1111/jnc.15250.
19. O’Leary, T.P.<sup>^\*</sup>, Sullivan, K.E.<sup>^\*</sup>, Wang, L., Lemire, A., Clements, J., **Cembrowski, M.S.**<sup>#</sup>. Extensive and spatially variable within-cell-type heterogeneity across the basolateral amygdala. *eLife* 9, e59003:1-27, 2020.
  - *eLife “Striking Image”*.
18. Erwin, S.R.<sup>^\*</sup>, Sun, W.<sup>\*</sup>, Copeland, M., Lindo, S., Spruston, N., **Cembrowski, M.S.**<sup>#</sup>. A sparse, spatially biased subtype of mature granule cell dominates activity in hippocampal-associated behaviors. *Cell Reports* 31(4): 1-12, 2020.
17. **Cembrowski, M.S.**<sup>#</sup> Single-cell transcriptomics as a framework and roadmap for understanding the brain. *Journal of Neuroscience Methods*, 326: 1-7, 2019.
16. **Cembrowski, M.S.**<sup>#</sup>, Spruston, N.<sup>#</sup> Heterogeneity within classical cell types is the rule: lessons from hippocampal pyramidal neurons. *Nature Reviews Neuroscience*, 20(4): 193-204, 2019 (invited submission).
  - *Cover illustration*.
  - *Recommendation on Faculty of 1000*.
15. **Cembrowski, M.S.**<sup>#</sup>, Wang, L., Lemire, A., DiLisio, S.F.<sup>^</sup>, Copeland, M., Clements, J., Spruston, N. The subiculum is a patchwork of discrete subregions. *eLife* 7, 10/7554/eLife.37701, 2018.
14. **Cembrowski M.S.**<sup>#</sup>, Menon, V.<sup>#</sup> Continuous variation within cell types of the nervous system. *Trends in Neurosciences* 41(6): 339-350, 2018 (invited submission).
  - *Research Highlight*. Lewis, S. Patchwork subiculum. *Nature Reviews Neuroscience* 20(1): 3, 2019.
  - *Recommendation Faculty of 1000*.
13. **Cembrowski, M.S.**<sup>#</sup>, Phillips, M.G.<sup>^</sup>, DiLisio, S.F.<sup>^</sup>, Shields, B.C., Winnubst, J., Chandrashekar, J., Bas, E., Spruston, N.<sup>#</sup> Dissociable structural and functional hippocampal outputs via distinct subiculum cell classes. *Cell* 173(5): 1280–1292, 2018.
  - *Research Highlight*. Whalley, K. A regional divide. *Nature Reviews Neuroscience* 19(7): 390, 2018.

12. Bloss, E.B., **Cembrowski, M.S.**, Karsh, B., Colonell, J., Fetter, R.D., Spruston, N.# Single excitatory axons form clustered synapses onto CA1 pyramidal cell dendrites. Nature Neuroscience 21(3): 353-363, 2018.
11. **Cembrowski, M.S.**#, Spruston, N. Integrating results across methodologies is essential for producing robust neuronal taxonomies. Neuron 94(1): 747-751, 2017.
10. **Cembrowski, M.S.**#, Spruston, N. Illuminating the neuronal architecture underlying context in fear memory. Cell 167(4): 888-889, 2016 (invited submission).
9. **Cembrowski, M.S.**, Wang, L., Sugino, K., Shields, B.C., Spruston, N.# Hipposeq: a comprehensive RNA-seq database of gene expression in hippocampal principal neurons. eLife 5, 10.7554/eLife.14997, 2016.
8. Bloss, E.B., **Cembrowski, M.S.**, Karsh, B., Colonell, J., Fetter, R., Spruston, N.# Structured patterns of dendritic inhibition support branch-specific forms of integration in CA1 pyramidal cells. Neuron 89(5): 1016-1030, 2016.
7. **Cembrowski, M.S.**, Bachman, J.L., Wang, L., Sugino, K., Shields, B.C., Spruston, N.# Spatial gene-expression gradients underlie prominent heterogeneity of CA1 pyramidal neurons. Neuron 89(2): 351-368, 2016.
  - *Featured article of the issue.* Previewed by Tushev, G. and Schuman, E.M. Rethinking Functional Segregation: Gradients of Gene Expression in Area CA1. Neuron 89(2):242-243, 2016.
  - *Of Outstanding Interest.* Mallory, C.S. and Giocomo, L.M. Heterogeneity within hippocampal place coding. Review, Current Opinion in Neurobiology 49:158-167, 2018.
  - *Highlighted reference (1 of 6).* Soltesz, I. and Losonczy, A. CA1 pyramidal cell diversity enabling parallel information processing in the hippocampus. Review, Nature Neuroscience 21(18): 484-493, 2018.
  - *Of Special Interest.* Valero, M. and de la Prida, L.M. The hippocampus in depth: a sublayer-specific perspective of entorhinal–hippocampal function. Review, Current Opinion in Neurobiology 52:107-114, 2018.
  - *Of Special Interest.* Suvrathan, A. Beyond STDP – Towards Diverse and Functionally Relevant Plasticity Rules. Review, Current Opinion in Neurobiology 54:12-19, 2019.
6. Kim, Y.\*, Hsu, C.-L.\*, **Cembrowski, M.S.**, Mensh, B.D., Spruston, N.# Dendritic sodium spikes are required for long-term potentiation at distal synapses on hippocampal pyramidal neurons. eLife 4, doi:10.7554/eLife.06414, 2015.
  - *Recommendation on Faculty of 1000.*
5. Choi, H., Lei, Zhang, L., **Cembrowski, M.S.**, Sabottke, C.F., Markowitz, A.L., Butts, D.A., Kath, W.L., Singer, J.H., Rieke, H.# Intrinsic bursting of All amacrine cells underlies oscillations in the rd1 mouse retina. Journal of Neurophysiology 112(6): 1491-1504, 2014.
4. Ke, J., Wang, Y., Borghuis, B.G., **Cembrowski, M.S.**, Rieke, H., Kath, W.L., Demb, J.B., Singer, J.H.# Adaptation to background light enables contrast coding at rod bipolar cell synapses. Neuron 81(2): 388-401, 2014.
  - *Recommendation on Faculty of 1000.*
3. **Cembrowski, M.S.**#, Logan, S., Tian, M., Jia, L., Li, W., Kath, W.L., Rieke, H., Singer, J.H. The mechanisms of repetitive spike generation in an axonless retinal interneuron. Cell Reports 1(2): 155-166, 2012.

2. Jarsky, T.\*, **Cembrowski, M.S.\***, Logan, S., Kath, W.L., Riecke, H., Demb, J., Singer, J.H.# A synaptic mechanism for retinal adaptation to luminance and contrast. The Journal of Neuroscience 31(30): 11003-110515, 2011.
1. Lim, E.M., Cembrowski, G.S., **Cembrowski, M.**, Clarke, G.# Race-specific WBC and neutrophil count reference intervals. International Journal of Laboratory Hematology 32(6): 590-597, 2010.

Talks: 34 total invited talks, available upon request

Selected press coverage

4. “100 000\$ pour le cerveau”. La Presse. November 10, 2020.
3. “The study of memory mechanisms to identify new therapeutic targets for PTSD”. SelectScience interview, [online](#).
2. “Neurobiology: gene expression captured on-site”. Nature Methods 14(11):1037-1040, 2017, by Vivien Marx.
1. “Investments Boost Neurotechnology Career Prospects”. Science 346(6209):111-114, 2014, by Jeffrey M. Perkel.

Current funding as PI (total since January 2019: ~\$9.4M CAD total, with ~\$2.9M to Cembrowski)

11. **Innovation Fund Grant**, Canadian Foundation for Innovation. “in Vivo Multimodal Analysis of neuroProjectome (iMAP).” \$6,000,000 CAD infrastructure grant as co-PI (lead PI: Tim Murphy; co-PIs: Ann Marie Craig, Liisa Galea, Brian MacVicar, Lynn Raymond, Terrence Snutch, Yu Tian Wang, Cheryl Wellington, Catherine Winstanley). 2021-2024.
10. **Dawn Shaw Alzheimer’s Disease Research Grant**, Djavad Mowafaghian Centre for Brain Health. “Optimizing and understanding therapeutic sensory entrainment in Alzheimer’s disease models using brain-wide high density recordings and alignment to molecular markers.” \$75,000 CAD operating grant as co-PI (lead PI: Tim Murphy). 2020-2021.
9. **Azrieli Future Leader in Canadian Brain Research**, Brain Canada Foundation, Azrieli Foundation, Health Canada. “The cell-type-specific organization and operation of the living human subiculum in health and epilepsy.” \$100,000 CAD operating grant as PI. 2020-2022.
8. **Scholar Award**, Michael Smith Foundation for Health Research. “Understanding and disrupting fear memory in the brain.” \$450,000 CAD operating grant as PI. 2020-2025.
7. **Convergence Science Research Award**, United States Department of Defense. “Using the CHIMERA Model to Dissect the Mechanisms by Which Abeta Modulates Chronic Fear Memory Extinction and Cognitive Flexibility After Traumatic Brain Injury.” \$646,247 USD operating grant as co-PI, with PI Cheryl Wellington. 2020-2022.
6. **Project Grant**, Canadian Institutes of Health Research. “Elucidating and disrupting the neural substrates of fear memory.” \$984,000 CAD operating grant as PI. 2019-2024.
5. **Discovery Grant Launch Supplement**, Natural Sciences and Engineering Research Council of Canada. “Subtype-specific rules of memory encoding and retrieval in dentate gyrus granule cells.” \$12,500 CAD operating grant as PI. 2019-2019.
4. **Discovery Grant**, Natural Sciences and Engineering Research Council of Canada. “Subtype-specific rules of memory encoding and retrieval in dentate gyrus granule cells.” \$185,000 CAD operating grant as PI. 2019-2024.
3. **New Frontiers in Research Fund**, joint between Canadian Institutes for Health Research, Natural Sciences and Engineering Research Council of Canada, and the Social Sciences and Humanities Research Council. “Generation and application of a novel molecular biosensor in fear memory.” \$271,900 CAD operating grant as PI with Andre Berndt as co-PI. 2019-2021.

2. **John R. Evans Leaders Fund**, Canadian Foundation for Innovation. “Memory Deconstruction Facility.” \$312,000 CAD infrastructure grant as PI. 2019.
1. **Visiting Scientist**, Janelia Research Campus, Howard Hughes Medical Institute. “A bottom-up understanding of cell-type heterogeneity in the brain.” \$103,464 USD operating grant as PI. 2019-2020.

Funding as graduate student (\*note: ineligible for funding at postdoc at internally funded HHMI)

5. **Graduate Research Fellowship**, National Science Foundation. \$121,000 USD. 2009-2011.
4. **University Scholar**, Northwestern University Graduate School. \$36,000 USD. 2009.
3. **Postgraduate Scholar Award - Doctoral**, Natural Sciences and Engineering Research Council of Canada (NSERC). \$63,000 CAD; declined. 2009.
2. **Multidisciplinary Visual Sciences Training Grant (T32EY007128)**, National Institutes of Health. \$42,000 USD; declined \$20,000. 2008-2009.
1. **Royal E. Cabell Fellowship**, Northwestern University. \$53,000 USD. 2007-2008.

Student supervision and mentorship

22. Mathias Delhaye, PhD student. 2021-current. Co-supervised with Ann Marie Craig.
21. Mia Kassab, undergraduate student. 2021-current.
20. Nadine Plett, undergraduate student. 2021-current.
19. Axel Guskjolen, postdoctoral fellow. 2021-current.
  - *Recipient of a 2021 Institute of Mental Health Fellowship (declined).*
  - *Recipient of a 2021 Djavad Mowafaghian Centre for Brain Health General Award*
  - *Recipient of a 2020 NSERC Postdoctoral Fellowship.*
18. Aahana Kanyal, co-op undergraduate. 2020.
17. Brianna Bristow, technician. 2020-current.
16. Rennie Kendrick, Fulbright Scholar. 2020-current.
  - *Recipient of a 2020 Alexander Graham Bell Canada Graduate Scholarship-Master’s.*
  - *Recipient of a 2020 US Fulbright Scholarship.*
15. Larissa Kraus, postdoctoral scientist. 2020-current.
  - *Recipient of a 2020 Walter Benjamin Programme fellowship from the German Research Foundation.*
14. Madeline Elder, BSc student. 2020-current.
  - *Recipient of a 2020 Alexander Graham Bell Canada Graduate Scholarship-Master’s.*
  - *Recipient of a 2020 Undergraduate Student Research Award from the Natural Sciences and Engineering Research Council of Canada.*
  - *Recipient of a 2020 Summer Student Research Program Award (declined).*
  - *Recipient of a 2020 Student Undergraduate Research Award (declined).*
13. Adrienne Kinman, PhD student. 2019-current.
  - *Recipient of the 2021 Benjamin Feldman and Family Endowment Fund for Transformational Activity in Mental Health*
  - *Recipient of a 2019 Frederick Banting and Charles Best Canada Graduate Scholarship-Master’s.*
12. Angela Zhang, undergraduate student. 2019-2020.
11. Hans Bae, undergraduate student. 2019-2020.
10. Stacy Wang, undergraduate student. 2019-2020.
9. Willis Cao, undergraduate student. 2019-2020.
8. Jasem Estakhr, PhD student, co-supervised with Yu Tian Wang. 2019-current.
7. Kaitlin Sullivan, technician and PhD student. 2019-current.

- *Recipient of a 2021 Djavad Mowafaghian Centre for Brain Health General Award*
  - *Recipient of a 2020 Institute of Mental Health Marshall Scholarship*
  - *Recipient of a 2020 Canadian Open Neuroscience Platform Scholar Award (declined).*
  - *Recipient of a 2019 Frederick Banting and Charles Best Canada Graduate Scholarship-Master's.*
  - *Recipient of the 2019 Royal Canadian Legion Master's Scholarship in Veteran Health Research (sole recipient in national competition).*
6. Sarah Erwin, technician. 2019-current.
    - *Recipient of a 2021 Cordula and Gunter Paetzold Fellowship*
    - *Recipient of a 2021 Djavad Mowafaghian Centre for Brain Health General Award*
  5. Dr. Timothy O'Leary, research associate. 2019-current.
  4. Jessica Passlack, Janelia Undergraduate Scholar. 2018.
  3. Salvatore DiLisio, surgery technician. 2017.
  2. Matthew Phillips, Janelia Undergraduate Scholar. 2015, 2016.
  1. Joshua Fass, Janelia Undergraduate Scholar. 2013.