

Mark Steven Cembrowski

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Citizenship

Canada and United States

Education

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

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

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

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 Faculty, School for Biomedical Engineering (2020-current)

Associate Faculty, Institute for Applied Mathematics (2020-current)

Associate Faculty, 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)

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, the Azrieli Foundation, and Health Canada. 2019.
- **Visiting Scientist.** Janelia Research Campus, Howard Hughes Medical Institute. 2019.
- **Next Generation Leader.** Allen Institute, 2018. (1 of 6 selected in 2018 worldwide competition; award led to appointment to the Allen Institute Scientific Advisory Board, 2018-2021)
- **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)

23. O’Leary, T.P.*^, Kendrick, R.M.*^, Sullivan, K.E. ^, Bristow, B.N. ^, Wang, L., Clements, J., Lemire, A.L., **Cembrowski, M.S.#**. Neuronal cell types, projections, and spatial organization of the central amygdala. Submitted.
22. Guskjolen, A.^#, **Cembrowski, M.S.#**. Evolution of the memory trace: From learning to forgetting. Molecular Psychiatry, revision submitted.
21. Erwin, S.R.*^, Bristow, B.N.*^, Sullivan, K.E. ^, Kendrick, R.M.^, Marriott, B., Wang, L., Clements, J., Lemire, A., Jackson, J., **Cembrowski, M.S.#**. Spatially patterned excitatory neuron subtypes and circuits of the claustrum. eLife, 10:e68967, 2021.
20. Sullivan, K.E.*^, Kendrick, R.M.*^, **Cembrowski, M.S.#**. Elucidating memory in the brain via single-cell transcriptomics. Journal of Neurochemistry, 157:982–992, 2021.
 - “Top Downloaded Article Award”: 18th most downloaded publication from 2021 Journal of Neurochemistry
19. O’Leary, T.P.*^, Sullivan, K.E.*^, Wang, L., Lemire, A., Clements, J., **Cembrowski, M.S.#**. 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.*^, Sun, W.*^, Copeland, M., Lindo, S., Spruston, N., **Cembrowski, M.S.#**. 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.#** Single-cell transcriptomics as a framework and roadmap for understanding the brain. Journal of Neuroscience Methods, 326: 1-7, 2019.
16. **Cembrowski, M.S.#**, Spruston, N.# 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.#**, Wang, L., Lemire, A., DiLisio, S.F.^, 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.#**, Menon, V.# Continuous variation within cell types of the nervous system. Trends in Neurosciences 41(6): 339-350, 2018 (invited submission).
13. **Cembrowski, M.S.#**, Phillips, M.G.^, DiLisio, S.F.^, Shields, B.C., Winnubst, J., Chandrashekar, J., Bas, E., Spruston, N.# 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., Rieke, 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 (45 total, details available upon request)

Selected service

8. Member of the Canadian Association for Neuroscience Scientific Program Committee, 2021-2024.
7. iMAP (CFI infrastructure grant) oversight committee member, 2022-current.
6. CRC Tier II Statistical and Computational Biology Selection Committee, UBC Department of Pathology and Laboratory Medicine, Faculty of Medicine, 2022.
5. Allen Institute Advisory Board member, 2018-2021.
4. Reviewer for awards: Allen Next Generation Leader (2019-2022), CAN-CIHR-INMHA Brain Star Awards (2021), Canadian Open Neuroscience Platform Scholar (2021).
3. External reviewers for grants: Boehringer Ingelheim Foundation Exploration Grants Programme (2022), NSERC Discovery Grant (2019-2021), NFRF – Exploration Grant (2021), Azrieli Foundation Future Leader of Canadian Brain Research (2021), Canada Research Chair Tier II (2020), European Research Council Consolidator Grant (2019)
2. Panel reviewer for grants: Brain Canada Platform Support Grants (2022)
1. Manuscript reviewer: Cell, Science Translational Medicine, Nature Neuroscience, Nature Communications, Neuron, Cell Reports, Current Biology, PLoS Biology, Journal of Neuroscience, Hippocampus, Journal of Neurophysiology, Journal of Chemical Neuroanatomy, Neuroinformatics, Neuroscience.

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.

Funding as PI (total: ~\$9.4M CAD total since January 2019; ~\$3M to Cembrowski operating/salary)

12. **Spatial Genomics Award**, Advanced Cell Diagnostics. “Applying multiplexed FISH for unprecedented insight into the human brain.” \$30,000 in-kind grant as PI.
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). 2020-2022.
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. 2019-2022.
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. 2019-2022.

Funding as graduate student (*note: ineligible for funding as 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 (total offered awards to lab members: >\$1M)

Total: 16 undergraduate students, 9 grad students, 3 postdocs, 3 technicians

31. Sydney Wood, MSci placement student. 2022-current.
30. Regan Campbell, MSc student. 2022-current.
 - *Recipient of a 2022 Alexander Graham Bell Canada Graduate Scholarship-Master's (\$17,500)*
29. Shalini Iyer, PhD student. 2022-current.
 - *Recipient of a 2022 BC Research Scholarship (\$15,000)*
28. Raja Choudhary, undergraduate student. 2022.
 - *Recipient of a 2022 Undergraduate Student Research Award from the Natural Sciences and Engineering Research Council of Canada (\$4,500)*
27. Esther Kim, Work-Learn student.
26. Jennifer Tsai, co-op undergraduate student. 2022.
 - *Recipient of a 2021 Biotalent Student Work Placement Program Award (\$7,000)*
25. William Daniels, directed studies undergraduate student. 2022-current.
24. Lauren Zung, directed studies undergraduate student. 2021-current.
23. Derek Merryweather, PhD student. 2021-current.
22. Daemon Cline, PhD student. 2021-current. Co-supervised with Tim Kieffer.

- *Recipient of a 2020 Alexander Graham Bell Canada Graduate Scholarships – Doctoral (\$105,000)*
 - *Recipient of a 2022 UBC 4-Year Fellowship (\$90,000; accepted in title only)*
21. Mathias Delhay, PhD student. 2021-current. Co-supervised with Ann Marie Craig.
20. Nadine Plett, undergraduate student. 2021-current.
- *Recipient of a 2021 Summer Student Research Program Award (\$2,800)*
19. Axel Guskjolen, postdoctoral fellow. 2021-2022.
- *Recipient of a 2022 Institute of Mental Health Fellowship (\$75,000; declined)*
 - *Recipient of a 2021 Djavad Centre for Brain Health General Award (\$5,000)*
 - *Recipient of a 2020 NSERC Postdoctoral Fellowship (\$90,000; declined \$45,000)*
18. Aahana Kanyal, co-op undergraduate. 2020.
17. Brianna Bristow, technician. 2020-current.
16. Rennie Kendrick, Fulbright Scholar. 2020-2021.
- *Recipient of a 2020 Alexander Graham Bell Canada Graduate Scholarship-Master's (\$17,500; declined)*
 - *Recipient of a 2020 US Fulbright Scholarship (\$25,000)*
15. Larissa Kraus, postdoctoral scientist. 2020-current.
- *Recipient of a 2020 Walter Benjamin Programme fellowship from the German Research Foundation (\$150,000)*
14. Madeline Elder, BSc student. 2020-2021.
- *Recipient of a 2020 Alexander Graham Bell Canada Graduate Scholarship-Master's (\$17,500; declined).*
 - *Recipient of a 2020 Undergraduate Student Research Award from the Natural Sciences and Engineering Research Council of Canada (\$4,500)*
 - *Recipient of a 2020 Summer Student Research Program Award (\$2,800; declined)*
 - *Recipient of a 2020 Student Undergraduate Research Award (\$3,000; declined)*
13. Adrienne Kinman, PhD student. 2019-current.
- *Recipient of a 2022 Postgraduate Graduate Scholarship – Doctoral (\$63,000)*
 - *Recipient of a 2022 UBC 4-Year Fellowship (\$90,000; accepted in title only)*
 - *Recipient of the 2021 Benjamin Feldman and Family Endowment Fund for Transformational Activity in Mental Health (\$5,000)*
 - *Recipient of a 2020 Djavad Centre for Brain Health General Award (\$5,000)*
 - *Recipient of a 2019 Frederick Banting and Charles Best Canada Graduate Scholarship-Master's (\$17,500)*
12. Angela Zhang, undergraduate student. 2019-2020.
- *Recipient of a 2022 Summer Student Research Program Award (\$2,800)*
 - *Recipient of a 2022 Student Undergraduate Research Award (\$3,000)*
11. Hans Bae, undergraduate student. 2019-2020.
10. Stacy Wang, undergraduate student. 2019-2020.
9. Willis Cao, undergraduate student. 2019-2020; honours thesis student, 2021-2022.
8. Jasem Estakhr, PhD student, co-supervised with Yu Tian Wang. 2019-current.
7. Kaitlin Sullivan, technician and PhD candidate. 2019-current.
- *Recipient of a 2022 Alexander Graham Bell Canada Graduate Scholarships – Doctoral (\$105,000)*
 - *Recipient of a 2022 UBC 4-Year Fellowship (\$90,000; accepted in title only)*
 - *Recipient of a 2021 Djavad Centre for Brain Health General Award (\$5,000)*
 - *Institutional Nominee, 2020 Vanier Scholarship.*
 - *Recipient of a 2020 Institute of Mental Health Marshall Scholarship (\$25,000; declined)*

- *Recipient of a 2020 Canadian Open Neuroscience Platform Scholar Award (\$25,000; accepted in title only, declined funding).*
 - *Recipient of a 2019 Frederick Banting and Charles Best Canada Graduate Scholarship-Master's (\$17,500)*
 - *Recipient of the 2019 Royal Canadian Legion Master's Scholarship in Veteran Health Research (\$30,000; sole recipient in national competition).*
6. Sarah Erwin, technician (2019-2021) and MSc student (2021-current).
- *Recipient of a 2022 Alexander Graham Bell Canada Graduate Scholarship-Master's (\$17,500)*
 - *Recipient of a 2021 Cordula and Gunter Paetzold Fellowship (\$18,000)*
 - *Recipient of a 2021 Djavad Centre for Brain Health General Award (\$5,000)*
5. Dr. Timothy O'Leary, research associate. 2019-2020.
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.