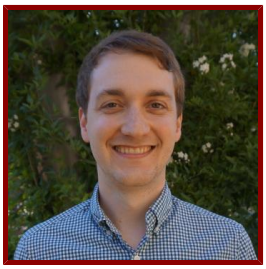
Stanford



Nathan McDonald

Postdoctoral Research Fellow, Biology

Curriculum Vitae available Online

Bio

HONORS AND AWARDS

- Postdoctoral Research Fellowship, The Helen Hay Whitney Foundation (2019-2022)
- (declined) Ruth L. Kirschstein National Research Service Award F32, NIH NINDS (2018)
- Stanford Training Program in Aging Research T32, NIH NIA (2017)
- Most Outstanding Graduate Student Award, Vanderbilt Department of Cell and Developmental Biology (2016)
- Predoctoral Fellowship, American Heart Association (2015-2016)
- Colonel Robinson Merit Scholarship, University of North Carolina at Chapel Hill (2007-2011)

PROFESSIONAL EDUCATION

- Doctor of Philosophy, Vanderbilt University (2017)
- Bachelor of Science, University of North Carolina, Chapel Hill (2011)

STANFORD ADVISORS

- Kang Shen, Postdoctoral Faculty Sponsor

LINKS

- Google scholar publications: https://scholar.google.com/citations?user=Vr61gIQAAAAJ&hl=en

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

I am interested in the fundamental cell biology of neurons. In particular, I study how neuronal synapses are formed and function. Synapses are specialized intercellular junctions that facilitate rapid communication between neurons, and thus form the basis of neural circuits and nervous system function.

Within a synapse, synaptic vesicles containing neurotransmitters are released at a specific region termed the active zone. The active zone is composed of a variety of molecules that coordinate the tethering and priming of synaptic vesicles, the recruitment of ion channels to respond to action potentials, and the stabilization of the synapse through transmembrane connections to a postsynaptic cell.

A wide range of transmembrane proteins are capable of initiating synapse formation during development and provide specificity for targeting the proper postsynaptic cell, including Neurexins/Neuroligins, LRRTMs, DIPs/DPRs, and many Ig domain proteins. However, in all synapses, these molecules must signal to build a common

active zone core. I am studying how the conserved active zone core assembles downstream of this complexity, a fundamental unresolved question in developmental neurobiology.

To study this problem, I use the simple and stereotyped nervous system of the nematode Caenorhabditis elegans. I use fluorescent imaging of endogenous proteins at single neuron and single synapse resolution, as well as genetic and biochemical methods.

Publications

PUBLICATIONS

- **Finding functions of phase separation in the presynapse.** *Current opinion in neurobiology*
  McDonald, N. A., Shen, K. n.
  2021; 69: 178–84
- **Opposite Surfaces of the Cdc15 F-BAR Domain Create a Membrane Platform That Coordinates Cytoskeletal and Signaling Components for Cytokinesis** *CELL REPORTS*
  Snider, C. E., Chandra, M., McDonald, N. A., Willet, A. H., Collier, S. E., Ohi, M. D., Jackson, L. P., Gould, K. L.
  2020; 33 (12): 108526
- **Assembly of synaptic active zones requires phase separation of scaffold molecules.** *Nature*
  McDonald, N. A., Fetter, R. D., Shen, K.
  2020
- **DYRK kinase Pom1 drives F-BAR protein Cdc15 from the membrane to promote medial division** *MOLECULAR BIOLOGY OF THE CELL*
  Bhattacharjee, R., Mangione, M. C., Wos, M., Chen, J., Snider, C. E., Roberts-Galbraith, R. H., McDonald, N. A., Lo Presti, L., Martin, S. G., Gould, K. L.
  2020; 31 (9): 917–29
- **The F-BAR Domain of Rga7 Relies on a Cooperative Mechanism of Membrane Binding with a Partner Protein during Fission Yeast Cytokinesis** *CELL REPORTS*
  Liu, Y., McDonald, N. A., Naegele, S. M., Gould, K. L., Wu, J.
  2019; 26 (10): 2540-+
- **Nanoscale architecture of the Schizosaccharomyces pombe contractile ring.** *eLife*
  McDonald, N. A., Lind, A. L., Smith, S. E., Li, R. n., Gould, K. L.
  2017; 6
- **Structural organization of membrane-inserted hexamers formed by Helicobacter pylori VacA toxin** *MOLECULAR MICROBIOLOGY*
  Pyburn, T. M., Foegeding, N. J., Gonzalez-Rivera, C., McDonald, N. A., Gould, K. L., Cover, T. L., Ohi, M. D.
  2016; 102 (1): 22-36
- **The Tubulation Activity of a Fission Yeast F-BAR Protein Is Dispensable for Its Function in Cytokinesis** *CELL REPORTS*
  McDonald, N. A., Takizawa, Y., Feoktistova, A., Xu, P., Ohi, M. D., Kooi, C. W., Gould, K. L.
  2016; 14 (3): 534-546
- **Characterization of Cytokinetic F-BARs and Other Membrane-Binding Proteins.** *Methods in molecular biology (Clifton, N.J.)*
  McDonald, N. A., Gould, K. L.
  2016; 1369: 181-189
- **Linking up at the BAR: Oligomerization and F-BAR protein function** *CELL CYCLE*
  McDonald, N. A., Gould, K. L.
  2016; 15 (15): 1977-1985
- **Oligomerization but Not Membrane Bending Underlies the Function of Certain F-BAR Proteins in Cell Motility and Cytokinesis** *DEVELOPMENTAL CELL*
  McDonald, N. A., Kooi, C. W., Ohi, M. D., Gould, K. L.
  2015; 35 (6): 725-736
- **Regulation of contractile ring formation and septation in Schizosaccharomyces pombe** *CURRENT OPINION IN MICROBIOLOGY*

Willet, A. H., McDonald, N. A., Gould, K. L.

2015; 28: 46-52

- **Identification of New Players in Cell Division, DNA Damage Response, and Morphogenesis Through Construction of Schizosaccharomyces pombe Deletion Strains** *G3-GENES GENOMES GENETICS*

  Chen, J., Beckley, J. R., McDonald, N. A., Ren, L., Mangione, M., Jang, S. J., Elmore, Z. C., Rachfall, N., Feoktistova, A., Jones, C. M., Willet, A. H., Guillen, R., Bitton, et al

  2015; 5 (3): 361-370

- **The F-BAR Cdc15 promotes contractile ring formation through the direct recruitment of the formin Cdc12** *JOURNAL OF CELL BIOLOGY*

  Willet, A. H., McDonald, N. A., Bohnert, K. A., Baird, M. A., Allen, J. R., Davidson, M. W., Gould, K. L.

  2015; 208 (4): 391-399

- **The Cdc15 and Imp2 SH3 domains cooperatively scaffold a network of proteins that redundantly ensure efficient cell division in fission yeast** *MOLECULAR BIOLOGY OF THE CELL*

  Ren, L., Willet, A. H., Roberts-Galbraith, R. H., McDonald, N. A., Feoktistova, A., Chen, J., Huang, H., Guillen, R., Boone, C., Sidhu, S. S., Beckley, J. R., Gould, K. L.

  2015; 26 (2): 256-269

- **Convergent Targeting of a Common Host Protein-Network by Pathogen Effectors from Three Kingdoms of Life** *CELL HOST & MICROBE*

  Wessling, R., Epple, P., Altmann, S., He, Y., Yang, L., Henz, S. R., McDonald, N., Wiley, K., Bader, K. C., Glaesser, C., Mukhtar, M. S., Haigis, S., Ghamsari, et al

  2014; 16 (3): 364-375

- **Independently Evolved Virulence Effectors Converge onto Hubs in a Plant Immune System Network** *SCIENCE*

  Mukhtar, M. S., Carvunis, A., Dreze, M., Epple, P., Steinbrenner, J., Moore, J., Tasan, M., Galli, M., Hao, T., Nishimura, M. T., Pevzner, S. J., Donovan, S. E., Ghamsari, et al

  2011; 333 (6042): 596-601