

Nathan A. McDonald, Ph.D.

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EDUCATION

- 2017 Vanderbilt University
Ph.D. in Cell and Developmental Biology
- 2011 University of North Carolina at Chapel Hill
B.S. in Chemistry
Minor in Biology

GRANTS AND AWARDS

- 2019-2022 Helen Hay Whitney Postdoctoral Research Fellowship
- 2018 (*declined*) NINDS Ruth L. Kirschstein National Research Service Award - F32 NS110172
- 2017 Stanford Training Program in Aging Research T32 AG0047126
- 2016 Award for Excellence in Cell Dynamics, 2016 Symposium on Cell Dynamics
- 2016 Vanderbilt Department of Cell and Developmental Biology "Most Outstanding Graduate Student" Award
- 2015-2016 American Heart Association Predoctoral Fellowship 15PRE21780003
- 2013 Qualifying Exam Exemplary Pass (top 5%)
- 2007-2011 Colonel Robinson Merit Scholarship, University of North Carolina Chapel Hill
- 2007-2011 University of North Carolina Honors Program

RESEARCH EXPERIENCE

- 2017-Present Postdoctoral Scholar in Biology, Stanford University
Adviser: Kang Shen, Ph.D.
- 2011-2017 Graduate Student in Cell and Developmental Biology, Vanderbilt University
Adviser: Kathleen Gould, Ph.D.
Dissertation: "Nanoscale architecture of F-BAR proteins and the *Schizosaccharomyces pombe* contractile ring."
- 2009-2011 Undergraduate Research Assistant, University of North Carolina Chapel Hill
Adviser: Jeffrey Dangl, Ph.D.

PEER-REVIEWED PUBLICATIONS

- **McDonald NA** and Shen K. (2021) Finding functions of phase separation in the presynapse. *Current Opinion in Neurobiology*. 69: 179-184.
- Snider CE, Chandra M, **McDonald NA**, Willet AH, Collier SE, Ohi MD, Jackson LP, Gould KL. (2020) Opposite surfaces of the Cdc15 F-BAR domain create a membrane platform that coordinates cytoskeletal and signaling components for cytokinesis. *Cell Reports*. 33(12): 108526.
- **McDonald NA**, Fetter RD, Shen K. (2020) Assembly of synaptic active zones requires phase separation of scaffold molecules. *Nature*. 588: 454–458.

- Bhattacharjee R*, Mangione MC*, Wos M, Chen JS, Snider CE, Roberts-Galbraith RH, **McDonald NA**, Lo Presti L, Martin SG, Gould KL. (2020) DYRK kinase Pom1 drives F-BAR protein Cdc15 from the membrane to promote medial division. *Molecular Biology of the Cell*. 31(9): 917–929. **Equal contributions*
- Liu Y*, **McDonald NA***, Naegele SM, Gould KL, and Wu JQ. (2019) The F-BAR domain of Rga7 relies on a cooperative mechanism of membrane binding with a partner protein during fission yeast cytokinesis. *Cell Reports*. 26(10):2540-2548. **Equal contributions*
- **McDonald NA**, Lind AL, Smith SE, Li R, and Gould KL. (2017) Nanoscale architecture of the *Schizosaccharomyces pombe* contractile ring. *eLife*. 6:e28865.
- Pyburn TM, Foegeding NJ, González-Rivera C, **McDonald NA**, Gould KL, Cover TL, and Ohi MD. (2016) Structural organization of membrane-inserted hexamers formed by *Helicobacter pylori* VacA toxin. *Molecular Microbiology*. 102(1):22-36.
- **McDonald NA** and Gould KL. (2016) Linking up at the BAR: oligomerization and F-BAR protein function. *Cell Cycle*. 15(15): 1977-85.
- **McDonald NA***, Takizawa Y*, Feoktistova A, Xu P, Ohi MD, Vander Kooi CW, and Gould KL. (2016) The tubulation activity of a fission yeast F-BAR protein is dispensable for its function in cytokinesis. *Cell Reports*. 14(3):534-46. **Equal contributions*
- **McDonald NA** and Gould KL. (2016) Characterization of cytokinetic F-BARs and other membrane-binding proteins. *Methods in Molecular Biology*. 1369:181-9.
- **McDonald NA**, Vander Kooi CW, Ohi MD, and Gould KL. (2015) Oligomerization but not membrane bending underlies the function of certain F-BAR proteins in cell motility and cytokinesis. *Developmental Cell*. 35(6):725-36.
 - Previewed in: Traub LM. (2015) F-BAR/EFC Domain Proteins: Some Assembly Required. *Developmental Cell*. 35:664-666.
- Willet AH*, **McDonald NA***, and Gould KL. (2015) Regulation of contractile ring formation and septation in *Schizosaccharomyces pombe*. *Current Opinion in Microbiology*. 28:46-52. **Equal contributions*
- Willet AH, **McDonald NA**, Bohnert KA, Baird MA, Allen JR, Davidson MW, and Gould KL. (2015) The F-BAR Cdc15 promotes contractile ring formation through the direct recruitment of the formin Cdc12. *The Journal of Cell Biology*. 208(4):391-9.
- Ren L, Willet AH, Roberts-Galbraith RH, **McDonald NA**, Feoktistova A, Chen JS, Huang H, Guillen R, Boone C, Sidhu SS, Beckley JR, and Gould KL. (2015) 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*. 26(2):256-69.
- Chen JS, Beckley JR, **McDonald NA**, Ren L, Mangione M, Jang SJ, Elmore ZC, Rachfall N, Feoktistova A, Jones CM, Willet AH, Guillen R, Bitton DA, Bähler J, Jensen MA, Rhind N, and Gould KL. (2014) Identification of new players in cell division, DNA damage response, and

morphogenesis through construction of *Schizosaccharomyces pombe* deletion strains. *G3*. 5(3):361-70.

- Weßling R, Epple P, Altmann S, He Y, Yang L, Henz SR, **McDonald NA**, Wiley K, Bader KC, Gläßer C, Mukhtar MS, Haigis S, Ghamsari L, Stephens AE, Ecker JR, Vidal M, Jones JD, Mayer KF, Ver Loren van Themaat E, Weigel D, Schulze-Lefert P, Dangl JL, Panstruga R, and Braun P. (2014) Convergent targeting of a common host protein-network by pathogen effectors from three kingdoms of life. *Cell Host and Microbe*. 16(3):364-75.
- Mukhtar MS, Carvunis AR, Dreze M, Epple P, Steinbrenner J, Moore J, Tasan M, Galli M, Hao T, Nishimura MT, Pevzner SJ, Donovan SE, Ghamsari L, Santhanam B, Romero V, Poulin MM, Gebreab F, Gutierrez, BJ, Tam S, Monachello D, Boxem M, Harbort CJ, **McDonald NA**, Gai L, Chen H, He Y, European Union Effectoromics Consortium, Vandenhoute J, Roth FP, Hill DE, Ecker JR, Vidal M, Beynon J, Braun P, and Dangl JL. (2011) Independently evolved virulence effectors converge onto hubs in a plant immune system network. *Science*. 333(6042):596-601.

PRESENTATIONS

Oral Presentations

- Assembly of synaptic active zones requires phase separation of scaffold molecules. *ASCB|EMBO 2020*.
- Synapse active zone assembly requires scaffold molecule phase separation. *CSHL Molecular Mechanisms of Neuronal Connectivity 2020*.
- Pre-synaptic active zone assembly requires scaffold molecule condensates. *Intrinsically Disordered Proteins Symposium 2020, Stanford, CA*.
- Pre-synapse active zones assemble through phase separation of core scaffolds. *ASCB|EMBO 2019, Washington DC*.
- Two mechanisms of oligomerization by the Cdc15 and Imp2 F-BAR domains result in distinct functions during cytokinesis. *Cold Spring Harbor Cell Biology of Yeasts Meeting, Cold Spring Harbor, NY 2015*.
- Two mechanisms of oligomerization by the Cdc15 and Imp2 F-BAR domains result in distinct functions during cytokinesis. *8th International Fission Yeast Meeting, Kobe, Japan 2015*.
- Oligomerization of the F-BAR scaffold Cdc15 supports its efficient membrane binding and contractile ring integrity. *Plant and Microbial Cytoskeleton Gordon Conference, Andover, NH 2014*.

Poster Presentations

- McDonald NA, Sarah SE, Li R, and Gould KL. Nanoscale architecture of Cdc15 and the *S. pombe* contractile ring. *American Society for Cell Biology Annual Meeting, San Francisco, CA 2016*.
- McDonald NA, Takizawa T, Feoktistova A, Xu P, Ohi MD, Vander Kooi CW, and Gould KL. Diverse modes of oligomerization by F-BAR domains are critical for functions beyond membrane bending. *American Society for Cell Biology Annual Meeting, San Diego, CA 2015*.

- McDonald NA, Vander Kooi CW, Ohi MD, and Gould KL. The F-BAR domain of the essential cytokinetic scaffold Cdc15 exhibits novel membrane binding properties. *American Society for Cell Biology Annual Meeting, New Orleans, LA 2013.*

MENTORING

Graduate Students

- 2020 Emma Theisen – *Regulation of presynaptic phase separation membrane tethering.*
- 2019 Hannah Fung – *Regulation of SYD-2/Liprin- α by SAD-1 phosphorylation.*
- 2016 Archana Krishnamoorthy – *Structure/function analysis of an Rga7 F-BAR – Rng10 interaction.*
- 2016 Natalya Ortolano – *Antephase checkpoint function of the E3 ubiquitin ligase CHFR.*
- 2016 Veronica Farmer – *CRISPR-mediated knockout and fluorescent tagging of FCHSD1/2 non-tubulating F-BAR proteins.*
- 2015 Zachery Lonergan – *Mechanisms of non-tubulating F-BAR domain membrane binding.*
- 2014 MariaSanta Mangione – *Structure/function analysis of Cdc15's phosphorylated middle region.*

Undergraduates

- 2015 Sylvia Jang – *Mechanisms of Pcp1 binding to Ppc89 at the spindle pole body.*