BIOGRAPHICAL SKETCH

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NAME	POSITION TITLE
David M. Miller	Professor
eRA COMMONS USER NAME millerdm	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of Southern Mississippi (Hattiesburg, MS)	B.S.	1973	Biology
Rice University (Houston, TX)	Ph.D.	1981	Biochemistry
Baylor College of Medicine (Houston, TX)	Postdoc	1981-83	Muscle assembly. Mentor: *H. F. Epstein, MD*
MRC-Lab. of Molecular Biology (Cambridge, UK)	Postdoc	1983-84	Myogenesis. Mentor: *S. Brenner, MD*

A. PERSONAL STATEMENT

The Miller lab uses the model organism, *C. elegans*, to investigate neural development and function. Research topics include mechanisms of synaptic specificity, neuronal plasticity, sensory neuron morphogenesis and neurodegeneration. The goal of this work is to identify molecular pathways that control these events and to establish the cell biological mechanism of each process. The PI has acquired extensive experience with key approaches used in these studies including *C. elegans* genetics, high-resolution light microscopy, genomic analysis and protein biochemistry. The PI has been actively involved in graduate education in the classroom as well as serving on 56 Ph.D. committees and mentoring a total of 14 graduate students in the Miller lab.

B. POSITIONS AND HONORS

Positions

1978	Instructor, Department of Biochemistry, Rice University, Houston, TX
1980-1983	Postdoctoral Fellow, Dept of Neurology, Baylor College of Med., Houston, TX (HF Epstein)
1983-84 & S85	Visiting Scientist, MRC Laboratory of Molecular Biology, Cambridge, UK (S. Brenner)
1984-1990	Assistant Professor of Zoology and Genetics, Department of Zoology, North Carolina State University, Raleigh, NC
1990-1994	Assistant Research Professor, Department of Cell Biology, Duke University, Durham, NC
1994-2005	Associate Professor, Department of Cell Biology and Developmental Biology, Vanderbilt University, Nashville, TN
2005-present	Professor, Department of Cell Biology and Developmental Biology, Vanderbilt University, Nashville, TN

Honors

1973	Phi Kappa Phi: Outstanding Student in Biochemistry, University of Southern Mississippi
1973-1977	Robert Welch Foundation Fellow, Rice University
1980-1982	Muscular Dystrophy Association Postdoctoral Fellow
1983, 1985	Burroughs Wellcome Fund Travel Grant
1984	EMBO Long Term Fellowship
1985	Burroughs Wellcome Fund Travel Grant
2012	Elaine Sanders-Bush Award for Excellence in Teaching (For Mentoring graduate students in a research setting), Vanderbilt University
2013	AAAS Fellow

Professional Activities

Reviewer for NIH, NSF and multiple scientific journals.
American Society for Cell Biology, Society for Developmental Biology, Genetics Society of America

C. SELECTED PEER REVIEWED PUBLICATIONS *(in chronological order)*

1. **Miller, D.M.,** Shen, M.M., Shamu, C.E., Bürglin, T.R., Ruvkun, G., Dubois, M.L., Ghee, N., and Wilson, L. (1992) *C. elegans unc-4* gene encodes a homeodomain protein that determines the pattern of synaptic input to specific motor neurons. *Nature 355, 841-845.* PMID: 1347150.
2. *Winnier, A.R., *Meir, JY-J. Ross, J.M., Ishihara, T., Katsura, I., Tavernarakis, N., Driscoll, M., and **Miller, D.M., III.** (1999) UNC-4/UNC-37-dependent repression of motor neuron-specific genes controls synaptic choice in *Caernorhabditis elegans*. *Genes and Development 13, 2774-2786.* (*This authors contributed equally) PMID: 10557206
3. Christensen, M., Estevez, A., Yin, X., Fox, R., Morrison, R., McDonnell, M., Gleason, C., **Miller, D.M. III** and Strange, K. (2002) A primary culture system for functional analysis of *C. elegans* neurons and muscle cells. *Neuron* 33, 503-514. PMID: 11856526.
4. *Von Stetina, S.E., *Fox, R.M., Watkins, K.L., Starich, T.A., Shaw, J.E., and **Miller, D.M.** (2007) UNC-4 represses CEH-12/HB9 to specify synaptic inputs to VA motor neurons in *C. elegans*. *Genes and Development* 21: 332-346. (*This authors contributed equally) PMCID: PMC1785118.
5. *Von Stetina, S. E, *Watson, J.D., Fox, R.M., Olszewski, K., Roy, P., and **Miller, D.M. III**. (2007) Cell-specific microarray profiling reveals a comprehensive picture of gene expression in the *C. elegans* nervous system. *Genome Biology, **8**:R135* (*This authors contributed equally) Highly accessed PMCID: PMC2323220.
6. M Chatzigeorgiou, S Yoo, JD Watson, W-H Lee, WC Spencer, KS Kindt, SW Hwang, **DM Miller, III,** M Treinin, M Driscoll, WR Schafer (2010) Specific roles for DEG/ENaC and TRP channels in touch and thermosensation in *C. elegans* nociceptors. *Nature Neuroscience **13,** 861-868.* PMCID: PMC2975101
7. CJ Smith, JD Watson, WC Spencer, T O'Brien, B Cha, A Albeg, M Treinin, **DM Miller, III** (2010) Time-lapse imaging and cell-specific expression profiling reveal dynamic branching and molecular determinants of a multi-dendritic nociceptor in *C. elegans*. *Developmental Biol. 345, 18-33.* PMCID: PMC2919608. *These authors contributed equally. Cover Art
8. M Gerstein….**DM Miller, III**…*et al.* (modENCODE consortium) (2010). Integrative Analysis of the *Caenorhabditis elegans* Genome by the modENCODE Project. *Science 330, 1775-1787.* PMCID: PMC3142569
9. WC Spencer*, G Zeller*, JD Watson, SR Henz, KL Watkins, RD McWhirter, SC Petersen, VT Sreedharan, C Widmer, J Jo, V Reinke, L Petrella, S Strome, S Von Stetina, M Katz, S Shaham, G Raetsch, **DM Miller, III** (2011). A spatial and temporal map of *C. elegans* gene expression. *Genome Research 21: 325-341.* PMCID: PMC3032935. *These authors contributed equally.
10. SC Petersen, JD Watson, JE Richmond, M Sarov, WW Walthall, **DM Miller, III** (2011). A transcriptional program promotes remodeling of GABAergic synapses in *Caenorhabditis elegans*. *J. Neuroscience 31, 15362–15375*. PMCID: PMC3229156.
11. CS Smith, JD Watson, MK Van Hoven, DA Colon-Ramos, **DM Miller, III** (2012) Netrin (UNC-6) mediates dendritic self-avoidance. *Nature Neuroscience* 15, 731-737. PMCID: PMC3337961
12. SJ Husson, WS Costa, JN Stirman, JD Watson, WC Spencer, **DM Miller, III,** H Lu, A Gottschalk (2012). Optogenetic analysis of a nociceptor neuron and network reveals ion channels acting downstream of primary sensors. *Current Biology* 22, 743-752. PMCID: PMC3350619.
13. JD Schneider*, RL Skelton*, SE Von Stetina*, A van Oudenaarden, T Middelkoop, H. Korswagen**, DM Miller, III** (2012). UNC-4 antagonizes Wnt signaling to regulate synaptic choice in the *C. elegans* motor circuit. *Development 139, 2234-2245*. PMCID: PMC3357913. *These authors contributed equally.
14. *CJ Smith, *T O'Brien, M Chatzigeorgiou, WC Spencer, E Feingold-Link, SJ Husson, S Hori, S Mitani, A Gottschalk, WR Schafer, **DM Miller, III** (2013). Sensory neuron fates are distinguished by a transcriptional switch that regulates dendrite branch stabilization. *Neuron* 79**,** 266-280. PMCID: PMC3795438. *These authors contributed equally.
15. Y Wang, L Han, C Matthewman, T Miller, **DM Miller, III,** L Bianchi (2013) Neurotoxic *unc-8* mutants encode constitutively active DEG/ENaC channels that are blocked by divalent cations. *J. Gen. Physiology* 142, 157-169. PMCID: PMC3727304.

C. RESEARCH SUPPORT

ACTIVE

1R01 NS079611-01A1 (Miller) 06/01/2013-05/31/2018 4.2 calendar months
NIH/NINDS $218,750/yr
Molecular regulation of dendrite morphogenesis
The goal of this project is use molecular genetic approaches to identify determinants of dendrite branching and self-avoidance.

1R01 NS081259-01A1 (Miller & Richmond, Bianchi) 06/01/2013-04/30/2017 3.7 calendar months
NIH/NINDS $284,494/yr
Molecular determinants of synaptic plasticity
The goal of this project is to define the role of a DEG/ENaC protein UNC-8 in an activity-dependent mechanism of synaptic remodeling.

1R21 NS66882 (Hammarlund & Miller) 09/01/2013 – 08/31/2015 1.4 calendar months
NIH/NINDS $275,000/2 yr
Identification of transcriptional targets of the DLK-1 axon regeneration pathway.
The goal of this project is to use cell specific profiling methods and genetic analysis to identify DLK-1 regulated genes that promote neuron regeneration.

Completed During the Last Three Years

5R01 NS026115-21 (Miller) 08/15/2008-06/30/2013 4.2 calendar months
NIH/NINDS $198,000
Molecular Genetics of Neural Specificity
The main goal of this project is to identify the *unc-4* pathway genes that regulate synaptic specificity.

5 U01 HD004263-04 (Waterston, PI) 04/01/2007-03/31/2013 4.2 calendar months
NIH/NIHDS/University of Washington $191,989
Global Identification of Transcribed Elements in the *C. elegans* Genome
The goal of this project is to identify all transcripts expressed by the *C. elegans* genome.

Innovation and Discovery in Engineering And Science (IDEAS) Pilot Grant (Vanderbilt) 07/01/2010 – 06/30/2012
A genetic screen in C. elegans to identify the in vivo target of the potent Wnt inhibitor, pyrvinium.
Support for a postdoc to use a genetic screen and next generation DNA sequencing to identify the target of a novel drug now in clinical trials for treatment of colon cancer.
Role: Miller (PI), E. Lee (Co-PI).

5R21 NS066882-02 Miller (PI) 05/01/2009 – 04/30/2012
NIH/NINDS
Identification of transcriptional determinants of dendritic patterning
This project used cell-specific microarray profiling to identify the targets of transcription factors that control morphogenesis of a nociceptive neuron in *C. elegans.*

Pilot Grant 04/01/2010 – 03/31/2011
Conte Center for Neuroscience Research (Vanderbilt)
5P50 MH78028 Blakely (PI)
Gene expression profiles of C. elegans serotonergic neurons
This project will exploit methods for isolating RNA from specific *C. elegans* cells to identify transcripts that are highly expressed in serotonergic neurons.
Role: PI of Pilot Grant.

US-Israel Binational Science Foundation (BSF) Trenin (PI) 10/01/2006 - 09/30/2010
Genetic Approaches to Nociceptor Function
This project uses a combination of microarray profiling and genetic methods to identify molecules that govern the function of pain receptors (nociceptors) in *C. elegans*.
Role: Co-investigator

5R21 MH077302-02 Miller (PI) 05/01/2006 - 04/30/2010
NIH/NIMH

Identification of synaptic remodeling genes in C. elegans

This project is designed to exploit cell specific microarray profiling technology developed in the Miller lab to identify transcripts that regulate developmentally regulated rewiring of a specific class of *C. elegans* motor neurons. (No cost extension, 04/30/08 – 03/31/10)

Role: PI