STEPHANIE J.B. FRETHAM, Ph.D.

Assistant Professor of Biology
Luther College
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Decorah, IA 52101
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EDUCATION AND TRAINING

Vanderbilt University Medical Center, Nashville, TN, November 2010-July 2013
Postdoctoral Fellow

University of Minnesota, Minneapolis, MN, November 2010
Ph.D. in Neuroscience

Luther College, Decorah, IA, May 2005
B.A. in Biology and Psychology, *summa cum laude*

TEACHING EXPERIENCE

Luther College, Fall 2013-present

Biology 115: Human Anatomy. This is a 4 credit, basic gross anatomy course including dissection of the cat with reference and comparison made to human organ systems.

Biology 368: Human Anatomy and Dissection. This is a 4 credit, in-depth gross anatomy course which includes dissection of human cadavers. Skeletal, muscular, nervous, digestive, cardiovascular, respiratory, and urogenital systems are covered.

Biology 358: Toxicology. This is a 4 credit course covering the principles of toxicology through primary literature, and lab exercises. Students design, conduct, and present an original research project.

Vanderbilt University Medical Center, Fall 2012

Post-doctoral Teaching Fellow: Structure, Function and Development (Gross Anatomy)
Performed and presented pro-sections of the gluteal region, axilla, and upper and lower limbs, aided medical students during laboratory, and assisted with laboratory practical exams and assessments

Nashville State Community College, 2012

Guest Lecturer: Anatomy and Physiology I

Guest Lecturer: Introduction to Biology

Vanderbilt University, Spring 2012-present

Participant: Teaching Certificate Program
Program for postdoctoral fellows and graduate students providing interactive workshops, discussion, teaching experience with critical feedback, and scholarly learning research projects

Vanderbilt University, Fall 2011

Discussion Leader: FOCUS course for first year biomedical graduate students

Prepared and led critical and in-depth discussion of methodology, experimental design, and data interpretation of selected journal articles; Facilitated development of scientific writing skills through evaluation and constructive feedback of written article summaries

University of Minnesota, Fall 2008
Student: Preparing Future Faculty
Course focused on educational philosophy, course design, and professional development

University of Minnesota, Spring 2007
Teaching Assistant: Medical Neuroscience
Assisted medical students during neuroanatomy lab and tutoring sessions; Graded exams

Luther College, 2003-2005
Teaching Assistant: General Biology; Physiology; Brain and Behavior
Prepared and assisted students during lab sessions and practical exams; Graded exams and laboratory reports

MENTORING EXPERIENCE

Luther College: Undergraduates mentored
Calysta Rice (2014)
Thomas Tourdot (2014-2015): Senior Paper: "Analysis of the PI3K/Akt/DAF-16 Pathways' Protective Property During Exposure to Excess Iron in *C. elegans"*
Ellen Badger (2014)
Casey Liveringhouse (2014-2015): Senior Paper: "Daf-16 is Protective Against Oxidative Stress During Excess Iron Exposure in *Caenorhabditis elegans"*
Jamison Ash (2014)
Grant Goss (2014-2015)
Hailey Prohaska (2014-2015): Senior Paper: "The effects of Iron on the Insulin/IGF-1 Signaling (IIS) Pathway in *C. elegans* through the study of Nuclear Localization of DAF-16"
Blake Letney (2015-current): Senior Paper: "Interaction between PI3K pathway and iron homeostasis
Connor Hoff (2015)
Jenna Johnson (2015-current): Senior Honors Project: "The effects of iron chelation on proteostasis networks"
Marta Williams (2016-current)
Tanner Gibbons (2016-current)
Trevor Kao (2016-current)
Leah Barkema (2016-current)

University of Minnesota and Vanderbilt University
Research Mentor, 2007-2010, 2012
Trained and directed research undergraduate students, Ashton Lehmann, Halyna Ivanchuck, and Sarah Dunk

RESEARCH EXPERIENCE

Luther College, Biology Department, 2013-current
Assistant Professor

I use *Caenorhabditis elegans,* a small non-parasitic nematode, to explore the mechanisms through which metal homeostasis regulates and is regulated by neuronal function.
Techniques used: Light and fluorescence microscopy, genetic manipulation, protein assays, assessment of motor and learning behavior.

Vanderbilt University Medical Center, Pediatric Toxicology, 2010-2013
Postdoctoral Research
Advisor: Michael Aschner, Ph.D.
I assayed phenotypic, biochemical, and behavioral outcomes following methylmercury exposure in the nematode *Caenorhabditis elegans* that relate to toxicity, insulin signaling, dopaminergic function and neurodegeneration.
Techniques used: Genetic crosses and RNAi screens, fluorescent and confocal microscopy, behavioral assessment of learning and motor function, protein and RNA analysis

University of Minnesota, Graduate Program in Neuroscience, 2005-2010
Doctoral Research
Advisor: Michael Georgieff, M.D.
Dissertation: The Impact of Iron Deficiency During Development on Mammalian Target of Rapamycin Signaling, Neuronal Structure, and Learning and Memory Behavior
Techniques used: Genetic mouse model characterization and maintenance, Morris water maze and open field behavioral assays, protein and RNA analysis, immunohistochemistry

University of Nebraska Medical Center, Department of Pharmacology, Summer 2004
Undergraduate MD/PhD Summer Research Program
Advisors: David Bylund, Ph.D. and Kevin Happe, Ph.D.
I characterized an animal model of juvenile depression using the learned helplessness paradigm in rats.

Luther College, Department of Psychology, 2003-2005
Undergraduate Research Assistant
Advisor: Kristy Gould, Ph.D.
I conducted context and reinforcement learning experiments with chickadees and rats. I also designed a senior project focused on the use of contextual cues as discriminatory stimuli.

FUNDING

Iowa College Foundation, RJ McElroy Student/Faculty Research Program, "The Effects of Iron on Proteostasis Networks" ($1,990) 2015-2016.
National Research Service Award, National Institute of Neurological Disorders and Stroke, F31NS063667 "The Effects of Early Iron Deficiency on mTOR Signaling" ($100,436) 2008-2011

FELLOWSHIPS AND AWARDS

Postdoctoral Fellowship, NIH Environmental Toxicology Training Grant, Department of Pediatric Toxicology, Vanderbilt University, 2012-present

Best Abstract Oral Presentation by a Graduate Student, Pediatrics Department University of Minnesota, 2010

Selected for Special Poster Session at Winter Brain Conference, 2010

Poppele Award, Graduate Program in Neuroscience, University of Minnesota, 2008

Predoctoral Fellowship, NIH Translational Research in Neurobiology of Disease Training Grant, Department of Neurosurgery, University of Minnesota, 2007-2008

Predoctoral Fellowship, Center for Neurobehavioral Development, University of Minnesota, 2006-2007

Phi Beta Kappa, 2005

Psi Chi, 2003

Robert C. Byrd Scholarship, 2001-2005

PUBLICATIONS

Research Articles

Bixel, G.M., Fretham, S.J.B., Aschner, M. (2015). High-Resolution Multi-Photon Imaging of Morphological Structures of *Caenorhabditis elegans*. Current Protocols in Toxicology. 64:11.19.1-11.19.11. doi: 10.1002/0471140856.tx1119s64

Pisansky, M.T., Wickham, R.J, Su, J., **Fretham, S.J.B**, Yuan, L., Sun, M., Gewirtz, J.C., Georgieff, M.K. (2013). Iron Deficiency with or without Anemia Impairs Prepulse Inhibition of the Startle Reflex. *Hippocampus.* 23(10); 952-962.

Fretham, S.J.B., Carlson, E.S., Georgieff, M.K. (2013). Neuronal-Specific Iron Deficiency Dysregulates Mammalian Target of Rapamycin Signaling During Hippocampal Development in the Mouse. *Journal of Nutrition*. 143: 260-266.

Bastian, T.W., Anderson, J.A., **Fretham, S.J.B**., Prohaska, J.R., Georgieff, M.K., Anderson, G.W. (2012). Fetal and Neonatal Iron Deficiency Reduces Thyroid Hormone-Responsive Gene mRNA Levels in the Neoatal Rat Hippocampus and Cerebral Cortex. *Endocrinology.* 153(11):5668-5680.

Fretham, S.J.B., Carlson E.S., Petryk A., Georgieff, M.K. (2012). Temporal Manipulation of Transferrin-Receptor-1-Dependent Iron Uptake Identifies a Sensitive Period in Mouse Hippocampal Neural Development. *Hippocampus.* 22:1691-1702.

Tran, P.V, **Fretham, S.J.B.,** Wobken, J., Miller, B.S., Georgieff, M.K. (2012). Gestational-Neonatal Iron Deficiency Suppresses and Iron Treatment Re-Activates IGF Signaling in Developing Rat Hippocampus. *Am J Physiol Endocrinol Metab*. 302:E316-E324.

Carlson, E.S., **Fretham, S.J.B.,** Unger, E., O'Connor, M.B., Petryk, A., Schallert, T., Rao, R., Tkac, I., Georgieff, M.K. (2010). Hippocampus Specific Iron Deficiency Alters Competition and Cooperation Between Developing Memory Systems. *J Neurodev Disord.* 2(3):133-143.

Tran, P., **Fretham, S.J.B.**, Carlson, E.S., Georgieff, M.K. (2009). Long-Term Reduction of Hippocampal BDNF Activity Following Fetal-Neonatal Iron Deficiency in Adult Rats. *Pediatric Research*, 65(5):493-498.

Tran, P., Carlson, E.S., **Fretham, S.J.B**., Georgieff, M.K. (2008). Early-life Iron Deficiency Anemia Alters Neurotrophic Factor Expression and Hippocampal Neuron Differentiation in Male Rats. *Journal of Nutrition*, 138(12):2495-501.

Invited Review Articles

Fretham S.J.B., Caito S.W., Martinez-Finley E.J., Aschner M. (2012). Mechanisms and Modifiers of Methylmercury Induced Neurotoxicity. *Toxicology Research,* 1:32-38.

Caito S.W., **Fretham S.J.B**., Martinez-Finley E.J., Chakraborty S., Avila, D., Chen, P., Aschner M. (2012). Genome-Wide Analyses of Metal Responsive Genes in *Caenorhabditis elegans. Frontiers in Genetics.* 3:52.

Martinez-Finley E.J., Chakraborty S., **Fretham S.J.B**., Aschner M. (2012). Cellular Transport and Homeostasis of Essential and Nonessential Metals. *Metallomics*, 4(7):593-605.

Fretham, S.J.B., Carlson, E.S., Georgieff, M.K. (2011). The Role of Iron in Learning and Memory. *Advances in Nutrition*. 2:112-121.

Book Chapters and Encyclopedia Entries

Fretham S.J.B., Costa L.G., Rocha J.B.T., Farina M., Aschner M. Mercury. *Encyclopedia of the Neurological Sciences*, Aminoff MJ, Daroff RB, Eds-in-Chief, Costa LG, Aschner M, Associate Eds, Neurotoxicology Section. Elsevier, Oxford, UK (*in press*)

Martinez-Finley E.J., **Fretham S.J.B**., Caito S.W., Chen, P., Aschner M. (2015). Metal Toxicology, in *Mammalian Toxicology* ed A.-D. Mohamed B. John Wiley & Sons, Hoboken, NJ doi: 10.1002/9781118683483.ch8

Fretham S.J.B., Martinez-Finley E.J., Aschner M. (2014) Mercury and Neurodegeneration, Bioactive Nutraceuticals and Dietary Supplements in *Neurological and Brain Disease: Prevention and Therapy.* Waton, R.R. and Preedy, V.R., Eds. Academic Press, Waltham, MA

Fretham S.J.B., Aschner M. *(2014)* Mercury, in *Metallobiology: Binding, Transport and Storage of Metal Ions in Biological Systems*, Maret, W. and Wedd, A., Eds. Royal Society of Chemistry

Fretham S.J.B., Caito S.W., Martinez-Finley E.J., Aschner M. (2014). *Neurotoxicology* in Principles and Methods of Toxicology eds A.W. Hayes and C.L. Kruger. CRC Press.

Martinez-Finley E.J., Chakraborty S., Caito S.W., **Fretham S.J.B**., Aschner M. (2012). *C. elegans* and Neurodegeneration In *Caenorhabditis Elegans*: Anatomy, Life Cycles and Biological Functions. *Advances in Medicine and Biology.* Vol. 44, Berhardt L.V., Ed. Nova Publishing Company, Hauppauge, NY.

ABSTRACTS (*Luther Undergraduate Students)

Fretham, S.J.B. Use of Multiple Model Systems to Develop Student-Designed Research Projects in an Undergraduate Toxicology Course. Poster Presentation, Society of Toxicology Annual Meeting, 2015.

*Tourdot, T.K., *Liveringhouse, C.L, *Ash, J.J., *Goss, G.W., **Fretham, S.J.B.** PI3K/Akt/DAF-16 Activity is Protective During Excess Iron Exposure in *C. elegans*. Poster Presentation, Society of Toxicology Annual Meeting, 2015 and Midstates Consortium Undergraduate Research Symposium, 2014.

Fretham, S.J.B., Aschner, M. Contribution of PI3K/Akt/DAF-16 Activity in *C. elegans* to Gene-Environment Interactions Following MeHg Exposure. Poster Presentation, Society of Toxicology Annual Meeting, 2013.

Fretham, S.J.B., Aschner, M. Methylmercury Exposure and daf-16 Activity in *C. elegans.* Poster Presentation, Society of Toxicology Annual Meeting, 2012.

Fretham, S.J.B., Carlson, E.S., Wobken, J., Petryk, A., Georgieff, M.K. Defining A Sensitive

Period for Iron in the Development of Hippocampal CA1 Dendritic Structure and Spatial Memory Behavior. Special Poster Session, Winter Conference on Brain Research, 2010.

Fretham, S.J.B., Carlson, E.S., Peterson, M., Bitterman, P., Georgieff, M.K. The Effects of Hippocampal Neuronal Iron Deficiency on mTOR Signaling and Protein Translation Rate. Poster Presentation, Society for Neuroscience Meeting, 2009.

Fretham, S.J.B., Carlson, E.S., Peterson, M., Bitterman, P., Georgieff, M.K. The Effects of Hippocampal Neuronal Iron Deficiency on mTOR Signaling and Protein Translation Rate. Poster Presentation, Cell Biology of Metals Gordon Research Conference, 2009.

Fretham, S.J.B., Carlson, E.S., Petryk, A., Georgieff, M.K. 2009. Timing of Prevention of Long-term Behavioral Deficits in Mice Following Fetal-Neonatal Hippocampal Iron Deficiency. Platform Presentation, Pediatric Academic Societies Annual Meeting 2009.

Fretham, S.J.B., Carlson, E.S., and Georgieff, M.K. 2008. Hippocampal Iron Deficiency Alters Activation of mTOR Signaling During Development. Poster Presentation, Pediatric Academic Societies and Asian Society for Pediatric Research Joint Meeting, 2008, and the University of Minnesota Biomedical Sciences Graduate Programs Research Recognition Day, 2008.

Bohmer, S.J., Carlson, E.S., and Georgieff, M.K. 2007. Prenatal/Early postnatal iron deficiency anemia reduces S6K phosphorylation in the developing hippocampus. Poster Presentation, Society for Neuroscience Meeting, 2007.

INVITED ORAL PRESENTATIONS

"The Necessity and Danger of Metals in the Brain" presented at the Luther College Biology Colloquium Series, November 2012.

"Iron Deficiency: A Tale of Two Mice" presented at Vanderbilt University, April 2010.

"The Influence of Iron Deficiency on mTOR Signaling" presented at Emory University, March 2010.

"Defining a Sensitive Period for Iron During Hippocampal Development" presented at the University of Minnesota Pediatric Research Education and Scholarship Symposium, April 2010.

"Iron Deficiency on Demand, a Mouse Model" presented at the University of Minnesota Center for Neurobehavioral Development Colloquium, March 2009.

"Hippocampal Iron Deficiency and mTOR Signaling During Development" Student selected speaker at the University of Minnesota Graduate Program in Neuroscience Annual Retreat, February 2009.

"Hippocampal Iron Deficiency Alters Activation of mTOR Signaling During Development" presented at the University of Minnesota Graduate Program in Neuroscience Colloquium, July 2008 and the Pediatric Research Education and Scholarship Symposium, April 2008.

SERVICE AND VOLUNTEER ACTIVITIES

Tennessee Science Bowl, 2012
Moderator, overseeing matches and interacting with high school Science Bowl teams and coaches

University of Minnesota Graduate Program in Neuroscience Steering Committee, 2008-2010
Student Representative, providing input for shaping the future of the graduate program

University of Minnesota Graduate Program in Neuroscience Outreach Committee, 2007-2008
Student Representative, developing and organizing community outreach activities designed to educate students and the public about neuroscience

Minnesota Academies of Science, Science Bowl, 2006-2010
Moderator, overseeing matches and interacting with high school and middle school Science Bowl teams and coaches

University of Minnesota Brain Awareness, 2005-2010
Volunteer, traveling to area middle and high schools, the Minnesota State Fair, and the Twin Cities Math and Science Fair to educate students and adults about the nervous system and stimulate interest in science and math

PROFESSIONAL ASSOCIATIONS AND CENTER MEMBERSHIPS

Iowa Academy of Science
2014-present
American Association of Anatomists
2014-present
Human Anatomy and Physiology Society
2014-2015
Society of Toxicology
2012-present
Center in Molecular Toxicology, Vanderbilt University
2012-2013
Society for Neuroscience
2006-2015
Center for Neurobehavioral Development, University of Minnesota
Student Member, 2006-2010
Alumni Member, 2010-present