BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors. Follow this format for each person. DO NOT EXCEED FIVE PAGES.

NAME: Zoe Anastasia McElligott

eRA COMMONS USER NAME (credential, e.g., agency login): mcelliza

POSITION TITLE: Assistant professor

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
New York University	BS	2003	Neural Science
Vanderbilt University	PhD	2009	Neuroscience
University of North Carolina at Chapel Hill	Post-Doc	2013	Chemistry/Neuroscience

A. Personal Statement

The overarching goal of my research is to investigate neuronal pathways that mediate behavioral manifestations, with a focus on stress, anxiety and addiction circuitries. My lab focuses on building an understanding of the underlying physiological mechanisms that mediate both typical behavior and pathological states. To accomplish these goals my lab utilizes system spanning techniques from cellular physiology to behavior including: whole-cell electrophysiology, electrochemistry, optogenetics, Designer Receptors Exclusively Activated by Designer Drugs (DREADDs), IHC, *in situ* hybridization, behavioral studies (anxiety, reward, alcohol related behaviors). This multidisciplinary approach allows me to investigate distinct neurological substrates and circuits and how they engage each other.

B. Positions and Honors <u>Positions</u>

2001 - 2002 Undergraduate Research Assistant, Cornell University, NY, NY, mentor: Neil Harrison
2003 - 2004 Interdisciplinary Graduate Program, Vanderbilt University, Nashville, TN
2005 - 2009 Graduate School: Program in Neuroscience, Vanderbilt University, Nashville, TN, mentor: Danny Winder
2009 - 2012 Post-doctoral research: Chemistry Department, University of North Carolina Chapel Hill, Chapel Hill, NC mentor: Mark Wightman, Ph.D.
2013 – Present Assistant professor, Bowles Center for Alcohol Studies, Department of Psychiatry, University of North Carolina Chapel Hill, NC

<u>Honors</u>

2003 Graduated *cum laude*, New York University
2003 Founder's Award, New York University 2003
200-2003 Scholars Group, College of Arts and Science, New York University
2007 Program in Neuroscience Annual Retreat Poster Winner
2008 Elaine Sanders-Bush Neuroscience Award, Honorable Mention
2011 and 2014 Travel Award Recipient to the International Conference on Alcoholism and Stress
2011 Gordon Research Conference on Catecholamines Poster Winner

Other Experience and Professional Memberships

Society for Neuroscience
Research Society for Alcoholism
Manuscript review: *Neuropharmacology, Plos One, ACS Chemical Neuroscience, Journal of Chemical Neuroanatomy, Psychopharmacology*
Grant review: Université de Genène Centre de Recherche Clinique

C. Contribution to Science 1. **GLUTAMATERGIC PLASTICITY IN THE EXTENDED AMYGDALA**

Beginning in graduate school,
I have focused my research on plasticity mechanisms within the bed nucleus of the stria terminalis (BNST). This topic is of critical importance because of the role that the BNST plays in modulating both drug seeking and anxiety-like behavior. Furthermore it is now well accepted that many psychiatric disorders are manifested in part due to altered learning mechanisms. Focusing on long term depression (LTD) of glutamatergic signaling I made seminal contributions to the understanding of metabotropic glutamate receptor 5 (mGluR5) LTD and uncovered the novel and distinct α_1-adrenergic receptor (α_1-AR) mediated LTD. Using electrophysiology, combined with drug treatment and behavioral manipulation, I contributed to studies examining the expression of mGluR5 LTD following cocaine exposure. I was the lead author on manuscripts that found that α_1-AR LTD is induced by extended norepinephrine exposure, requires L-type voltage gated calcium channels and is mediated by a post-synaptic mechanisms involving the internalization of GluA1 calcium permeable AMPA receptors. Furthermore, my data suggested that this plasticity is induced by chronic stress and liable under conditions of heightened anxiety/depression and alcohol exposure.

a. Grueter BA, **McElligott ZA**, and Winder DG, Group I mGluRs and long-term depression: gatekeepers to addiction? *Molecular Neurobiology* (2007) Dec;36(3):232-44.
b. Grueter BA, **McElligott ZA**, Robison AJ, Mathews GC, Winder DG. In vivo metabatropic glutamate receptor 5 (mGluR5) antagonism prevents cocaine-induced disruption of postsynaptically maintained mGluR5-dependent long-term depression. *Journal of Neuroscience* (2008) Sept 10; 28(37): 9261-70
c. **McElligott, ZA** and Winder, DG Modulation of glutamatergic synaptic transmission in the bed nucleus of the stria terminalis *Progress in Neuropsychopharmacology and Biological Psychiatry* (2009) June 11
d. **McElligott, ZA** and Winder, DG Modulation of glutamatergic synaptic transmission in the bed nucleus of the stria terminalis *Progress in Neuropsychopharmacology and Biological Psychiatry* (2009) June 11
e. **McElligott ZA**, Klug J, Nobis W, Patel S, Grueter BA, Kash TL and Winder DG Distinct forms of $G_q$receptor-dependent plasticity of excitatory transmission in the BNST are differentially affected by stress. *Proceedings of the National Academy of Sciences* (2010) Feb 2; 107 (5)

2. NOREPINEPHRINE RELEASE AND UPTAKE DYNAMICS IN THE EXTENDED AMYGDALA

After moving to the University of North Carolina at Chapel Hill for my post-doctoral research, I began to study the release and uptake of catecholamines using Fast Scan Cyclic Voltammetry. Extending the studies of norepinephrine I began in graduate school, I hypothesized that the noradrenergic system could also be prone to modulation/plastic changes resulting from stress and/or substance abuse. I demonstrated, for the first time, that both uptake mechanisms and autoreceptor regulation of NE release were altered in an animal model of post-traumatic stress disorder and following morphine dependence.

a. Herr NR, Park JW, **McElligott ZA**, Belle AM, Carelli RM and Wightman RM *In Vivo* Voltammetry Monitoring of Electrically Evoked Extracellular Norepinephrine in Subregions of the Bed Nucleus of the Stria Terminalis. *Journal of Neurophysiology* (2012) March; 107(6):1731-7
b. **McElligott ZA**, Fox ME, Walsh PL, Urban DJ, Ferrel MS, Roth BL, Wightman RM Noradrenergic Synaptic Function in the Bed Nucleus of the Stria Terminalis Varies in Animal Models of Anxiety and Addiction *Neuropsychopharmacology* (2013) Aug;38(9):1665-73

3. TECHNICAL ADVANCES IN *EX VIVO* FAST SCAN CYCLIC VOLTAMMETRY While fast scan cyclic voltammetry is a well-established technique for monitoring the release and uptake of the biogenic amines dopamine, norepinephrine and serotonin, advances are still being made to refine and develop this electrochemical method. Fast scan cyclic voltammetry is typically sampled at 10Hz and thus allows subsecond resolution of release and uptake events, with my co-authors, I demonstrated that a faster sampling rate (60Hz) better resolves the uptake rates observed with classic transporter studies and amperometry (albeit at the expense of adsorption time). Additionally, I have authored a paper making a case for the adoption of the use of optogenetic and chemogenetic technologies coupled to fast scan cyclic voltammetry in slices. Recent evidence demonstrates that electrically stimulating dopamine in striatal slices activates intra-slice circuitry that promotes dopamine release. My data builds on a growing line of evidence that utilizing optogenetic techniques in slice fast scan cyclic voltammetry better approximates *in vivo* studies and allows for a more detailed pharmacological assessment.

- **a.** Walsh PL, Kile BM, **McElligott ZA**, Bucher ES, Salahpour A, Caron MG, Wightman RM Improving the Temporal Resolution of Fast-Scan Cyclic Voltammetry. *ACS Chemical Neuroscience* (2012) April; 3(4):285-292
- **b.** **McElligott Z** Optogenetic and Chemogenetic Approaches to Advance Monitoring Molecules *ACS Chemical Neuroscience* (March 20, 2015 epub ahead of print)

4. NEUROPEPTIDE MODULATION OF SYNAPTIC FUNCTION AND PLASTICITY. An additional area where I have made and am making contributions is in the understanding of how neuropeptides modulate synaptic transmission and influence behavior within the extended amydgala. During my graduate studies I found that yohimbine was acting at an off target within the bed nucleus of the stria terminalis which was later determined to be an orexin receptor mediated process. Additionally, my norepinephrine studies demonstrated that the activation of α_1-ARs could release CRF in the BNST to increase glutamatergic transmission (previously cited paper).

- **a.** Stamatakis AM, Sparta DR, Jennings JH, **McElligott ZA**, Decot H, Stuber GD. Amygdala and bed nucleus of the stria terminalis circuitry: Implications for addiction-related behaviors. *Neuropharmacology* (2014) Jan; 76
- **b.** Kash TL, Pleil KE, Marcinkiewcz CA, Lowery-Gionta EG, Mazzone C, Sugam J, Hardaway JA, **McElligott ZA** Neuropeptide Regulation of Signaling and Behavior in the BNST (in press *Mol. Cells*)
- **c.** Davis AR, Shields AD, Brigman J, Norcross M, **McElligott ZA**, Holmes A, and Winder DG, Yohimbine impairs extinction of cocaine-conditioned place preference in an alpha$_2$-adrenergic receptor independent process. *Learning and Memory(2008*) Aug 26:15(9): 667-76.