William James Tyler, Ph.D.

Assistant Professor Arizona State University PO Box 874501, LSC-336 Tempe, AZ 85287-4501 email: wtyler@asu.edu CSO & Co-founder SynSonix, Inc. email: wtyler@synsonix.com

EDUCATION/TRAINING

Postdoctoral Fellowship – 01/2003 to 08/2006

Harvard University, Department of Molecular and Cellular Biology

Investigations: Activity-dependent Refinement of Neural Circuits in the Mammalian Olfactory System

Advisor: Venkatesh N. Murthy, Ph.D.

Doctorate of Philosophy - Psychology/Behavioral Neuroscience, 01/2003

University of Alabama at Birmingham

Dissertation: Brain-Derived Neurotrophic Factor-Induced Plasticity of Both the Presynaptic and

Postsynaptic Compartments of Hippocampal Excitatory Synapses. Mentor: Lucas D. Pozzo-Miller, Ph.D.

Bachelor of Science – Psychology, 08/1998 University of Alabama at Birmingham

ACADEMIC POSITIONS HELD

Assistant Professor of Neurobiology and Bioimaging – 08/2006 - Present School of Life Sciences

Course Director, *Imaging Structure and Function in the Nervous System* – 07/2008 - Present Cold Spring Harbor Laboratory, Cold Spring Harbor, NY

PROFESSIONAL & RESEARCH POSITIONS HELD

CSO & Co-founder – 01/2009 - Present SynSonix, Inc.

Research Assistant - 1997-1998

Department of Psychology, University of Alabama at Birmingham, Birmingham, AL

R&D/Synthetic Chemist - 1995-1997 Avanti Polar Lipids, Inc., Alabaster, AL

ACADEMIC AWARDS AND HONORS

- DARPA Young Faculty Award, 2010 2012
- Samuel Barker Award, the dean's annual award for excellence in graduate studies at the doctoral level, University of Alabama at Birmingham 2003
- Imaging Structure and Function in the Nervous System course participant, Cold Spring Harbor Laboratories 2002
- Outstanding Student in Behavioral Neuroscience, Department of Psychology and Graduate School Awards, University of Alabama at Birmingham 2001
- Young Investigator Travel Award, Society for the Study of Ingestive Behavior 1999
- John W. P. Ost Undergraduate Research Award, University of Alabama at Birmingham 1994

FELLOWSHIPS

- NIH Individual NRSA Postdoctoral Fellowship (NINDS 5F32NS050976); Synaptic Plasticity in Olfactory Juxtaglomerular Neurons, PI – William Tyler, Harvard University – 09/2004 to 08/2006
- NIH Institutional NRSA Predoctoral Fellowship (NINDS 5T32NS007441); Predoctoral Neuroscience Training Program; PI – John Hablitz, University of Alabama at Birmingham - 2000 to 2001

PATENTS

- 3. Devices and Methods for Modulating Brain Activity (application #61/257915), November, 2009. Inventor: **W.J. Tyler**
- 2. Methods and Devices for Modulating Cellular Activity using Ultrasound (application #61/175413), April, 2009. Inventor: **W.J. Tyler**
- 1. Ultrasound for Modulating Neural Activity (application #61/080666), 2008: Converted to PCT Application July, 2009, (PCT/US2009/050560). Inventor: **W. J. Tyler**

JOURNAL ARTICLES PUBLISHED

- 21. Tufail, Y., A. Matyushov, N. Baldwin, M.L. Tauchmann, J. Georges, A. Yoshihiro, S.I. Helms Tillery, W.J.
- Tyler (2010). Transcranial pulsed ultrasound stimulates intact brain circuits. Neuron 66(5), 681-694.
- 20. **Tyler, W.J.**, (2010). Ultrasound for Neuromodulation? A Continuum Mechanics Hypothesis. *The Neuroscientist*, Advanced Online Publication, January 25, 2010.
- 19. **Tyler, W.J.**, Y. Tufail, and S. Pati (2010). Noninvasive functional neurosurgery using ultrasound. *Nature Reviews Neurology*, 6(1), 13-14.
- 18. **Tyler, W. J.**, Y. Tufail, M. Finsterwald, M.L. Tauchmann, E.J. Olsen, C. Majestic (2008). Remote excitation of neuronal circuits using low-intensity, low-frequency ultrasound. *PLoS One* 3(10) e3511.
- 17. Song, H, W. Kong, N. Weatherspoon, G. Qin, **W. Tyler**, J. Turk, R. Curtis III, Y. Shi (2008). Modulation of the regulatory activity of bacterial two-component Regulatory Systems by SlyA. *Journal of Biological Chemistry* 283 (42), 28158-28168.
- 16. **Tyler, W. J.**, G. Petzold, S. Pal, and V. N. Murthy (2007). Experience-dependent modification of primary sensory synapses in the mammalian olfactory bulb. *Journal of Neuroscience* 27, 9427-9438.
- 15. Hojjati, M. R., G. M. van Woerden, **W. J. Tyler**, K. P. Giese, A. J. Silva, L. Pozzo-Miller, and Y. Elgersma (2007). Kinase activity is not required for α CaMKII-dependent presynaptic plasticity at hippocampal CA3-CA1 synapses. *Nature Neuroscience* 10(9) 1125-1127.
- 14. **Tyler, W. J.**, X-I Zhang, K. Hartman, J. Winterer, W. Muller, P.K. Stanton, L. Pozzo-Miller (2006). BDNF increases release probability and the size of a rapidly recycling vesicle pool within hippocampal excitatory synapses. *Journal of Physiology* 574 (3), 787-803.
- 13. Li, Z., J. Burrone, **W.J. Tyler***, K.N. Hartman, D.F. Albeanu, V.N. Murthy (2005). Synaptic vesicle Recycling studied in transgenic mice expressing synaptopHluorin. *Proceedings of the National Academy of Sciences* 102 (17), 6131-6136 (*cover credit).
- 12. Tyler, W. J. and V. N. Murthy (2004). Synaptic vesicles. Current Biology 14(8), R294-297.
- 11. **Tyler, W. J.**, and L. D. Pozzo-Miller (2003). Miniature synaptic transmission and BDNF modulate dendritic spine growth and form in rat CA1 pyramidal neurones. *Journal of Physiology* (London) 553(2), 497-509.
- 10. **Tyler, W. J.**, S. Perrett, and L. D. Pozzo-Miller (2002). The role of neurotrophins in neurotransmitter release. *Neuroscientist* 8 (6), 524-531.
- 9. **Tyler*, W. J.**, M. A. Alonso, C. R. Bramham, and L. D. Pozzo-Miller (2002). From acquisition to consolidation: On the role of brain-derived neurotrophic factor signaling in hippocampal-dependent learning. *Learning and Memory* 9 (5), 224-237 (*cover credit).
- 8. Tartaglia, N., J. Du, **W. J. Tyler**, E. Neale, L. D. Pozzo-Miller, and B. Lu (2001). Protein synthesis-dependent and -independent regulation of hippocampal synapses by brain-derived neurotrophic factor. *Journal of Biological Chemistry* 276 (40), 37585-37593.
- 7. Filippova, N., A. Sedelnikova, W. J. Tyler, T. L. Whitworth, H. Fortinberry, and D. S. Weiss (2001).
- Recombinant GABA_c receptors expressed in rat hippocampal neurons after infection with an adenovirus containing the human p1 subunit. *Journal of Physiology* (London) 535 (1), 145-153.
- 6. **Tyler, W. J.**, and L. D. Pozzo-Miller (2001). BDNF enhances quantal neurotransmitter release and increases the number of docked vesicles at the active zones of hippocampal excitatory synapses. *Journal of Neuroscience* 21 (12), 4249-4258.
- 5. Cox, J. E., **W. J. Tyler**, A. Randich, G. R. Kelm, and S. T. Meller (2001). Celiac vagatomy reduces suppression of feeding by jejunal fatty acid infusions. *Neuroreport* 12 (6), 1093-1096.
- 4. Cox, J. E., **W. J. Tyler**, A. Randich, G. R. Kelm, S. S. Bharaj, R. J. Jandacek, and S. T. Meller (2000). Suppression of food Intake, body weight, and body fat by jejunal fatty acid infusions. *American Journal of Physiology* 278, R604-R610.
- 3. Randich, A., **W. J. Tyler**, J. E. Cox, S. T. Meller, G. R. Kelm, and S. S. Bharaj (2000). Responses of celiac and cervical vagal afferents to infusions of lipids in the jejunum or ileum of the rat. *American Journal of Physiology* 278, R34-R43.

JOURNAL PUBLICATIONS (continued)

2. Cox, J. E., S. M. McCown, J. M. Bridges, and **W. J. Tyler** (1996). Inhibition of sucrose intake by continuous celiac, superior mesenteric, and intravenous CCK-8 infusions. *American Journal of Physiology* 270, R319-R325. 1. Cox, J. E., G. S. Perdue, and **W. J. Tyler** (1995). Suppression of sucrose intake by continuous near-celiac and intravenous cholecystokinin infusions in rats. *American Journal of Physiology* 268, R150-R155.

ABSTRACTS PUBLISHED

- 23. M.L. Tauchmann, Z. Gilbert, K. Cruz, **W.J. Tyler** (2009). Sensory input gain is mediated by the context of associative learning at primary olfactory synapses. *Society for Neuroscience Abstracts*, 257.3.
- 22. Rincon, L., Y. Tufail, G.E. Jabbour, S.I. Helms Tillery, **W.J. Tyler** (2009). Stimulation of channelrhodopsin-2 expressing neurons using organic LEDs. *Society for Neuroscience Abstracts*, 770.14.
- 21. Tufail, Y., A. Matyushov, N. Baldwin, M.L. Tauchmann, J. Georges, A. Yoshihiro, S.I. Helms-Tillery, **W.J. Tyler** (2009). Remote stimulation of intact brain circuits with transcranial pulsed ultrasound. *Society for Neuroscience Abstracts*, 105.1.
- 20. Baluch, D.P., J. Georges, P. Deviche, **W.J Tyler** (2009). Estrogen acts through GPR-30 receptors to rapidly increase neurotransmitter release from hippocampal excitatory synapses. *Society for Neuroscience Abstracts*, 523.3.
- 19. Rincon, L., Y. Tufail, G.E. Jabbour, S.I. Helms Tillery, **W.J. Tyler** (2009). Channelrhodopsin-2 expressing neurons stimulated with blue organic LEDs. *Biomedical Engineering Society Abstracts*, PS 8B-170.
- 18. Murthy, V. N., D. F. Albeanu, **W.J. Tyler**, T. F. Sato, E. R. Soucy, and M. Meister (2007). Development and plasticity of functional odor inputs into the olfactory bulb. *Neuroscience Research* 58, S6.
- 17. **Tyler, W.J**. and V. N. Murthy (2006). Experience-dependent modification of sensory synapses in the olfactory bulb. *Society for Neuroscience Abstracts*.
- 16. Hojjati, M.R., **W.J. Tyler**, K.P. Giese, L.D. Pozzo-Miller, A.J. Silva, Y. Elgersma (2006). Regulation of neurotransmitter release by α CaMKII requires α CaMKII protein, but not α CaMKII activity. *Society for Neuroscience Abstracts*.
- 15. **Tyler, W. J.** and V. N. Murthy (2006). Experience-dependent adaptation of sensory synapses in the olfactory bulb. *Association for Chemoreception Sciences Meeting Abstracts*, *258*.
- 14. Pozzo-Miller, L.D., X.L. Zhang, **W.J. Tyler**, J. Winterer, W. Muller, and P.K. Stanton (2005). BDNF enhances synaptic vesicle release from the readily releasable pool of excitatory hippocampal synapses. *Society for Neuroscience Abstracts*, 365.6.
- 13. **Tyler, W. J.**, D. F. Albeanu, and V. N. Murthy (2003). Visualizing synaptic structure and function in the mammalian olfactory bulb using genetically-encoded fluorescent probes. *Society for Neuroscience Abstracts*.
- 12. Pozzo-Miller, L. D., and **W. J. Tyler** (2002). Beyond hippocampal LTP: BDNF enhances quantal release, docked vesicles, and the maturation of dendritic spines in CA1 pyramidal neurons. *Federation of European Neuroscience Societies Abstracts*, 202.1.
- 11. Ward, M., M. A. Alonso, **W. J. Tyler**, and L. D. Pozzo-Miller (2002). BDNF increases dendritic length and branching in hippocampal CA1 pyramidal neurons. *Society for Neuroscience Abstracts*, 233.6.
- 10. **Tyler, W. J.** and L. D. Pozzo-Miller (2002). BDNF signaling induces the formation of dendritic spines as well as alters spine morphology in the absence of SNARE-mediated vesicular glutamate release. *Society for Neuroscience Abstracts*, 130.9.
- 9. Fenster, S. D., T. Whitworth, **W. J. Tyler**, M. W. Quick, and L.D. Pozzo-Miller (2002). Calcium phosphate-mediated transfection of organotypic slice cultures of postnatal rat hippocampus using GFP and RFP as markers: Application for morphological studies. *Society for Neuroscience Abstracts*, 609.7.
- 8. Kanju, P. M., T. Subramaniam, P. Karanja, Q. Brown, **J. Tyler**, B. Bahr, and V. Suppiramaniam (2002). Lysosomal dysfunction leads to altered AMPA channel properties in hippocampal neurons. *Society for Neuroscience Abstracts*, 139.11.
- 7. **Tyler, W. J.**, and L. D. Pozzo-Miller (2001). BDNF increases spine density in CA1 neurons in the absence of action potentials. *Society for Neuroscience Abstracts*.
- 6. Filippova, N., A. Sedelnikova, **W. J. Tyler**, T. L. Whitworth, H. Fortinberry, and D. S. Weiss (2001). Recombinant GABA_c receptors expressed in rat hippocampal neurons after infection with an adenovirus containing the ρ1 subunit. *Society for Neuroscience Abstracts*.
- 5. **Tyler, W. J.**, M.M. Fisher, S. Haymon, and L.D. Pozzo-Miller (2000). BDNF Increases Quantal Transmitter Release in Hippocampal Slices by Modulating the Number of Synapses as well as Docked Vesicles per Active Zone. *Society for Neuroscience Abstracts*, 331.14.

ABSTRACTS PUBLISHED (continued)

- 4. Haymon, S., N. Tartaglia, J. Du, **W. J. Tyler**, E. Neale, B. Lu, and L.D. Pozzo-Miller (2000). BDNF increases the number of docked vesicles and the expression levels of synaptic vesicle proteins in hippocampal slices. *Society for Neuroscience Abstracts*, 331.13.
- 3. **Tyler, W. J.**, E. Phillips, M. W. Quick, and L. Pozzo-Miller (1999). BDNF increases the number of docked vesicles in the active zone of CA1 excitatory spine synapses in hippocampal slices. *Society for Neuroscience Abstracts* 25:1, 1010.
- 2. **Tyler, W. J.**, J. E. Cox, S. T. Meller, G. R. Kelm, S. S. Bharaj, and A. Randich (1999). Responses of celiac and cervical vagal afferents to infusions of lipids into the jejunum or ileum of the rat. *Appetite*. *32*:2.
- 1. Cox, J. E., G. S. Perdue, and **W. J. Tyler**. Effects of continuous near-celiac CCK infusions on sucrose intake and feeding behavior. *Society for Neuroscience Abstracts* 20:1285, 1994.

SYMPOSIA, PRESENTATIONS, & SPECIAL LECTURES

- 18. Noninvasive Brain Stimulation with Transcranial Pulsed Ultrasound, University of Alabama at Birmingham School of Medicine, Neuroscience Research Day, Invited Alumni Speaker, February, 2010.
- 17. Ultrasonic Neuromodulation: The Noninvasive Future of Therapeutic Neurostimulation and Brain-Machine Interfaces, Barrow Neurological Institute Neuroscience Symposium, January, 2010, Phoenix, Arizona.
- 16. Pulsed Ultrasound for Noninvasive Neural Interfaces, Invited Participant/Lecturer, DARPA Novel Neural Interface Workshop, January, 2010, Arlington, Virginia.
- 15. Chasing Quanta and Building a Neurotechnology Company in Tough Economic Times, Invited Lecturer, M.I.T. Neurotechnology Ventures Course, November, 2009, Cambridge, Massachusetts.
- 14. Ultrasonic Neuromodulation: Noninvasive Remote Control of Intact Brain Circuits using Pulsed Ultrasound, Invited Symposium Speaker, Neural Restoration Workshop, Sandia National Laboratories, November, 2009, Albuquerque, New Mexico.
- 13. Remote Stimulation of Neuronal Circuits using Pulsed Ultrasound, Invited Speaker, Translational Genomics/Barrow Neurological Institute/St. Joseph's Hospital, October, 2009, Phoenix, Arizona.
- 12. Remote Stimulation of Neuronal Circuits using Pulsed Ultrasound, Invited Speaker, Department of Physiology Colloquim Series, July, 2009, University College of London, London, U.K.
- 11. Remote Excitation of Neuronal Activity using Pulsed Ultrasound, Invited Symposium Speaker, The Physiological Society Meeting, July, 2009, Dublin, Ireland.
- 10. Future Neurotechnologies, Invited Speaker, Neurotechnology Industry Organization Partnering Conference, April, 2009, San Francisco, California.
- 9. Hypersonic Neuromodulation: Noninvasive Control of CNS Activity, Arizona State University and Barrow's Neurological Institute Joint Neuroscience Symposium, 2008, Phoenix Arizona.
- 8. Experience-dependent Plasticity in a Primary Olfactory Circuit, Arizona State University and Barrow's Neurological Institute Joint Neuroscience Symposium, 2007, Phoenix Arizona.
- 7. Implementing Genetically-encoded Optophysiological Probes to Investigate Neural Circuits, Arizona Imaging and Microanalysis Annual Meeting, 2007, Tempe, Arizona.
- 6. Optical analysis of neurotransmitter release from individual hippocampal presynaptic nerve terminals following BDNF treatment. University of Alabama at Birmingham, Departmental of Neurobiology, Annual Retreat, 2002, Birmingham, Alabama.
- 5. Brain-Derived Neurotrophic Factor enhances quantal neurotransmitter release, dendritic spine formation, and synapse maturation. University of Alabama at Birmingham Graduate Student Research Day, 2002, Birmingham, Alabama.
- 4. BDNF increases spine density in CA1 neurons in the absence of action potentials. Society for Neuroscience Annual Meeting, 2001, Birmingham, Alabama.
- 3. BDNF enhances quantal neurotransmitter release and increases the number of docked vesicles at the active zones of hippocampal excitatory synapses. University of Alabama at Birmingham, Departmental of Neurobiology, Annual Retreat, 2000, Birmingham, Alabama.
- 2. BDNF enhances synaptic vesicle docking and quantal transmitter release at hippocampal excitatory synapses. University of Alabama at Birmingham Graduate Student Research Day, 2000, Birmingham, Alabama.
- 1. Responses of celiac and cervical vagal afferents to infusions of lipids into the jejunum or ileum of the rat. Society for the Study of Ingestive Behavior, National Meeting, Young Investigator Symposium, 1999, Clearwater, Florida.

RESEARCH SUPPORT

Current

- 4. DARPA Young Faculty Award, The Development of Pulsed Ultrasound for Novel Neural Interfaces, PI W.J. Tyler, Arizona State University, \$300,000.
- 3. DoD/US Army Research, Development, and Engineering Command (56465-LS), Remote Control of Intact Mammalian Brain Circuits Using Pulsed Ultrasound, **PI W.J. Tyler**, Arizona State University, \$450,009, 09/01/2009 08/31/2012.
- 2. NIH NCCR, Prairie Technologies 2-Photon Microscope, PI B. Smith, **Co-PI W.J. Tyler**, Arizona State University, \$457,000.
- 1. NIH SBIR, NeuroVisions, Collaborator W.J. Tyler, Arizona State University, \$25,000.

Completed

1. Arizona Alzheimer's Consortium, Ovarian Hormone Loss and the Aging Brain: An Analysis of Hippocmapal Structure and Function, PI - H. Bimonte-Nelson, **Co-PI - W.J. Tyler**, Arizona State University, \$50,000, July 2007 - July 2008.

Pending

1. NIH NINDS RO1, Ultrasonic Neuromodulation in Animal Models of Neurological Disease, **PI - W.J. Tyler**, Arizona State University, \$1,700,000/5 years, submitted February, 2010.

TEACHING EXPERIENCE

- Instructor, Animal Physiology (BIO-360), Arizona State University, Spring, 2009
- Course Director, Imaging Structure and Function in the Nervous System, Cold Spring Harbor Laboratories, Summer, 2008, 2009, and 2010
- Lecturer, Molecular and Cellular Neuroscience (MCN-555), Arizona State University, Fall, 2009, 2008
- Lecturer, Human Systems Neuroscience (BME-598), Arizona State University, Spring, 2009, 2008, 2007
- Lecturer, Mechanisms of Integration (NEIS), University of Arizona College of Medicine, PHX, Fall. 2008. 2007
- Instructor, Neurobiology (BIO-467/591), Arizona State University, Fall, 2009, 2008, 2007
- Instructor, Neuroscience Seminar (BIO-495/491), Arizona State University, Fall, 2007, 2006
- Teaching Fellow, *Imaging Structure and Function in the Nervous System*, Cold Spring Harbor Laboratories, Summer, 2007, 2004, and 2003
- Instructor, Neuroscience: Molecules to Behavior (BIO-494/591), Arizona State University, Fall, 2006
- Course Assistant, Methods in Neuroscience (MCB-117), Harvard University, Fall, 2004
- Lecturer, Psychotherapy and Behavior Change (PY-418), UAB, Fall, 2001
- Instructor, Introduction to Psychology (PY-101), UAB, Spring, 2001
- Instructor, Elementary Statistical Methods and Experimental Design (PY-217), UAB, Winter, 2001
- Teaching Assistant, Methods in Psychological Research (PY-215), UAB, Summer, 1999
- Teaching Assistant, Introduction to Neurobiology (NEUR-704), Dauphin Island Sea Laboratory, Summer, 1999

STUDENTS SUPERVISED

Graduate Thesis Committee Member (Doctoral Level)

- Monica Li Tauchmann, Biology, Arizona State University (chair; current)
- Yusuf Tufail, Biology, Arizona State University (chair; current)
- Anna Yoshihiro, Neuroscience, Arizona State University (chair; current)
- Liliana Rincon, Bioengineering, Arizona State University (co-chair; current)
- Fernando Vonhoff, Neuroscience Graduate Program, Arizona State University (non-chair; current)

Graduate Thesis Committee Member (Master's Level)

- Rachel Russo, Master's of Science in Design, Arizona State University (non-chair; completed Fall, 2007)
- Nicholas Baker, Master's of Biology, Arizona State University, (non-chair; completed Spring, 2010)

Undergraduate Honor's Thesis Committee Member

- Maria Bengton, Bioengineering, Arizona State University (co-chair, completed Spring, 2008)
- Angela Stroebel, Biology, Arizona State University (chair; completed Spring, 2008)
- Britny Sunhil, Psychology, Arizona State University (non-chair, completed Fall, 2006)

Undergraduate Independent Studies Advisor

- Karina Cruz, Biology, Arizona State University, Fall, 2008 to Spring, 2009
- Zach Gilbert, Biology, Arizona State University, Spring, 2008 to Fall, 2009

STUDENTS SUPERVISED (continued)

- Erik Handberg, Biology, Arizona State University, Fall, 2008 to Fall, 2009
- Cassie Majestic, Biology, Arizona State University, Fall, 2007 to Spring, 2008
- Mandana Behbahani, Biology, Arizona State University, Fall, 2007 to Spring, 2008
- Alex Matyushov, Physics/Barrett Honors College, Arizona State University, Spring, 2007 to present
- Ryan Lewis, Barrett Honors College/SOLUR Student, Arizona State University, Spring, 2007
- Emily Olson, Biology, Arizona State University, Fall, 2006 to Spring, 2008

UNIVERSITY SERVICE

- Arizona State University, Alpha Phi Omega Service Fraternity, Faculty Advisor Spring, 2007 to Spring 2008
- Arizona State University, School of Life Sciences Safety Committee Member Fall, 2007 to Fall, 2008
- Arizona State University, School of Life Sciences Events Committee Member Fall, 2007 to Fall, 2008

GENERAL ACADEMIC SERVICE

ad hoc Reviewer for European Journal of Neuroscience

PROFESIONAL AFFILIATIONS

- Society for Neuroscience