

MICHAEL IAN SANDSTROM

CURRICULUM VITAE

PERSONAL

Home Address: 1820 South Crawford Street
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 Psychology Department & Brain Center
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ACADEMIC & PROFESSIONAL HISTORY

DATES	POSITION/DEGREE	INSTITUTION
September 2014- Present	Full Professor / Principal Investigator	Central Michigan University, Mount Pleasant, Michigan, Psychology Department, and Neuroscience Interdisciplinary Programs
September 2012- August 2014	Associate Professor / Principal Investigator	Central Michigan University, Mount Pleasant, Michigan, Psychology Department, and Neuroscience Interdisciplinary Programs
July 2009-September 2012	Associate Professor / Co-Director of Neuroscience Programs at Central Michigan University / Principal Investigator	Central Michigan University, Mount Pleasant Michigan, Psychology Department, and Neuroscience Interdisciplinary Programs. President of Michigan Chapter Society for Neuroscience 2009-2011.
January 2004- March 2009	Assistant Professor / Principal Investigator	Central Michigan University, Mount Pleasant, Michigan, Psychology Department, and Neuroscience Interdisciplinary Programs
June 1998- December 2004	Postdoctoral Fellow / Research Scientist	Indiana University, Bloomington, Indiana, Program in Neural Science
June 1998	<i>Doctor of Philosophy:</i> Neuroscience	Ohio State University, Columbus, Ohio Neuroscience Graduate Program
1992-1998	Graduate student	Ohio State University, Columbus, Ohio Neuroscience Graduate Program
1992	<i>Bachelor of Science:</i> Biology/Philosophy	University of Hartford, West Hartford, Connecticut (graduated magna cum laude)
1987-1989		Bryn Athyn College of the New Church, Bryn Athyn, Pennsylvania

RESEARCH FOCUS EXPERIENCE

**January 2004
– Present**

Central Michigan University, Mount Pleasant, Michigan. Research has been focused on using optogenetic stimulation of neurons either in-vitro or in-vivo to explore the physiological development of either distorted neuronal responses (Huntington's Disease) or reparative neuronal release of dopamine (Parkinson's Disease). Most recent work indicated below in section entitled "Research/Advising"

1998-2004

Indiana University, Bloomington Indiana. Electrophysiology and iontophoresis in the striatum of awake, unrestrained rats. Parkinson's disease research & microdialysis to investigate interaction between glutamate and ascorbate within the dorsal striatum.
Mentor: Dr. George V. Rebec

1992-1998

Ohio State University, Columbus, Ohio. Developmental sensorimotor plasticity following depletion of striatal dopamine in rats. Parkinson's disease research.
Advisor: Dr. John P. Bruno

1992

The University of Connecticut Health Center, West Hartford, CT; Fluid percussion trauma to the central nervous system and mechanisms of neuronal cell death.
Supervisor: Dr. Tracy MacIntosh

AWARDS / ACHIEVEMENTS

December 3, 2018

Graduate Presentation Grant awarded to graduate student Kevin Anderson for expenses acquired travelling to international Society for Neuroscience Annual Meeting for poster presentation: \$500.00

September 4, 2018

CLASS Student Presentation Grant awarded to graduate student Kevin Anderson for expenses acquired travelling to international Society for Neuroscience Annual Meeting for poster presentation: \$250

May, 2018

Research Funds Garnered from FNI Grant
Collaborative Project for testing potential treatments for Parkinson's disease, Field Neurosciences Institute. \$12,500.

October 9, 2013

Submission of R-21 Research Grant to NINDS
Transplant-Derived Neuron Incorporation During Behavioral Recovery of Freely-Moving Rats Modeling Huntington's Disease
Targeted October 15th deadline (\$275K request)
Submitted during Fall sabbatical. Not funded.

- October 2, 2013** ***Premiere Display Grant Award***
Office of Research and Sponsored Programs \$1000
For Poster Presentation at Society for Neuroscience Meetings
San Diego, CA in November 2013.
- April 2009** ***Faculty Recognition Award***
Exemplary service as a research mentor for undergraduate
students.
- December 2008** ***Nomination for 2008-2009 Excellence in Teaching Award***
This nomination and the letters of support subsequently garnered
from both former students and faculty peers are considered quite
an achievement.
- February 2008** ***Submission of first R-15 Research Grant to NINDS***
This grant submission was accomplished with support from the
below “PRIF” grant. Not funded.
- January 2006** ***Honors Faculty Status***
- May 2004** ***Presidents Research Initiation Fund Grant*** (Type A)
Central Michigan University. Competitive award from the Office of
Research and Sponsored Programs
\$15,000.00 for research initially, but see above.
- June 2002-2003** Neural Science Training Grant
Training in Sensorimotor Neuroplasticity
NINDS T32 NS07487
Principal Investigator: Dr. George Rebec
- December 1996** *Graduate Student Alumni Research Award*
Ohio State University. Competitive award from Graduate School.
\$1400.00 for research
- February 1996** NIH Predoctoral Fellowship Grant Award
Neural Development, Plasticity & Regeneration
Principal Investigator: Dr. Michael S. Beattie

PROFESSIONAL AFFILIATIONS

Society for Neuroscience
Michigan Chapter Society for Neuroscience (**President, 2009-2011**)
During this time, I formulated the review process for the poster competition and oversaw the first
Michigan Chapter SfN meeting at Central Michigan University (mentioned in scholarly initiatives).
Faculty for Undergraduate Neuroscience (FUN)
American Association for the Advancement of Science
Association for the Scientific Study of Consciousness

RESEARCH PUBLICATIONS AND PRESENTATIONS

PUBLICATIONS

A. Manuscripts

Sandstrom, M.I., Anderson, K.A., Jayaprakash, N., Bhupal, P.K., and Dunbar, G.L. (2018) Plastic Adaptation: A Neuronal Imperative Capable of Confounding the Goals of Stem Cell Replacement Therapy for either Huntington's or Parkinson's Disease. Chapter 2 (pp. 7-46), In Victor V. Chaban (Ed), Neuroplasticity: Insights of Neural Reorganization. IntechOpen, London, UK. ISBN: 978-1-78923-194-6. Chapter doi: 10.5772/intechopen.71790.

Bhupal, P.K., Anderson, K. A., Shall, G.P., Lynn, J., Hoolsema, K.S., Rossignol, J., Dunbar, G.L., and Sandstrom, M.I. (2018). Behavioral and neurochemical responses derived from dopaminergic intrastriatal grafts in hemiparkinsonian rats engaged in a novel motor task, *Journal of Neuroscience Methods*. 307, 149-163. doi: 10.1016/j.neumeth.2018.06.005.

Welchko, R.M., Hulse, T.D., Dieffenbach, S.S., Shall, G.P., Huo, W., Siegal, L.R., Watters, J.R., Leveque, X.T., Sandstrom, M.I., Rossignol, J., Lu, M., and Dunbar, G.L. (2018). Trans-differentiation of rat mesenchymal stem cells into dopaminergic neurons for cell transplantation, *Journal of Stem Cell Research & Therapy*, 8(4), 1-7. doi: 10.4172/2157-7633.1000421

Shall, G., Menosky, M., Decker, S., Nethala, P., Welchko, R., Leveque, X., Lu, M., Sandstrom, M., Hochgeschwender, U., Rossignol, J., and Dunbar, G.L. (2018). Effects of Passage Number and Differentiation Protocol on the Generation of Dopaminergic Neurons from Rat Bone Marrow-Derived Mesenchymal Stem Cells, *International Journal of Molecular Sciences*. 19, 720. doi:10.3390/ijms19030720.

Wolfram, A.M., Altemus, M., Wickwire, J.H., and Sandstrom, M.I. (2014). Presymptomatic Glutamate levels in Prefrontal Cortex in the Hdh(CAG150) Mouse Model of Huntington's Disease, *Journal of Huntington's Disease*, 3(4), 387-99; doi: 10.3233/JHD-140114.

Lowrance, S.A., Fink, K.D., Crane, A., Matyas, J., Dey, N.D., Matchynski, J.J., Thibo, T., Reinke, T., Kippe, J., Hoffman, C., Sandstrom, M.I., Rossignol, J., and Dunbar, G.L. (2013). Bone-marrow-derived mesenchymal stem cells attenuate cognitive deficits in an endothelin-1 rat model of stroke. *Restorative Neurology and Neuroscience*, DOI: 10.3233/RNN-130329.

Matchynski, J.J., Lowrance, S.A., Pappas, C., Rossignol, J., Puckett, N., Sandstrom, M., and Dunbar, G.L. (2013) Combinatorial treatment of tart cherry extract and essential fatty acids reduces cognitive impairments and inflammation in the mu-p75 Saporin-induced mouse model of Alzheimer's Disease, *Journal of Medicinal Food*, 16(4), 288-295.

Fink KD, Rossignol J, Crane AT, Davis KK, Bavar AM, Dekorver NW, Lowrance SA, Reilly MP, Sandstrom MI, von Hörsten S, Lescaudron L, Dunbar GL. (2012-Jun) Early cognitive dysfunction in the HD 51 CAG transgenic rat model of Huntington's disease.. *Behavioral Neuroscience* 126(3), 479-487.

Lowrance, S.A., Matchynski, J., Rossignol, J., Dekorver, N., Sandstrom, M., and Dunbar, G. (2012). CXB-909 Attenuates Cognitive Deficits in the mu-p-75 Saporin Mouse Model of Alzheimer's Disease. *Neuroscience and Medicine*, (2012), 3, 65-68.

Sandstrom, M.I., Steffes, S.K., Jayaprakash, N., Wolfram-Aduan, A., and Dunbar, G.L., Book Chapter: *Early Dysfunction of Neural Transmission and Cognitive Processing, in Huntington's Disease*, In Huntington's Disease - Core Concepts and Current Advances, Nagehan Ersoy Tunali Ed., (February 2012), ISBN: 978-953-307-953-0, InTech, Open Source & available from: <http://www.intechopen.com/books/huntington-s-disease-core-concepts-and-current-advances/early-dysfunction-of-neural-transmission-and-cognitive-processing-in-huntington-s-disease>

Dey N.D., Bombard M.C., Roland B.P., Davidson S., Lu M., Rossignol J., Sandstrom M.I., Skeel R.L., Lescaudron L., & Dunbar G.L., Genetically engineered mesenchymal stem cells reduce behavioral deficits in the YAC 128 mouse model of Huntington's disease. Behavioural Brain Research. (2010), 214(2), 193-200.

Sandstrom, M.I., and Steffes, S., Constructing inexpensive, flexible, and versatile microdialysis probes in an undergraduate microdialysis research lab, Journal of Undergraduate Neuroscience Education (JUNE), (2008), Fall Quarter, 7(1), A33-A47.

H.-Martines, K., Shear, D.A., Hargrove, C., Patton, J., Mazei-Robison, M., Sandstrom, M.I., and Dunbar, G.L., 7-nitroindazole attenuates 6-hydroxydopamine-induced spatial learning deficits and dopamine neuron loss in a presymptomatic animal model of Parkinson's disease, Experimental & Clinical Psychopharmacology, 16(2), (2008) 178-189.

Dey, N.D., Boersen A.J., Myers, R.A., York, L.R., Bombard, M.C., Lu, M., Sandstrom, M.I., Hulce, V.D., Lescaudron, L., and Dunbar, G.L., The novel substituted pyrimidine, KP544, reduces motor deficits in the R6/2 transgenic mouse model of Huntington's disease, Restorative Neurology and Neuroscience, 25, (2007) 485-492.

Sandstrom, M.I., and Rebec, G.V., Extracellular ascorbate modulates glutamate dynamics: Role of behavioral activation, BMC Neuroscience, 8, (2007) 32. (<http://www.biomedcentral.com/1471-2202/8/32>)

Dunbar, G.L., Sandstrom, M.I., Rossignol, J., and Lescaudron, L., Neurotrophic enhancers as therapy for behavioral deficits in rodent models of Huntington's Disease: Use of gangliosides, substituted pyrimidines, and mesenchymal stem cells, Behavioral and Cognitive Neuroscience Reviews, 5(2), (2006) 63-79.

Rebec, G.V., Witowski, S.R., Sandstrom, M.I., Rostand, R.D., and Kennedy, R.T., Extracellular ascorbate modulates cortically evoked glutamate dynamics in rat striatum • SHORT COMMUNICATION, Neuroscience Letters, 378(3), (2005) 166-170.

Sandstrom, M., Nelson, C.L., and Bruno, J.P., Neurochemical correlates of sparing from motor deficits in rats depleted of striatal dopamine as weanlings, Developmental Psychobiology 43, (2003) 373-383.

Sandstrom, M. and Rebec, G.V., Characterization of striatal activity in conscious rats: Contribution of NMDA and AMPA/kainate receptors to both spontaneous and glutamate-driven firing, Synapse 47, (2003) 91-100.

Bruno, J.P., Sandstrom, M., Arnold, H.M., and Nelson, C.L., Age-dependent neurobehavioral plasticity following forebrain dopamine depletions. (Review) Developmental Neuroscience 20, (1998) 164-179.

Soghomonian, J.J., Laprade, N., Sandstrom, M., and Bruno, J.P., *c-fos* gene expression is induced in a subpopulation of striatal neurons following a single administration of a dopamine D1-receptor agonist in adult rats lesioned with 6-OHDA as neonates. Molecular Brain Research 57(1), (1998) 155-160.

McGaughy, J., Sandstrom, M., Ruland, S., Bruno, J.P., and Sarter, M., Lack of effects of lesions of the dorsal noradrenergic bundle on behavioral vigilance. Behavioral Neuroscience 111, (1997) 646-652.

Sandstrom, M., and Bruno, J.P., Sensitivity to the motoric effects of a dopamine antagonist differ as a function of age at the time of dopamine depletion. Developmental Psychobiology 30(4), (1997) 293-300.

Sandstrom, M., Sarter, M., and Bruno, J.P., Interactions between D1 and muscarinic receptors in the induction of striatal *c-fos* in rats depleted of DA as neonates. Developmental Brain Research, 96, (1996) 148-158.

B. Published Abstracts

- 2018** Anderson, K.A., Peterson, E.D. Pal, A., Burkett, E.L., Byrd, R.A., Whitehead, B.J., Hanler, A.S., Ancog, R.R., Azinger, K.E., Hill, M.D., Hochgeschwender, U., & Sandstrom, M.I. Luminopsin-mediated stimulation of transplanted dopaminergic cells in unilateral 6-OHDA lesion model of Parkinson's disease. **BOTH** Michigan Chapter Society for Neuroscience 49th Annual Meeting Abstracts, Wayne State University, May 14, 2018. Poster A38. **AND** Soc. Neurosci. Abs. 44, 5929 in San Diego, CA. Updated in between.
- 2017** Bhupal, P. K., Anderson, K. A., Hoolsema, K., Hovater, J. Azinger, K.E., Berger, R., Burkett, E., Whitehead, B., Hill, M.D., Ancog, R., O'Neil, M., Pollak, A., Turnbull, J., Mischley, M. & Sandstrom, M. I. Assessing Motor Asymmetry and Response of Intra-striatal grafts in the Unilaterally Dopamine-Depleted Parkinson Modal in Context of a Natural Locomotor Challenge. Michigan Chapter Society for Neuroscience 48th Annual Meeting Abstracts, University of Michigan, May 22, 2017. Poster A48.
- 2016** Parnit Bhupal, Gabrielle Shall, John Lynn, Jeff Turnbull, Joshua Hovater, Kevin Anderson, Tera Avory, Katrina Hoolsema, Tyler Ledy, Tristen Tibbe, Kaylee Nicholson, Erica Burkett, Gary Dunbar, Ph.D., and Michael Sandström, Addressing limb use asymmetry in the unilaterally dopamine-depleted Parkinsonian rat by combining optogenetics and microdialysis in freely-moving animals. Soc. Neurosci. Abs. 42, 602.06 (2016)
- 2013** Wolfram-Aduan, A., Logan, K.L., Papanikolaou, T., Gafni, J., Bonner, A., Vitelli, C., Ganeshan, R., Detloff, P.J., Kirk, K.L., Sandstrom, M.I., Hughes, R.E., Ellerby, L.M. Effects of Syntaxin-1A on neurotransmitter release in a mouse model of Huntington's disease, **BOTH** Michigan Chapter Society for Neuroscience 44th Annual Meeting Abstracts, Wayne State University, May 13, 2013, **AND** Soc. Neurosci. Abs. 39 (2013) – updated in between.
- Jayaprakash, N., Wolfram-Aduan, A., Hill, N., and Sandstrom, M.I. Location and examination of neuronal stem cell transplants in awake and freely-moving rats using optogenetics. Soc. Neurosci. Abs. 39 (2013).

- 2012** *Jayaprakash, N., Delaney, E., Gilardone, J., Coon, S., Cantuba, J., Wolfram, A., and Sandstrom, M.I.,* Neurophysiology of stem cells evaluated with optogenetics. Michigan Chapter Society for Neuroscience 43rd Annual Meeting Abstracts. University of Michigan, May 19, 2012.
- 2011** *Wolfram-Aduan, A., Knirk, J., Wickwire, J., Rossignol, J., Crane, A., Knoll, A., Lowrance, S. Matyas, J., Koepke, B., Gilardone, J., Mandziara, M., Jayaprakash, N., Dunbar, G., Moskal, J., and Sandstrom, M.I.,* Globus pallidus neurochemical responses to the partial NMDA agonist GLYX-13 among HD51^{CAG} Huntington's disease model rats, *Soc. Neurosci. Abs.* 37 (2011).
- Wolfram-Aduan, A., Knirk, J., Crane A., Lowrance, S., Wickwire, J., Matyas, J., Gilardone, J., Mandziara, M., Levata, L., Koepke, B., Hartman, A., Jayaprakash, N., Tomlinson, H., Rossignol, J., Dunbar G.L., and Sandstrom, M.I.,* Exploring neurochemical responses to a partial NMDA agonist with aged HD51(CAG) Huntington's disease model rats, Michigan Chapter Society for Neuroscience 42nd Annual Meeting Abstracts. Michigan State University, May 16, 2011.
- Crane, A.T, Fink, K.D., Rossignol, J., Lowrance, S.A., Matyas, J.J., Sandstrom, M.I., Moskal, J.R., Dunbar G.L.* Reduction of cognitive deficits in the HD 51 CAG rat model of Huntington's disease with a NMDA receptor agonist, GLYX-1. *Soc. Neurosci. Abs.* 37 (2011).
- 2010** *Sandstrom, M.I., Steffes-Lovdahl, S., Jayaprakash N., Wolfram-Aduan, A., Harju, M., Raak, J.D., Wickwire, J.H., Koepke, R.S., Luck, E.N., Cox, C.L., Burdick, J.A., Cassisi, K.J., Hughes, C.R., and Lowe, M.,* Comparing early-stage striatal neurotransmitter responses to either operant-based or direct chemical stimulation across freely-moving knock-in 150 Huntington's model mouse genotypes with microdialysis, *Soc. Neurosci., Abs.* 36 (2010).
- Sandstrom, M.I., Steffes-Lovdahl, S., Jayaprakash, N., Harju, M., Raak, J.D., Wickwire, J.H., Koepke, R.S., Luck, E.N., Cox, C.L., Burdick, J.A., Cassisi, K.J., and Hughes, C.R.,* Investigating striatal neurotransmitter release capacity among freely-moving knock-in 150 Huntington's model mice with microdialysis resulting from either an operant task or elevated extracellular potassium, Michigan Chapter Society for Neuroscience 41st Annual Meeting Abstracts. Central Michigan University, May 28, 2010.
- 2009** *Matchynski, J.J., Lowrance, S., Rossignol, J., Puckett, M., Derkover, N., Radwan, J., Trainor, K., Sandstrom, M.I., and Dunbar, G.,* Intracerebroventricular injections of mu-P-75 saporin can produce memory deficits without impairing motor deficits in a mouse model of Alzheimer's disease, *Soc. Neurosci. Abs.* 35 (2009).
- 2008** *Sandstrom, M.I., Steffes, S., Carrasco, A., Lupo, M., Lee, J., and Buxton, T.,* Measuring striatal monoamine changes in R6/2 transgenic mice during an operant task designed to challenge behavioral flexibility, *Soc. Neurosci. Abs.* 34, (2008).
- 2008** *Bombard, M.C., Dey, N.D., Roland, B.P, Lu, M., Matchynski, J., Lowrance, S., Rossignol, J., Sandstrom, M.I., Lescaudron, L., and Dunbar, G.L.,* Intra-striatal transplantation of bone marrow stem cells that are genetically engineered to overexpress brain derived neurotrophic factor reduces behavioral deficits in the yeast artificial chromosome mouse model of Huntington's disease *Cell Transplantation: The Regenerative Medicine Journal*, 17(4), (2008), 462.
- 2007** *Bombard, M.C., Dey, N.D., Roland, B.P., Lu, M., Sandstrom, M.I., Shear, D.L., Lescaudron, L., and Dunbar, G.L.,* Adult, bone-marrow-derived stem cells that are genetically engineered to over-express brain derived neurotrophic factor and nerve growth factor reduce behavioral deficits in the yeast artificial chromosome transgenic mouse model of Huntington's disease. *Soc. Neurosci. Abs.* 33, (2007).

Dey, N.D., Bombard, M.C., Myers, R.A., Boersen, A.J., York, L.R., Roland, B.P., Sandstrom, M.I., Lescaudron, L., Hamilton, G., Williams, L., and Dunbar, G.L., The neuroimmunophilin, GPI-1485, ameliorates age-induced spatial learning deficits in the Morris water maze task. Soc. Neurosci. Abs. 33, (2007).

Dey, N.D., Bombard, M.C., Myers, R.A., Boersen, A.J., Rowland, B.P., Sandstrom, M.I., Lescaudron, L., Hamilton, G., Williams, L., and Dunbar, G.L., The novel neuroimmunophilin, GPI 1485, attenuates age-related cognitive deficits in rats. American Society for Neural Therapy and Repair, May 3-6 2007.

2006 Dunbar, G.L., Dey, N.D., Myers, R. Boersen, A., York, L., Lu, M., and Sandstrom, M.I., Treatments with the substituted pyrimidine, KP544, reduces cognitive and motor deficits in the R6/2 mouse model of Huntington's disease. Hereditary Disease Foundation; HD2006, August 11-13 2006, Abstract #199.

Sandstrom, M.I., Boček, K., Carrasco, A., deLaFe, M., Goffus, A.M., and Santini, A., Striatal glutamate release responses to startling noise pulses are not as suppressed by pre-pulses among R6/2 transgenic Huntington's model mice as they are among wild type littermates, Soc. Neurosci. Abs. 32 (2006).

2005 Sandstrom, M.I., Strawsine, M., Ferris A., Gustavision, Z., Devos, C.K., and Goffus, A.M., Glutamate and gamma-aminobutyric acid microdialysis measurements from striatum of freely moving R6/2 transgenic mice in response to ambient light manipulation, Soc. Neurosci. Abs. 31 (2005)

2002 Sandstrom, M.I., and Rebec, G.V., Sensory responses of single striatal units in awake rats following large dopamine-depleting lesions of the nigrostriatal pathway. Soc. Neurosci. Abs. 28 (2002).

2001 Sandstrom, M.I., and Rebec, G.V., Interaction between ascorbate and glutamate in the dorsal neostriatum of freely moving rats as measured by microdialysis. Soc. Neurosci. Abs. 27 (2001).

2000 Sandstrom, M.I., and Rebec, G.V., Evaluation of NMDA or AMPA-kainate GLU-receptor contribution to striatal neuron activity in awake, unrestrained rats. Soc. Neurosci. Abs. 26(1): 1225 (2000)

1999 Sandstrom, M.I., Kiyatkin, E.A., and Rebec, G.V., Characterization of silent and spontaneously active neuronal populations in striatum of awake, unrestrained rats. Soc. Neurosci. Abs. 25(2): 1927 (1999)

1997 Sandstrom, M.I., and Bruno, J.P., Neurobehavioral functions of residual striatal DA in rats treated with 6-OHDA as weanlings vs. as adults. Soc. Neurosci. Abs. 23(1): 190 (1997)

J.-J. Soghomonian, N. Laprade, M. Sandstrom, and J.P. Bruno, Chronic but not acute administration of SKF-38393 increases GAD65 mRNA levels in the striatum of rats depleted of dopamine as neonates. Soc. Neurosci. Abs. 23(1): 747 (1997)

1996 M. Sandstrom, J.P. Bruno, and J.-J. Soghomonian, Expression of c-fos mRNA in striatum of rats depleted of dopamine as neonates. Soc. Neurosci. Abs. 22:1090 (1996)

- 1995 *M. Sandstrom, M. Sarter, and J.P. Bruno*, D2 antagonist-induced striatal Fos-like immunoreactivity in rats depleted of dopamine as weanlings or as adults. Soc. Neurosci. Abs. 21(3):1689 (1995)
- 1994 *J.P. Bruno, and M. Sandstrom*, Animals depleted of striatal dopamine as weanlings fail to exhibit behavioral supersensitivity to the dopamine antagonist cis-flupentixol. Soc. Neurosci. Abs. 20(1):821 (1994)
- M. Sandstrom, M. Sarter, and J.P. Bruno*, DA-ACh interactions in the expression of Fos-like immunoreactivity in rats depleted of dopamine during development. Soc. Neurosci. Abs. 20(1):821 (1994)
- 1993 *M. Sandstrom, E. McCone, B. Johnson, and J.P. Bruno*, D1-D2 mediation of sensorimotor behavior differs between animals depleted of dopamine on postnatal day 1 versus day 3. Soc. Neurosci. Abs. 19(3): p.1830 (1993)

PRESENTATIONS

C. Poster Presentations

- 2018 Poster presentation for Michigan Chapter Society for Neuroscience 49th Annual Meeting (May 14, 2018), and the international Society for Neuroscience Annual Meeting 2018 (November 5, 2018, poster #292.09): Luminopsin-mediated stimulation of transplanted dopaminergic cells in unilateral 6-OHDA lesion model of Parkinson's disease. *Anderson, K.A., Peterson, E.D. Pal, A., Burkett, E.L., Byrd, R.A., Whitehead, B.J., Hauler, A.S., Ancog, R.R., Azinger, K.E., Hill, M.D., Hochgeschwender, U., & Sandstrom, M.I.* Updated between showings.
- 2017 Poster presentation for Michigan Chapter Society for Neuroscience 48th Annual Meeting (May 22, 2017). Assessing Motor Asymmetry and Response of Intra-striatal grafts in the Unilaterally Dopamine-Depleted Parkinson Modal in Context of a Natural Locomotor Challenge. *Bhupal, P. K., Anderson, K. A., Hoolsema, K., Hovater, J. Azinger, K.E., Berger, R., Burkett, E., Whitehead, B., Hill, M.D., Ancog, R., O'Neil, M., Pollak, A., Turnbull, J., Mischley, M., Sandstrom, M.I.*
- 2013 Poster presentation for both the Michigan Chapter Society for Neuroscience 44th Annual Meeting (May 13, 2013), and the international Society for Neuroscience Annual Meeting 2013 (November 11, 2013, poster # 333.01): Effects of Syntaxin-1A on neurotransmitter release in a mouse model of Huntington's disease. *Wolfram-Aduan, A., Logan, K.L., Papanikolaou, T., Gafni, J., Bonner, A., Vitelli, C., Ganeshan, R., Detloff, P.J., Kirk, K.L., Sandstrom, M.I., Hughes, R.E., Ellerby, L.M.* Updated between showings.
- 2012 Poster presentation for Michigan Chapter Society for Neuroscience 43rd Meeting: Neurophysiology of stem cells evaluated with optogenetics. *Jayaprakash, N., Delaney, E., Gilardone, J., Coon, S., Cantuba, J., Wolfram, A., and Sandstrom, M.I.*
- 2011 Poster presentation for Society for Neuroscience 41st Meeting: 148.07, Globus pallidus neurochemical responses to the partial NMDA agonist GLYX-13 among HD51^{CAG} Huntington's disease model rats A. *Wolfram-Aduan, J. Knirk, J. Wickwire, J. Rossignol, A. Crane, A. Knoll, S.A. Lowrance, J. Matyas, B. Koepke, J. Gilardone, M. Mandziara, N. Jayaprakash, G. L. Dunbar, J. Moskal, and M.I. Sandstrom.*

- 2008** Poster presentation for Society for Neuroscience 38th Meeting: 443.15, Measuring striatal monoamine changes in R6/2 transgenic mice during an operant task designed to challenge behavioral flexibility, *M.I. Sandstrom, S. Steffes, A. Carrasco, M. Lupo, J. Lee, and T. Buxton.*
- 2006** Poster presentation for Society for Neuroscience 36th Meeting: 472.5, Striatal glutamate release responses to startling noise pulses are not as suppressed by pre-pulses among R6/2 transgenic Huntington's model mice as they are among wild type littermates, *M.I. Sandstrom, K. Boček, A. Carrasco, C. Cooper, M. deLaFe, A.M. Goffus, S. Oyster, K. Pearsall, and A. Santini.*
- 2005** Poster presentation for Society for Neuroscience 35th Meeting: 1009.18, Glutamate and gamma-aminobutyric acid microdialysis measurements from striatum of freely moving R6/2 transgenic mice in response to ambient light manipulation. *M. Sandstrom, M. Strawsine, A. Ferris, Z. Gustavison, C.K. Devos, and A.M. Goffus.*
- 2002** Poster presentation for Society for Neuroscience 32nd Meeting: 885.6 Sensory responses of single striatal units in awake rats following large dopamine-depleting lesions of the nigrostriatal pathway. *M. Sandstrom and G.V. Rebec*
- 2001** Poster presentation for society for Neuroscience 31st Meeting: 826.12 Interaction between ascorbate and glutamate in the dorsal neostriatum of freely moving rats as measured by microdialysis. *M. Sandstrom and G.V. Rebec*
- 2000** Poster presentation for Society for Neuroscience 30th Meeting: 457.1 Both AMPA and NMDA glutamate receptors modulate striatal unit activity in awake, unrestrained rats. *M. Sandstrom, and G.V. Rebec*
- 1999** Poster presentation for Society for Neuroscience 29th Meeting: 765.11 Characterization of silent and spontaneously active neuronal populations in striatum of awake and unrestrained rats. *M. Sandstrom, E.A. Kiyatkin, and G.V. Rebec*
- 1997** Poster presentation for Society for Neuroscience 27th Meeting: 80.5 Neurobehavioral functions of residual striatal DA in rats treated with 6-OHDA as weanlings vs. as adults. *M. Sandstrom, and J.P. Bruno*
- 1996** Poster presentation for Society for Neuroscience 26th Meeting: 432.10 Expression of c-fos mRNA in striatum of rats depleted of dopamine as neonates. *M. Sandstrom, J.P. Bruno, and J.-J. Soghomonian*
- 1995** Poster production for Society for Neuroscience 25th Meeting: 662.10 D2 antagonist-induced striatal Fos-like immunoreactivity in rats depleted of dopamine as weanlings or as adults. *M. Sandstrom, M. Sarter, and J.P. Bruno*
- 763.3 Effects of lesions of the dorsal noradrenergic bundle on behavioral vigilance. *J. McGaughy, M. Sandstrom, M. Sarter, and J.P. Bruno*
- 1994** Poster presentation at Society for Neuroscience 24th Meeting: 339.3 Animals depleted of striatal dopamine as weanlings fail to exhibit behavioral supersensitivity to the dopamine antagonist cis-flupentixol. *J.P. Bruno, and M. Sandstrom*
- 339.4 DA-ACh interactions in the expression of Fos-like immunoreactivity in rats depleted of dopamine during development. *M. Sandstrom, M. Sarter, and J.P. Bruno*

- 1993 Poster presentation at Society for Neuroscience 23rd Meeting: 747.8 D1-D2 mediation of sensorimotor behavior differs between animals depleted of dopamine on postnatal day 1 versus day 3. *M. Sandstrom, E. McCone, B. Johnson, and J.P. Bruno*

D. Slide Presentations, Interviews & Invited Talks

2018 November 13, 2018: Invited to give a talk by the **Nu Rho Psi Honors Society** entitled *Learning to Appreciate Exploring the Brains of Freely-Moving Animals: A Growing Passion of an Inquisitive Mind*. As described by the event coordinator, Sheila J. Heileman (current Nu Rho Psi President), this event was geared towards mostly freshman and sophomore attendees, though there was a rather wider mixture of both early and more senior students there. My presentation lasted for about 20 minutes and provided a brief synopsis of my career work from its inception until now.

2017 February 18, 2017: Interviewed by Grant LeFaive from CM-Life regarding the efforts to ramp up the Neuroscience Program during reorganization. Article came out November 20, 2017. Provided insights about the education priorities we had in mind for CMU's Neuroscience Program.

October 10, 2017: Invited to give a talk and question/answer session regarding pharmacological associations with research to the **Psychopharmaceutical Society** by its President, Riley Crandall. Discussion went for 1 hour and got into all sorts of areas of interest regarding my work and the future of neuropsychopharmacology.

November 10, 2017: Interviewed by Emma Dyer, an education graduate student, regarding her presentation slated for an upcoming class on early psychomotor development of children. Recorded the interview for her, which was subsequently listened to by Dr. Nowak-Fabrykowski and translated to being invited to her class to present (below).

November 17, 2017: Invited to give a talk to 13 teachers in the education graduate program by Krystyna Nowak-Fabrykowski, Ph.D., Professor of Early Childhood Education for their class on early psychomotor development of children. Talked (45-min) about the neuroscience of early postnatal development and the plasticity and vulnerabilities associated with this early period and heard/commented on several brief Power Point presentations following.

2012 March 15, 2012, Online Super User Showcase about teaching technology: **Providing Feedback in the Digital Age**. Invited by Jeremy Bond, Manager and LMS Instructional Supporter in conjunction with the CMU Faculty Center For Innovative Teaching (FACIT). 12:30-1:30PM. Nineteen users were in attendance at the original session. Session archived and continually accessible at: <http://bit.ly/x45MKm>.

January 9, 2012, Grand Rounds at Saint Mary's of Michigan Hospital. Gave a presentation entitled: **Optogenetics and deteriorative Diseases**. Invited by Gary Dunbar who is the Research Director for the Field Neurosciences Institute and attends these Grand Rounds talks regularly. Talk was targeted towards an audience of Medical Professionals and included several video clips of the amazing things that can be done with optogenetics. It was delivered as an introduction to the new technique and to consider future medical opportunities the technique would open up. The talk was 1 hour followed by questions.

- 2011** December 21, 2011, Presentation at Bloomfield High School, Bloomfield, CT, during the holiday break about **Neurons, Neurotransmitters, and Neuroscience investigations**. Talk designed for advanced high school students including an interactive portion discussing research goals.
- 2010** October 5, 2010, *Ethics Talk* Internet Radio Interview: **Neuroscience and Morality II**. Invited expert for internet radio broadcast hosted by Hope May and colleagues discussing the role of neuronal mechanisms in reasoning, emotions, and morality; second in multi-part series. Available for download to iTunes at: <http://ethicstalk.cmich.edu/> (click show archives). One hour.
- 2010** September 28, 2010, *Ethics Talk* Internet Radio Interview: **Neuroscience and Morality I**. Invited expert for internet radio broadcast hosted by Hope May, Ph.D. and colleagues discussing the role of neuronal mechanisms in reasoning, emotions, and morality; first in multi-part series. Available for download to iTunes at: <http://ethicstalk.cmich.edu/> (click show archives). One hour.
- 2008** October 3, 2008, at Central Michigan University, Mount Pleasant, MI, **Ethics in People – Ethics in Research: Researchers are People Too – Biological and Environmental Influences**. Invited talk given for the Association for Psychological Science Student Caucus (APSSC) of Central Michigan University for their social. Well received. One hour.
- 2006** March 23, 2006, at Central Michigan University, Mount Pleasant, MI, **Neuroethics: An Overview of the Debates**. Colloquium talk held for students, faculty and local community, well attended and received. One and one half hours.
- 2006** February 3, 2006, at Bryn Athyn College of the New Church, Bryn Athyn, PA. **Neuroethics: Engaging Debates**. Colloquium talk held at college for undergraduates, faculty, and local community. Well attended and received. Two hours.
- 2003** January 28, 2003, At Central Michigan University, Mount Pleasant, MI. **Behavioral recovery among rats modeling Parkinson’s disease**. Colloquium talk held as part of interview visit that resulted in being hired as an assistant professor. One hour
- 2002** January 10, 2002. At Bryn Athyn College of the New Church, Bryn Athyn, PA. **Brain Deteriorative Diseases: What do we know? What can we learn using animal models?** Colloquium talk held in the evening and open to the local community. Attendance and response enthusiasm was high. One hour.
- 1998** December 22, 1998. At The University of Hartford, West Hartford, Connecticut. **The importance of age to the motoric effects of striatal dopamine depletion in an experimental animal model of Parkinson’s disease**. Given to undergraduate biology department about graduate work. One hour.
- 1997** May 16, 1997. At Indiana University, Bloomington Indiana. **Probing Age-Dependent Behavioral Plasticity Following Depletion of the Nigrostriatal Dopamine System: c-fos, and In-vivo microdialysis**. Talk prior to starting postdoctoral position & open to the Psychology Department at Indiana University. One hour.

TEACHING AND LECTURING

A. Full Courses

1. Regular Courses at Central Michigan University, Mount Pleasant, MI

Neuroscience I and II (NSC501 & 502). These graduate courses for the Neuroscience Graduate Program address the whole textbook: Kandel, Schwartz, and Jessell's *Principles of Neural Science – 5th Edition* (2013) from cover to cover in a two-course yearlong series regarding all essential standard knowledge about Neuroscience. Students are trained to carefully process neuroscience material by submitting essay questions throughout the semester and a term paper in the end. 4hr/session with NSC501 Fall and NSC502 Spring. I've been solely responsible for these courses barring this past Fall 2013 while I was on sabbatical.

Neuroscience Graduate Seminar (NSC690). This graduate course covers, across two semesters, ethics in neuroscience, recent cutting-edge neuroscience exposing students to more recent exploration methods, presentation styles, and journal article reviewing to a rather intense degree. Articles match and follow the core Neuroscience I and II topics with recent articles found to fill out the material discussed in that course. Faculty research interests and advanced students presenting previews of Masters or Doctoral work defenses also offered occasionally. 1-hr/session. Offered in Fall and Spring. I've been solely responsible for this course barring this past Fall 2013 while I was on sabbatical.

Behavioral Neuroscience, (PSY387). Lectures and demonstrations about the relationship between nervous system function and behavior. Upper level core class for the neuroscience major. Two evenings per week, Fall & Spring Semesters, 1hr-15min/session. Office hours, Blackboard online support, and review sessions held throughout the semester.

Honors Introduction to Psychology, (PSY100H). Introduction to psychology for honors students. While this covers the same spectrum of topics as general PSY100, more effort to engage debate, dialog, and independent thought is engendered for this course. There are more papers required and in-class discussion on the "hot topics" of psychology goes on at every class. Times and ancillaries are similar to above.

2. Occasional Courses at Central Michigan University, Mount Pleasant, MI

These are courses that I've taught in the past and was successful with but are currently not part of my regular semester schedule.

Introduction to Psychology, (PSY100). General introduction psychology survey course covering a broad spectrum of associated subjects. Fall & Spring Semesters, 1hr-15min/session. Office hours, Blackboard online support, and review sessions held throughout the semester.

Physiological Psychology, (PSY587). In depth discussion and lecture oriented course about the physiological foundations of nervous system function. Graduate students produced a term paper and presentations for the class about individually selected controversies in the field. One evening per week, Spring Semester, 3-hr/session. Online support, term paper & presentation help, and review sessions held throughout the semester.

3. Courses at Other Institutions

January 8 – May 4, 2001, **Introduction to Psychology, (PSY 101, Section 3421)**. **Indiana University**, Bloomington, IN. General introduction psychology course emphasizing biological psychology & neuroscience aspects. Three days per week Spring semester, 50-min/day, 250 students. Office hours and review sessions held throughout semester.

B. Invited & Guest Lectures

- 2013** October 7, 2013 with **Bryn Athyn College**, Bryn Athyn, PA. Invited Skype lecture for the Introductory Psychology class of Sarah Wong. Discussed the background of deteriorative disease of the motor system and some research-related items. Approximately 1-hour followed up with student questions
- 2012** January 19, 2012 at **Bryn Athyn College**, Bryn Athyn, PA. Invited Skype chat with Psychology classroom of Soni Werner teaching first course about neuroscience, stem cells, and research technology. Approximately 1-hour. Interacted with student questions.
- 2011** August 30 and September 1, 2011 at **Central Michigan University**, Mount Pleasant, MI. Guest Lectures for *Neuroanatomy in Physical Therapy* 22160820 **PTH626-12300-22160820**, Invited by Professor Raju Chowdhary PT, MHS, NCS, GCS. 1 hour each. Discussed basic nervous system operations, connections, anatomy, and somatosensory interactions.
- December 21, 2011 presentation at Bloomfield High School during the holiday break about *Neurons, Neurotransmitters, and Neuroscience investigations*. Talk designed for advanced high school students including an interactive portion discussing research goals.
- 2006** March 23, 2006, at **Central Michigan University**, Mount Pleasant, MI, *Neuroethics: An Overview of the Debates*. Colloquium talk held for students, faculty and local community, well attended and received. One and one half hours.
- 2006** February 3, 2006, at **Bryn Athyn College**, Bryn Athyn, PA. *Neuroethics: Engaging Debates*. Colloquium talk held at college for undergraduates, faculty, and local community. Well attended and received. Two hours.
- 2002** November 13, 2002 Designed and led discussion on section of “Research and professional ethics in bio-behavioral sciences” (A502) class at the Center for Integrative Study of Animal Behavior (CISAB) regarding: *Animal welfare of laboratory and field animals*. Class coordinator Dr. Ellen Ketterson. 2-hrs. **Indiana University**
- 2002** January 7, 9, 10, 11, lectured to introduce the nervous system to an introductory biology class (BIO 121) at **Bryn Athyn College**, Bryn Athyn, PA. Invited by class instructor Dr. Sherri Cooper to introduce the basics of neuronal function and nervous system organization. Each class was 70-min. Thursday 1/10/02 provided an introduction to sensory mechanisms prior to helping lead a laboratory exercise on sensory perception. Lab was 3-hr.
- 2002** January 10, 2002. At **Bryn Athyn College**, Bryn Athyn, PA. *Brain Deteriorative Diseases: What do we know? What can we learn using animal models?* Colloquium talk held in the evening and open to the local community. Attendance and response enthusiasm was high. One hour.

- 1996** May 14, 1996. Developmental Psychobiology (PSYCH 627). Behavioral teratology. Effects of toxins on the developing nervous system. General overview, experimental concerns, and recent experiments discussed. One and one half hours. **Ohio State University**
- 1995** April 6, 1995. Developmental Psychobiology (PSYCH 627). Effects of early experience on CNS development. One and one-half hours. **Ohio State University**

C. Seminars

- Neuroscience Research seminar** (NSC690) I began teaching this for Fall 2008. It meets once a week and all neuroscience graduate students evaluate and discuss current research associated with literature from journals or faculty contributions. Central Michigan University
- Neuroscience seminar** (PSY487) I participate in this seminar as regularly as I can. I've taught this course myself during summer sessions while I was co-Director and have not been teaching it since. Typically a 45-min once per week journal club format with articles presented by students and discussed by the group and faculty present. Central Michigan University.
- Graduate seminar** (PSY or NSC789) Typically this is done on an individual basis to discuss subjects related to current ongoing projects and delve into the topic more deeply while manuscripts are being prepared. On one occasion, while developing what is now our core course series, we used this course (then listed as PSY789) as a test arena for going through Kandel, Schwartz, and Jessell's *Principles of Neural Science – 4th Edition* (2000). Now the update of that text (2013) is taught as NSC501 and 502. Central Michigan University.
- Research seminar in General Psychology** (PSY690), regularly give invited presentation in this seminar to new graduate students for generalized exposure to area. Typically only once every other semester. I attend these sessions regularly despite there being a very small proportion of Experimental Psychology faculty there. I typically attend at least half of these sessions. Central Michigan University.

RESEARCH / ADVISING

Dissertations, Theses, and Undergraduate Research Projects

Central Michigan University

- Fall'18** **Kevin Anderson** completed and defended his thesis entitled: *Luminopsin-Mediated Stimulation of Transplanted Dopaminergic Cells in Unilateral 6-OHDA Lesion Model of Parkinson's Disease*, defending in November. This study found some really interesting lingering effects of the luminopsin induction with a compound referred to as CTZ. Kevin received compliments from every faculty member about how well his thesis was written. Andrew Hauler completed his Directed Research (PSY496) and Romy Ancog did the work for his Directed Research that will be applied to the following Spring semester. New graduate student Anna Wedster's thesis subject was deliberated and the proposal has begun to be produced during this her first semester. Undergraduate volunteers beyond Andrew and Romy in the lab include Bailey Whitehead and Erica Burkett (both continuing after completing their honors theses), Monica Hill, and Kathryn Shaw (Corah Kaufman and Kelsey Bogrow decided they could not spend sufficient time in the lab and moved on). We also acquired Alexis Holstead who transferred in from another lab.

- Summer'18** The lab acquired **Anna Wedster** as a new graduate student who began helping in the lab and learning the ropes from Kevin Anderson. Bailey Whitehead proceeded with his Honors Thesis work having completed the proposal as part of the same project. Deliberation began about a potential 800 project for Kevin and a thesis direction for Anna.
- Spring'18** **Kevin Anderson** continued with his thesis work. Simultaneously he helped with multiple drafts of the Journal of Neuroscience Methods paper submitted regarding Parnit's thesis work that was recently published. Based on some of the comments we received back from reviewers of this manuscript, Kevin helped devise an Honors thesis project for Bailey Whitehead who worked on an examination of intact rats responding to the swimming apparatus. With the graduation of Rachel Byrd and departure of Kaitlynn Azinger, the lab acquired three new volunteers for the upcoming Fall semester: Kelsey Bogrow, Corah Kaufman, and Kathryn Shaw.
- Fall'17** **Parnit Bhupal** finished & defended her thesis entitled: *Effect of Tonic Release from Intra-Striatal Grafts in Parkinson's Model on Motor Deficits in a Novel Behavior Paradigm*, defending in October. She moved on to a position at Texas A&M University working with cancerous cell development. Kevin established the procedure to transfect adipose stem cells with a combination of channelrhodopsin and a luminopsin allowing the potential of either chemical or light stimulation and began work on his thesis proposal. Kevin produced and defended his proposal and began work on the project that originally intended to compare chemical and light stimulation of transplanted cells in the paradigm initiated by Parnit. After several attempts the combination of microdialysis and fiber-optic illumination was scratched due to technical difficulties and this thesis proceeded with the chemical stimulation comparisons. Kevin helped both Erica Burkett and Rachel Byrd with their Honors Theses which were completed based on efforts to confirm that we could successfully convert adipose-derived mesenchymal stem cells into dopaminergic neurons. Romy Ancog, Bailey Whitehead, Andrew Hauler, Monica Hill, and Kaitlyn Azinger were volunteering in the lab.
- Spring'17** **Parnit Bhupal** engaged fully with her thesis regarding transplantation of mesenchymal-derived dopaminergic cells, spending considerable time facing one hurdle after another. **Kevin Anderson** developed his thesis concept and learning what needs to be learned about how we control cells and do microdialysis during this semester, and subsequently in the summer he continued this effort into developing both the virus for optogenetic stimulation and the requisite dialysis probes. During the Spring semester we took on Megan O'Neil, Romy Ancog, Abigail Pollak, Matthew Mischley, Monica Hill, and Annika Zelinko. Toward the end of the semester, Erica Burkett indicated her desire to do her Honors thesis in a combination of the Summer and Fall where she would finish her proposal in the summer and the thesis in the Fall.
- Fall'16** Lab acquired **Kevin Anderson**, new graduate student in Experimental Psychology program. Working to establish light sensitive population of dopamine-producing cells to prepare for animal experiments. Virus now possible to concentrate. Finished building swimming apparatus and beginning testing apparatus on rats to improve in anticipation of use for microdialysis while swimming. Work continues on demonstrating capacity to produce necessary cells. Also working with Matt Finneran on measuring micropunch levels of dopamine, homovanillic acid, DOPAC, and serotonin with Dr. Jamie Johansen's animals with Kennedy's disease model. Taking time to perfect protocol. Also began working with Ryan Welchko in doing dialysis with his animals that he's transplanting with cells rendered dopaminergic using viral series. Lab added Remington Berger, Selma Huskic, Kaitlyn Azinger, and Bailey Whitehead. With many new students, there is lots of need to establish consistency among new learners.

- Spring'16** Continuing efforts to establish optogenetic stimulation via microdialysis in vitro as a proof of principle to be engaged with animals once demonstrated. Getting viruses to transfect sufficiently proved challenging as did establishing consistency with analysis. Working to rectify the system and to establish consistency. Formulating proposal for **Parnit Bhupal**. Building swimming apparatus and establishing Animal Care and Use approval for animal experiments. Other graduate student (non-degree) accepted into Wayne State University Neuroscience program. Continued to work with Josh Hovater, Katrina Hoolsema, Jeff Turnbull, Tristen Tibbe, Tera Arvoy, and boosting new students Kalee Nicholson, Erica Burkett, and Monica Hill.
- Fall'15** Work shifted into developing microdialysis project to measure optogenetic stimulation of mesenchymal stem cells brought through a neurotrophic regimen to guide them to becoming dopaminergic neurons. In vitro stimulation with high potassium was the goal and several learning experiments over the summer led to four cuvettes going through this process during the semester. **John Lynn** started as a Non-Degree Neuroscience Graduate Student. **Parnit Bhupal** also started but as a paid Neuroscience Graduate Student. Tera Arvoy, Josh Hovater, and Katrina Hoolsema did Directed Research. Jeff Turnbull, Tristan Tibbe, and Nichole Noble were volunteers.
- Spring'15** **Antigone Wolfram-Aduan** completed her dissertation entitled: *Optogenetic stimulation of transplanted neuronal stem cells in a quinolinic acid model of Huntington's disease: Behavioral and histological outcomes*. Tyler Levy did Directed Research along with Antigone. Katrina Hoolsema and John Lynn also helped. Jeff Turnbull, Tera Arvoy, Josh Hovater, and Tristan Tibbe also joined the lab as volunteers.
- Fall'14** Antigone continued working on her dissertation. Shaun Sehanobish did PSY496 and Katrina Buyze did HON499. Tyler Levy and Katrina Hoolsema also volunteered. Also we got the presymptomatic prefrontal cortex stuff with the knock-in mouse model of Huntington's disease accepted at the Journal of Huntington's Disease.
- Spring'14** **Naveen Jayaprakash** defended his dissertation entitled: *In-vivo neurophysiological examination of transplanted neuronal stem cells using optogenetics and iontophoresis in awake animals*. Work proceeded in initial collection for Antigone Wolfram-Aduan's project. At some point during this semester her dissertation direction needed to be changed from electrophysiology to stimulation & incorporation. This required negotiation for an extra semester. Antigone began teaching the online PSY387 as a result.
- Fall'13** I was on sabbatical this semester. Nevertheless **Antigone Wolfram-Aduan** finally overcame the hurdles to getting started put up by Animal Care and Use and our animal care coordinator to get started with NSC898 doing a dissertation that began work I also proposed in a grant proposal (the main purpose of the sabbatical) written and submitted October 9, 2013. **Naveen Jayaprakash**, having wrapped up data collection and therefore being in "all-but-dissertation" status (NSC899) was able to swing getting started in a postdoctoral position in Wisconsin while writing up his dissertation. His defense took place on December 10, 2013. John Lynn did Directed Research (PSY496) with Antigone as she got started with what she could during the latter half of the semester. Elaine Trinh also started as a volunteer in the lab. Other volunteers are in the wind for next semester. Katrina Buyze will be working with me as a Teaching Assistant in PSY387 in the Spring.

Spring'13

Neuroscience Graduate Research (NSC800): **Antigone Wolfram-Aduan** finished her 800 Project: Neurochemical Effects of Diminished Syntaxin-1A in the R6/2 model of Huntington's disease. This was finally defended in July 2013. Simultaneously, she was working on a separate project (NSC690 independent study) measuring changes in glutamate, glutamine, and GABA in the prefrontal cortex of a knock-in model of Huntington's disease in response to a drug that blocks glutamate reuptake. This project was somewhat stymied by difficulties getting homozygote animals initially, but we moved to using female animals also to finish this work. She also worked alongside **Naveen Jayaprakash** who was involved in data collection for NSC898/899 doing optogenetics in freely-moving rats that had received transplants of cells modified to respond to blue light. Antigone intended to continue this work into the area of transplantation using a rat model of Huntington's disease in her dissertation work. **Katie Logan-Dinco** continued to help Antigone with her 800 project in the NSC696, but eventually switched labs to work with Jamie Johansen. Nick Hill, the volunteer mentioned below, did Directed Research (PSY496) with Naveen in the optogenetics project. We also had a high school student, Lilly Vandermark, working in our lab to help with the Syntaxin project, in an independent study set up in conjunction with Alma High School and the teacher/coordinator Juli Dellamoretta from that High School. **Steven Lowrance** completed his Dissertation defense with Gary Dunbar in May, 2013 and I was on that committee. Lab volunteers included Megan Altemus, Francesca Picotte, Katrina Buyze, John Lynn, and Kathryn Leggieri. During the summer Antigone got the animal care and use proposal ready for her dissertation work using optogenetics.

Fall'12

Neuroscience Graduate Research (NSC696): **Katie Logan-Dinco** began learning laboratory techniques and incorporating into the microdialysis projects alongside **Antigone Wolfram-Aduan** who began her NSC800 project after finishing her thesis defense in the Spring (see below). Antigone's NSC800 project involves investigating a relationship between the Huntington protein function and a protein involved with neurotransmitter vesicle docking called syntaxin. The knock-out model mouse that lacks half of its syntaxin was produced by Lisa Ellerby at the Buck Institute in California who provided us with her animals. Katie Logan-Dinco worked with Antigone on this project along with an undergraduate directed research student, Nicole Masty (PSY496). **Naveen Jayaprakash's** NSC800 project was completed and defended in the beginning of the following Spring 2013 but the majority of the work was completed during this semester with in-vitro recordings from neuronal cells derived from stem cells that were treated with channel-rhodopsin rendering them sensitive to light stimulation. Nick Hill (undergraduate) came on board with our lab as a volunteer. Jessica Matchynski completed her Dissertation defense with Gary Dunbar and I was on that committee.

Summer'12

Antigone Wolfram-Aduan defended her thesis entitled: *The Effects of GLYX-13 on amino acid neurotransmitter release in the globus pallidus of the tgHD rat*. Defense on July 26, 2012.

Spring'12

Neuroscience Graduate Research (NSC696): **Antigone Wolfram-Aduan** continues projects using microdialysis to explore Huntington's disease in the globus pallidus and frontal cortex. Considerable effort was engaged to obtain animal care approval for two more projects, one of which will explore GLYX-13 in the frontal cortex and represent the second half of Antigone's thesis work. The other represents an exciting collaborative project with Dr. Lisa Ellerby from the Buck Institute of California with a dual hybrid mouse mutant that includes both Huntington's disease related mutations and a knock-out of a key gene called Synapsin I which is involved in neurotransmitter release control. Antigone also completed her Thesis proposal defense. (NSC800): **Naveen Jayaprakash** establishes and engages recording from subventricular stem cells using a protocol involving testing with glutamate antagonists, tetrodotoxin, and GABA stimulation and begins establishing neuron populations converted

from fibroblasts for the second half of the NSC800 project. Directed Research (PSY496): **Aaron Antcliff** worked on the younger rat GLYX-13 project. Lab volunteers included John Wickwire, Becky Koepke, Erin Delany, Megan Altemus, Nicole Masty, Stacy Coon, Robert Haney, Ben Brodie, Courtney Hughes, Julius Cantuba, and Francesca Picotte. **Jessica Matchynski** completed her Dissertation proposal meeting.

Fall'11

Neuroscience Graduate Research (NSC696): **Antigone Wolfran-Aduan** continues projects using microdialysis to explore Huntington's disease in the globus pallidus and frontal cortex. (NSC800): **Naveen Jayaprakash** establishes the optogenetic technique with stem cells obtained from the subventricular zone and also begins recording. Directed Research (PSY496): **Zachary Semaan** worked on the older rat GLYX-13 project. **Justin Gilardone** worked with Naveen on developing the optogenetics technique. Lab volunteers included Aaron Antcliff, John Wickwire, Becky Koepke, Erin Delany, Megan Altemus, and Nicole Masty. NSC800: **Jessica Matchynski** finished her 800 qualifier which was a meta-analysis of different Alzheimer's models in terms of behavioral testing.

Spring'11

Neuroscience Graduate Research (NSC696): **Antigone Wolfran-Aduan** began two projects exploring Huntington's model animals with rats (GLYX-13 and globus pallidus neurotransmission) and mice (glutamate transport blocker and frontal cortex neurotransmission). (NSC800): **Naveen Jayaprakash** began research investigating neuronal activity in-vitro and optogenetic control of neuron activity as a lead-up to research investigating induced pluripotent stem cell activity. Naveen also finished his Neuroscience Thesis (NSC799) entitled: *Monoamine and amino-acid transmitter release capacity from the knock-in transgenic mouse model of Huntington's Disease*. Directed Research (PSY496): **Jennifer Knirk** worked on the older rat GLYX-13 project, a part of work slated to be presented at this year's upcoming Society for Neuroscience meetings and was presented at the Michigan Society for Neuroscience meeting in May 2011.

Fall '10

Neuroscience Graduate Research (NSC696): **Antigone Wolfram-Aduan** began skill learning in my lab. Directed research (PSY496): **Mike Lowe** and **Kara Jacobitz** worked on the continuation of Naveen Jayaprakash's thesis and Sally Steffes-Lovdahl's dissertation which needed more homozygote representation and the monoamine oxidase activity assays. **Mike Lowe** accomplished the requirements and Kara experienced problems with her tonsils that translated into extensive absences so she received an incomplete to be finished in Spring. Honors Thesis research (HON499): **Jack Burdick** accomplished the large majority of his lab participation in the Spring but scheduled HON499 for this semester to fit it in and still needs to finish his Honors thesis but this seems to be moving smoothly. **Sally Steffes-Lovdahl** defended her dissertation in December entitled *Early stage Huntington's disease exploration with a novel reversed contingency operant task using the knock-in^{CAG(150)} mouse model: No evidence of genotype differences in assessment of early operant learning and task-driven neurotransmitter release prior to motor deficits*. **Naveen Jayaprakash** is working toward a similar goal with his thesis which he defended in June 2010. Neuroscience Theses committee member (NSC799): **Steven Lowrance** completed and passed his Master's orals with a thesis entitled: *The treatment efficacy of KRX-0501 in the mu-p75 saporin mouse model of Alzheimer's disease*. **Kyle Fink** completed and passed his Master's orals with a thesis entitled: *Detection of early cognitive dysfunction in a transgenic rat model of Huntington's disease using an operant conditioning paradigm*.

- Spring '10** Directed research (PSY496): **Becky Koepke** and **Jonathan Wickwire** are working on aspects of Sally Steffes' dissertation and generally helping with both Sally and Naveen. This project involves the use of knock-in 150-repeat mouse model of Huntington's disease with operant-related microdialysis and stand-alone chemically stimulated microdialysis respectively. Naveen Jayaprakash & Sally Steffes are working on thesis and dissertation data collection respectively and Mark Harju is continuing to learn the ropes in NSC696, graduate directed research. Master's Thesis committee member for **Jessica Matchynski** who completed and passed her Master's orals with a thesis entitled: *A Combination of antioxidants from tart cherries and essential fatty acids as treatment for Alzheimer's disease in a saporin-injected mouse model*. **Steven Lowrance's** thesis is being revised and his oral defense has yet to be scheduled. **Kyle Fink's** thesis proposal completed.
- Fall '09** Honor's Thesis Research (HON499): **Jacob Raak** completed his final paper this semester. **Naveen Jayaprakash** began working on Thesis (NSC798) proposal. **Mark Harju** continued with NSC696. **Sally Steffes** began work on her Dissertation (NSC898). Naveen & Sally both produced workable proposals at the end of this semester.
- Summer '09** (PSY496): **Kiara Gholston** worked on a project to investigate procedures for training mice to perform spontaneous alternation behaviors in an operant chamber. Doctoral Qualifying defense (NSC800): **Sally Steffes** completed work on a project comparing Huntington's disease mice with wild-type for monoamine neurotransmitter release during operant behavior. Graduate Research (NSC696) with Naveen Jayaprakash and Mark Harju.
- Spring 2009** Honor's Thesis Research (HON499): **Michael Lupo** completed his final paper for the project initiated the previous Spring. Graduate Research (NSC696) with Kyle Fink and Naveen Jayaprakash. Master's Thesis committee of **Jessica Matchynski** and **Steven Lowrance**. Proposal defense went smoothly. Thesis research initiated.
- Fall 2008** Directed research (PSY496): **Timothy Mucha**: cognitive behavioral control exploration of the R6/2 transgenic mouse; (HON499): **Audrey Carrasco**: Contributions of basal ganglia monoamines to behavioral flexibility in a mouse model of Huntington's disease; Master's Thesis (PSY798): **Sally Steffes**: Thesis Title -- *In-Vivo Assessment of Endogenous Behavior-Related Alterations in Monoamine Concentrations in the R6/2 Huntington's Disease Mouse Model During Cognitively Loaded Operant Tasks Requiring Strategy Shifting* – also started NSC800 research as part of doctoral qualifier that became a poster at this year's Society for Neuroscience Meeting; Graduate Research (PSY696): Kyle Fink, and (NSC696): Naveen Jayaprakash.
- Summer '08** Directed research (PSY496): **Jonathan Lee**: Aided with Sally Steffes' thesis work in final stages; Master's Thesis Research (PSY798): **Sally Steffes** continuing work initiated in Fall 2007.
- Spring 2008** Directed research (PSY496): **Kevin Storai**: neurochemical control during operant learning in a mouse model of Huntington's disease; Research methods (PSY385): **Matthew Combs**: neurochemical control during operant learning in a mouse model of Huntington's disease; Honor's Thesis Research (HON499): **Michael Lupo**: operant learning distinctions in a mouse model of Huntington's disease emphasizing repetitive versus varying response pattern contingencies; Master's Thesis Research (PSY798) **Sally Steffes**: initiating thesis project involving measuring neurotransmitter changes during operant learning in a mouse model of Huntington's disease.

- Fall 2007** Directed research (PSY496): **Shaina Kraynak**: transgenic Huntington's model mouse auditory stimulation comparing YAC128 and R6/2 strains with microdialysis; **Matthew Combs**: skill learning assessment as part of mouse microdialysis projects throughout the semester. Honor's Thesis research (HON499): **Suzanne Palmer**: transgenic Huntington's model mouse olfactory stimulation comparing YAC128 and R6/2 strains with microdialysis; Graduate research (PSY696): **Sally Steffes**: initiating research with microdialysis during operant behavior challenge with Huntington's model mice; Master's Thesis Defense Committee: **Rebecca Myers**: Thesis Title: *The use of the substituted pyrimidine, KP544, for the treatment of cognitive and motor impairments in the 3-nitropropionic acid mouse model of Huntington's disease*. Successful defense October 2007 resulting in Master's degree from Experimental Psychology.
- Spring 2007** Directed research (PSY496): **Christa Cooper**: transgenic Huntington's model mouse prepulse inhibition, **Elizabeth Elam**: transgenic Huntington's model mouse open field behavior with white-noise context, **Anthony Larder**: transgenic Huntington's model mouse amygdala microdialysis during startle sound exposure, **Jewel Askew**: transgenic Huntington's model mouse striatum microdialysis during startle sound exposure.
- Fall 2006** Graduate research (PSY696): **Sally Steffes** (Master of Science graduate student, Experimental Psychology). Undergraduate research (PSY385) **Melissa DeLafe**: Project involves working with transgenic mice and exploring the differential neurochemical correlates of pre-pulse inhibition associated with acoustic startle responses between Huntington's model mice and wild-type littermates.
- 2005-2006** Graduate research (PSY696): **Andrea Goffus** (Master of Science graduate student). Started Summer 2005 in lab and Fall 2005 as a graduate student. Transferred out of CMU after Spring 2006
- Summer '06** **Masters Thesis Committee for Nicholas Dey**: The effects of oral administration of the substituted pyrimidine KP544 in a transgenic mouse model of Huntington's disease. Successful defense June 2006 resulting in Master's Degree from Experimental Psychology.
- 2005** Directed research (PSY496) project. **Collin Devos**. Project involves microdialysis from both wild-type and Huntington's disease gene expressing transgenic mice to measure glutamate and GABA neurotransmitter responses to ambient light changes during the nocturnal phase.
- 2005** Honors Thesis (HON499) project: **Lindsey Vogl**. Project involved microdialysis from juvenile rats following early administration of the dopamine neurotoxin 6-hydroxydopamine and measuring a D2-like dopamine antagonist-induced increase in both glutamate and GABA using microdialysis.
- 2004-2005** **Masters Thesis Committee for Jacob McClean**: The Effects of the Substituted Pyrimidine KP544 in the 3-Nitropropionic Acid Rat Model of Huntington's Disease. Successful defense September 2004 resulting in Master's Degree from Experimental Psychology.
- 2004-2005** Directed research (PSY496) project: **Amanda Ferris**. Project involved microdialysis measurements of glutamate and GABA amino acid neurotransmitters from wild type and Huntington's gene expressing transgenic mice. Project culminated in a poster presentation at the SRCEE.

- 2004-2005** Directed research (PSY496) project: **Zachary Gustavison**. Project involved investigation of the early effects of antisense oligonucleotide blockade of neurotrophic factors on expression soon after dopamine depleting lesions using immunohistochemical staining. Project culminated in a poster presentation at the SRCEE.
- 2004-2005** Directed research (PSY496) & applied experimental methods (PSY385) projects: **Joshua Fuller**. Project involves mastery of scientific skills directed toward neurobehavioral experimentation in an age-dependent plasticity investigation. Skills include surgeries, microdialysis, sensorimotor testing, histology, and chemical analysis. Applied project investigated expression of neurotrophic factors in adult rats that had received dopamine depleting lesions as weanlings. Project culminated in a poster presentation at SRCEE.
- 2004-2005** Applied experimental methods (PSY385) project: **Megan Strawsine**. Project involves exploration of adult animals that had been depleted of dopamine as weanlings (juveniles) and the nature of trophic factors that may contribute to their relative lack of Parkinsonian motoric deficits Skills include surgeries, microdialysis, sensorimotor testing, histology, and chemical analysis. Project culminated in a research paper and a poster presentation at the Student Research and Creative Endeavors Exhibition (SRCEE).

Other Institutions

- 1999-2001** Honors Thesis project: **Jason Bailey**. Project involves microdialysis used to measure the interaction between the excitatory neurotransmitter l-glutamate and l-ascorbate within the rat neostriatum. Thesis: *Increase of extracellular glutamate due to ascorbate infusion in the rat striatum*. Completed May 2001. Indiana University
- 1998-1999** Honors Thesis project: **Mark Peters**. Project involved microdialysis used to measure the interaction between the excitatory neurotransmitter l-glutamate and l-ascorbate within the rat neostriatum. Thesis: *The effects of ascorbate on extracellular glutamate concentrations in the neostriatum of freely moving rats*. Completed December 1999. Indiana University

OTHER SCHOLARLY/EDUCATION INITIATIVES

Becoming a Member of the Neuroscience Council

A part of University reorganization included the establishment of a leadership body to govern the Neuroscience Program. This Council consists of the Chair, one member from the newly-named CLASS college, one from CHP, one from CST, and one from CMED. I was voted on as the member from CLASS at the end of Spring semester 2018. Thus far we have had several productive organizational meetings regarding Bylaws and curriculum. This council was formulated after the Spring semester included two ad-hoc committees that I also served on: 1. Bylaws subcommittee; 2. Curriculum subcommittee.

Formulating A Field Test for Neuroscience

The initial version of the field test for Neuroscience was formulated and tested on our undergraduate population at the end of Spring semester 2017 based on questions I formulated or adapted.

Serving on Faculty Senate covering Interim Period for Faculty on Sabbatical

When the regular Psychology representative for Faculty senate (Brian Gibson) went on sabbatical, I stepped in to cover this during Spring 2017 (between January and May 2017). During this period, I helped maintain the interests of the Psychology Department at the Faculty Senate.

Interim Senator for Psychology for Fall 2017

Served on faculty senate for one semester, Fall 2017, during the infamous vote on adding more diversity courses to the General Education roster.

Achieving Undergraduate Neuroscience Program of the Year

In November, 2013, our Undergraduate Neuroscience Program was voted the Program of the Year by the Society for Neuroscience Committee on Neuroscience Departments and Programs. This recognition award was presented at the 2013 Society for Neuroscience Annual Meeting and Gary Dunbar accepted this award as our current Director. Having been involved in this program during the period evaluated filled me with pride along with the students in attendance.

Neuroscience Program Co-Directorship

Between Summer II 2009 and Fall 2012 I co-directed the Neuroscience Undergraduate and Graduate programs. Initially with Dr. John Kelty from biology who provided minimal support. In Fall 2010 Dr. Kelty resigned, and Dr. Gary Dunbar took up co-directorship through the 2011 academic year. At the beginning of Fall 2012, I was given a reprieve to focus on research and bolster grant writing and the duty of Neuroscience Program directorship was reverted to Gary Dunbar, though I continue to aid in administrative efforts to the extent I am needed. During 2013 academic year I helped with the Program Review.

Michigan Chapter Society for Neuroscience Annual Meeting at CMU in 2010

We held the first CMU-based MISfN annual meeting in 2010 while I was President of the organization working on various aspects of making this possible. Gary Dunbar and I put forth a concerted effort to obtain an attractive guest speaker for the event. I've been helping with efforts headed up by Jessica Matchynski to organize the particulars. The meeting was a great success.

