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Curriculum Vitae
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EDUCATION AND TRAINING

1997-2001 **B.A. in Neurobiology**, New College of the University of South Florida, Sarasota, FL (This university emphasized self guided learning over grades, hence my GPA = 0)

2001-2007 **Ph.D. Neuroscience**, Washington University, St. Louis, MO
Division of Biology and Biomedical Sciences, Department of Anatomy & Neurobiology. Dr. Rachel O.L. Wong, advisor

2007-2010 **Postdoctoral Fellow,** University of Washington, Seattle,
Dept. Biological Structure, Investigating development of bipolar cell to retinal ganglion cell connectivity with Dr Rachel O.L. Wong

2010-2011 **Postdoctoral Fellow,** Harvard Medical School, Boston MA
Dept. Neurobiology, Reconstructing mouse lateral geniculate nucleus using electron microscopy with Jeff Lichtman and Clay Reid

2011- **Postdoctoral Fellow,** Harvard, Cambridge MA
Molecular and Cellular Biology / Center for Brain Science, Reconstructing mouse lateral geniculate nucleus using electron microscopy with Jeff Lichtman

TEACHING AND RESEARCH POSITIONS

1999 **Curatorial Assistant,** Allen Museum of Entomology

2000-2001 **Research Assistant**, New College of the University of South Florida, Recorded telencephalic visual responses in fish with Leo Demsky

2002 **Teaching Assistant**, Neurophysiology Lab, Washington University

2003 **Teaching Assistant**, Neurobiology summer course at Woods Hole Marine Biological Laboratory

HONORS AND FELLOWSHIPS

2007 **The Spencer T. and Ann W. Olin Fellow** Awarded to one graduate each year within the Division of Biology and Biomedical Science for excellence in biomedical research.

2008 **Vision Training Grant** NEI-UW. Stipend support for postdoctoral researcher within the department of Biological Structure.

2009 **Fundamentals of Neurobiology Training Grant** NIH-Harvard Medical

School. Stipend support for postdoctoral research within the department of Neurobiology

2015 - **Conte Center Award,** Postdoctoral research funding from the NIMH Silvio Conte Center grant - Imprinting a connectome: developmental circuit approach to mental illness

2015 **Conte Center Award for Outstanding Outreach & Community Building** Awarded for teaching and mentoring highschool students through the Conte Center's community outreach program

PRIMARY RESEARCH ACCOMPLISHMENTS

- In order to understand the how neurons remodel their synaptic connectivity during development, I used three dimensional optical imaging techniques to track the development of neural circuits in the retina. I found that some properties of the circuit, namely the alignment of visual maps in the inner and outer retina (Morgan 2006, *Nat. Neuro*.) and the Gaussian shape of receptive fields (Morgan 2008, *Neural Dev*.), emerged early in development, apparently as a consequence of the geometry of the tissue. Other circuit properties, such as the number of synapses formed between pairs of cells, depended on activity dependent synaptic remodeling (Kerschensteiner 2009, *Nature*). In particular, early in development, two types of bipolar cells formed synapses on the same type of retinal ganglion cell at the same rate. This balance was then upset by an activity dependent enhancement of the connectivity of one, but not the other, bipolar cell type (Morgan 2011, *Neuron*).
- In order to map the synaptic connectivity of thousands of neurons in the same piece of tissue, I helped develop high throughput electron microscopy imaging techniques. This work included improving protocols for tissue staining, sectioning and imaging, helping to write the software that made automated imaging possible and writing code for the analysis of connectivity patterns (Morgan and Hayworth, 2014, *Frontiers in Neural Circuits;* Kasthuri 2015, *Cell*). I then used these techniques to produce a serial section electron microscopy image volume of unprecedented size (100 trillion voxels)(submitted).
- In order to understand how axons coordinate their innervation of target cells, I mapped the synaptic organization of a large EM volume of mouse visual thalamus (submitted). Contrary to the view that visual information is simply relayed through the thalamus, I found that retinal inputs generated complex networks in which different kinds of retinal axons converged on the same target cells. I also found that same retinal axons produced different synaptic motifs depending on which target cell they were innervating. Finally, I found that sets of axons generated the same input pattern on the dendrites of multiple target cells by forming local fascicles that hopped from one dendrite to the next.

PUBLICATIONS

Martin VV, Beirlein M, **Morgan JL**, Rothe A, Gee KR. (2004) Novel fluo-4 analogs for fluorescent calcium measurements. *Cell Calcium.* 36: 509-14.

Morgan J, Wong R. (2004) Single dendrite seeks stable relationship. *Nat Neurosci.* 7: 205-6.

Lohmann C, Mumm J, **Morgan J**, Godinho L, Schroeter E, Stacy R, Wong WT, Oakley D, Wong ROL. (2005) Live Imaging of the developing retina. In: Yuste R, Konnerth A, editors. Imaging In Neuroscience and Development 171-184

Lohmann C, Demas J, **Morgan JL**, Wong ROL, (2005) A Practical Guide to: Calcium Imaging of the Retina. In: Yuste R, Konnerth A, editors. *Imaging In Neuroscience and Development Cold* 283-288

Mumm JS, Godinho L, **Morgan JL**, Oakley DM, Schroeter EH, Wong RO. (2005) Laminar circuit formation in the vertebrate retina. *Prog. Brain Res.* 147: 155-69

Morgan J, Huckfeldt R, Wong ROL. (2005) Imaging techniques in retinal research. *Experimental Eye Research* 80: 297-306

Morgan JL, Dhingra A, Vardi N, Wong RO. (2006) Axons and dendrites originate from neuroepithelial-like processes of retinal bipolar cells. *Nat. Neurosci*. 9: 85-92 *(Highlighted by Faculty 1000)*

Morgan JL, Wong RO. (2008) Ballistic labeling with fluorescent dyes and indicators. *Curr Protoc Neurosci.* Chapter 2: Unit 2.11.

Morgan JL, Schubert T, Wong RO. (2008) Developmental patterning of glutamatergic synapses onto retinal ganglion cells. *Neural Develop*, 3:8 *(Highlighted by J. Bio.)*

Huckfeldt R.M, Schubert T.*, **Morgan J.L**.*, Godinho L. Di Cristo G, Huang J.Z. and Wong R.O.L (2008) Transient neuronal processes regulate spatial distribution of a class of retinal interneuron *Nature Neuroscience* 12, 35-43

Kerschensteiner D., **Morgan J.L**., Parker E.D., Lewis R.M., Wong R.O.L (2009) Neurotransmission selectively regulates synapse formation in parallel circuits in vivo. *Nature* 460: 1016-20.

Williams PR, **Morgan JL**, Kerschensteiner D, Wong ROL, (2011) Live imaging of developing retinal circuits. In: Sharpe J., Wong R., Yuste R., *Imaging in Developmental Biology: A Laboratory Manual*, (Cold Spring Harbor Laboratory Press)

Morgan JL, Kerschensteiner D, (2011) Balistic labeling of developing retinaln. In: Sharpe J., Wong R., Yuste R., *Imaging in Developmental Biology: A Laboratory Manual*, (Cold Spring Harbor Laboratory Press) pp. 177-199.

Morgan J.L., Soto F., Wong R.O.L., Kerschensteiner D., (2011) Development of cell type-specific connectivity patterns of converging excitatory axons in the retina. *Neuron* 71: 1014-21

Schwartz GW, Okawa H, Dunn FA, **Morgan JL,** Kerschensteiner D, Wong RO, Rieke F., (2012) The spatial structure of a nonlinear receptive field. *Nat. Neurosci*. 15: 1572-80

Morgan JL, Lichtman JL., (2013) Why not connectomics? *Nature Methods* 10: 494-500

Morgan JL*, Hayworth KJ*, Schalek R, Berger DR, Hildebrand DG, Lichtman JW. (2014) Imaging ATUM ultrathin section libraries with WaferMapper: a multi-scale approach to EM reconstruction of neural circuits. *Front Neural Circuits*. 8:68.

Kasthuri N, Hayworth KJ, Berger DR, Schalek RL, Conchello JA, Knowles-Barley S, Lee D, Vázquez-Reina A, Kaynig V, Jones TR, Roberts M, **Morgan JL**, Tapia JC, Seung HS, Roncal WG, Vogelstein JT, Burns R, Sussman DL, Priebe CE, Pfister H, Lichtman JW., (2015) Saturated reconstruction of a volume of neocortex. *Cell* 162: 648-61

Morgan, JL and Lichtman, JW (in press) Digital tissue. In *Cellular Connectomics: Reconstruction of complete neural wiring diagrams.* Editors: Brigmann, K and Helmstaedter, M., Elsevier Press.

Morgan, JL., Berger D.B., Wetzel A.W., Lichtman J.W. (Submitted to Cell) The fuzzy logic of network connectivity in mouse visual thalamus.