Jason M Samonds

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OBJECTIVE

My motivation as a neuroscientist is to understand how cortical networks within and between early visual areas learn scene statistics and perform statistical inference functions such as complex and invariant pattern recognition, scene segmentation, and stereo correspondence and how these deficits in these functions arise in conditions such as autism spectrum disorder.

CAREER EXPERIENCE

Postdoctoral Research Associate
University of Texas at Austin, Center for Learning and Memory
May 2022 – present (independent PI status)

I am working on two independent projects with grant proposals currently under review with the NIH and DOD for funding. The first project is a collaboration with Aaron McGee's laboratory in Louisville to look at the development of binocular depth discrimination in mice using behavioral measurements, two-photon imaging, and DREADDs experiments. The second project is looking at deficits in binocular vision in a mouse autism/Fragile-X model (FMR1 KO) using behavioral measurements, two-photon imaging, and optogenetic experiments.

Postdoctoral Research Associate
University of Texas at Austin, Center for Learning and Memory
June 2015 – present (supervisor: Nicholas Priebe, PhD)

I am studying the neurophysiological mechanisms and behavior of stereopsis in the mouse visual system. I am using electrophysiological, two photon and intrinsic optical imaging, and optogenetic methods in acute and awake, behaving preparations to examine neuronal circuits in the visual cortex. I am also studying eye movement statistics in mice, marmosets, and humans (collaboration with Guillaume Masson's laboratory in Marseille, France). I mentor and supervise other post-docs, graduate students, undergraduate students, and research technicians.

Grant Support:	
HFSP 2015	A unified approach for studying adaptation in sensory cortices (Nicholas Priebe, Adrienne Fairhall, Ilan Lampl, Israel Nelken)
U01 NS094330	Neural ensembles underlying natural tracking behavior (Nicholas Priebe, Ila Fiete, Alexander Huk)
NEI R01 EY019288	Cortical integration of binocular input (Nicholas Priebe)
NEI R01 EY025102	CRCNS: The balance of excitation and inhibition in sensory cortex (Nicholas Priebe)
Teaching:	NEU 330 Neural System I, Vision I and II lectures
	NEU 394P Career Development for Neuroscientists, Postdocs lecture

Postdoctoral Research Associate
Carnegie Mellon University, Center for the Neural Basis of Cognition
January 2005 – May 2015 (supervisor: Tai Sing Lee, PhD)

My primary research goal was to test hypotheses about potential neurophysiological mechanisms of statistical inference among networks of V1 and V2 neurons. I used chronically implanted 100-electrode silicon arrays and the 32-electrode Gray Matter microdrive chamber system that allowed me to record from populations of neurons in areas V1 through V4 in awake, behaving macaques over a period of years. I mentored and supervised other post-docs, graduate students, and undergraduate students majoring in computer science, engineering, and neuroscience.

Grant Support:

NIMH IBSC MH64445	(James L McClelland) Interactive processes in perception (Tai Sing Lee & Carl Olson)
NSF CISE IIS-0413211	Statistical and neural basis of 3D surface inference in vision (Tai Sing Lee)
NSF CISE IIS-0713206	Computational & Neurophysiological Investigation of Robust Visual Inference (Tai Sing Lee)
NEI F32 EY017770	**Spatial Integration of V1 Horizontal Disparity Signals (Jason Samonds)**
AFOSR FA9550-09-1-0678	Multi-cue surface representation (Tai Sing Lee & Christopher Tyler)
NEI R01 EY022247	Hierarchical visual concepts in computer and biological vision (Tai Sing Lee & Alan Yuille)

Teaching: Computational Neuroscience of Vision, Binocular Vision lecture

Research Assistant
Vanderbilt University, Department of Biomedical Engineering
May 1999 – May 2004 (supervisor: AB Bonds, PhD)

My thesis proposal was to examine the dynamics of spatiotemporal properties of the spiking responses of populations of neurons in the primary visual cortex. I implemented, designed, and maintained stimuli, data collection, and data analysis systems on PC, Sun Microsystems, and custom hardware. I developed and implemented a broad range of neural signal processing tools with an emphasis on probabilistic signal processing. I implemented and maintained 100- and 25-electrode Bionics Technologies microelectrode arrays for large scale multi-unit recordings. I helped with the successful formulation and submission of an NIH grant (NEI RO1 EY014680).

Grant Support:

NEI RO1 EY03778	Spatial Characteristics of Cells in the Striate Cortex (AB Bonds)
NEI RO1 EY014680	Representation of Visual Information in Striate Cortex (AB Bonds)

Research Technician
Medical College of Wisconsin, Functional Imaging Research Center
May 1998-May 1999 (supervisor: Thomas E Prieto, PhD)

I designed mechanical and electrical subject interface systems, and maintained these systems, for functional magnetic resonance imaging studies. My projects included audio and visual stimuli, feedback and response systems, and head restraint.

Grant Support:

NIH P01 MH51358	(James S Hyde) Subject Interface Systems (Thomas E Prieto)

EDUCATION

Vanderbilt University, Nashville TN

Doctor of Philosophy in Biomedical Engineering, May 2004
Vanderbilt University, Nashville TN
Spatiotemporal analysis of synchronization of neural ensembles for spatial discriminations in cat striate cortex. *Vanderbilt University PhD Dissertation*, 2004.

Master of Science in Biomedical Engineering, May 2002
Vanderbilt University, Nashville TN
Spike train analysis of spatial discriminations and functional connectivity of pairs of neurons in cat striate cortex. *Vanderbilt University MS Thesis*, 2002.

Curriculum: Real-time Systems, Bioelectrical Signals, DSP, Artificial Intelligence, Neural Networks, Morphological Image Processing, Medical Imaging, Excitable Membranes, Visual System.
Workshops: *NIPS* Spike Train Analysis, UC-Berkeley BioMEMS

Research Assistantship, Academic Scholarship, Graduate School Travel Awards, Student Paper Award

Milwaukee School of Engineering, Milwaukee WI

Bachelor of Science in Biomedical Engineering, May 1999
Senior Design: Heart Sound Simulator, Design Team Associate Project Manager

Curriculum: Instrumentation, Imaging, Signals, Control Systems, Thermo/Fluids, Biomedical Design, Biomaterials.

Workshops: MCW fMRI Experiment Design & Issues

Alumni Association Student Achievement Award
M.S.O.E., Walton Foundation, and Pearl Noren Scholarships

PUBLICATIONS

Peer-reviewed Articles:

Samonds JM, Szinte M, Barr C, Montagnini A, Masson GS, Priebe NJ. Mammals employ distinct saccadic behaviors to achieve common neural coverage of natural scenes. (under revision)

Boone HC*, Samonds JM*, Crouse E, Barr C, Priebe NJ, McGee AW. Natural binocular depth discrimination behavior in mice explained by visual cortical activity. *Curr Biol* 31:2191-2198, 2021.

Samonds JM, Choi V, Priebe NJ. Mice discriminate stereoscopic surfaces without fixating in depth. *J Neurosci* 39(41):8024-8037, 2019.
***Hot Topic SFN 2019**

Samonds JM, Lieberman S, Priebe NJ. Motion discrimination and the motion aftereffect in mouse vision. *eNeuro* 5(6) e0065-18.2018 1–12, 2018.

Samonds JM, Geisler WS, Priebe NJ. Natural image and receptive field statistics predict saccade sizes. *Nature Neurosci* 21:1591–1599, 2018.
***Recommended by the Faculty of 1000 Prime**

Samonds JM, Lee TS, Kuhlmann S. Non-uniform surround modulation enhances orientation tuning for neurons in mouse primary visual cortex. *J Neurophysiol* 118(6):3282-3292, 2017.

Samonds JM, Tyler CW, Lee TS. Evidence of stereoscopic surface disambiguation in the responses of V1 neurons. *Cereb Cortex* 27(3):2260-2275, 2017.

Zhang Y, Li X, Samonds JM, Poole B, Lee TS. Relating functional connectivity in V1 neural circuits and 3D natural scenes using Boltzmann machines. *Vision Res* 120:121-131, 2016.

Samonds JM, Potetz BR, Lee TS. Sample skewness as a statistical measurement of neuronal tuning sharpness. *Neural Comp* 26(5):860-906, 2014.

Samonds JM, Potetz BR, Tyler CW, Lee TS. Recurrent connectivity can account for the dynamics of disparity processing in V1. *J Neurosci* 33(7):2934-294, 2013.
***Reviewed by Read J, Allenmark F. Visual perception: one world from two eyes. *Curr Biol* 23(11):R483-R486, 2013.**

Samonds JM, Potetz BR, Lee TS. Relative luminance and binocular disparity preferences are correlated in macaque V1, matching natural scene statistics. *Proc Nat Acad Sci USA* 109(16):6313-6318, 2012.

Samonds JM, Potetz BR, Lee TS. Cooperative and competitive interactions facilitate stereo computations in macaque primary visual cortex. *J Neurosci* 29(50):15780-15795, 2009.

Samonds JM, Potetz BR, Lee TS. Neurophysiological Evidence of Cooperative Mechanisms for Stereo Computation. *Advances in Neural Information Processing Systems* 19, MIT Press, 2007.

Samonds JM, Zhou Z, Bernard MR, Bonds AB. Synchronous activity in cat visual cortex encodes collinear and cocircular contours. *J Neurophysiol* 95(4):2602-2616, 2006.
***Reviewed by the Faculty of 1000**

Samonds JM, Bonds AB. Gamma oscillation maintains stimulus structure-dependent synchronization in cat visual cortex. *J Neurophysiol* 93(1):223-236, 2005.

Samonds JM, Bonds AB. Real-time visualization of neural synchrony for identifying coordinated cell assemblies. *J Neurosci Meth* 139(1):51-60, 2004.

Samonds JM, Bonds AB. From another angle: Differences in cortical coding between fine and coarse discrimination of orientation. *J Neurophysiol* 91(3):1193-1202, 2004.

Samonds JM, Allison JD, Brown HA, Bonds AB. Cooperative synchronized assemblies enhance orientation discrimination. *Proc Nat Acad Sci USA* 101(17):6722-6727, 2004.

Samonds JM, Allison JD, Brown HA, Bonds AB. Cooperation between Area 17 neuron pairs enhances fine discrimination of orientation. *J Neurosci* 23(6):2416-2425, 2003.
***Reviewed by the Faculty of 1000**

Brown HA, Allison JD, Samonds JM, Bonds AB. Nonlocal origin of response suppression outside of the classical receptive field in Area 17 of the cat. *Vis Neurosci* 20(1):85-96, 2003.

Reviews and Commentary:

Kelly RC, Smith MA, Samonds JM, Kohn A, Bonds AB, Movshon JA, Lee TS. Comparison of recordings from microelectrode arrays and single electrodes in visual cortex. J Neurosci 27(2):261-264, 2007.

Samonds JM. Feature configuration modulates effective connectivity. J Neurosci 26(14):3621-3623, 2006.

Samonds JM and Bonds AB. Cooperative and temporally structured information in the visual cortex. Signal Processing, 85(11):2124-2136, 2005.

Book Chapters:

Samonds JM, Priebe NJ. The Primary Visual Cortex. In *The Senses: A Comprehensive Reference, second edition*, Ed. Bernd Fritzsch, Elsevier, 2020.

Samonds JM, Lee TS. Neuronal interactions and their role in solving the stereo correspondence problem, In *Vision in 3D Environments*, Ed. Laurence Harris, Michael Jenkin, Cambridge University Press, 2011.

Lee TS, Stepleton T, Potetz B, Samonds JM. Neural coding of scene statistics for surface and object inference, In *Object Categorization: perspectives from human and machine vision*, Ed. Sven Dickinson, Ales Leonardis, Bernt Schiele, Michael Tarr, Cambridge University Press, 2008.

Invited Talks:

Stereoscopic Vision in Mice: From the Eyes to Neurons to Behavior. *Winter Conference on Brain Research*. Snowmass, CO, February, 2 2022.

Stereoscopic Vision in Mice: From the Eyes to Neurons to Behavior. *Brain & Behavior Institute*. University of Maryland. (Zoom) October 9, 2020.

Mice discriminate stereoscopic surfaces without fixating in depth. *The Institute for Neuroscience*. The Retreat at Balcones Springs. Marble Falls, TX, September 14, 2019.

Natural image and receptive field statistics predict saccade sizes. *Workshop on Natural Environments Tasks and Intelligence*. University of Texas at Austin. Austin, TX, April 26, 2019.

The impact of eye movements on mouse vision. *Department of Neuroscience*. University of Texas at Austin. Austin, TX, November 12, 2018.

Scene statistics represented in V1 recurrent networks help to infer binocular disparity. *Center for Perceptual Systems*. University of Texas at Austin. Austin, TX, February 9, 2015.

Scene statistics represented in V1 recurrent networks help to infer binocular disparity. *Department of Neuroscience*. Yale School of Medicine. New Haven, CT, February 8, 2013.

Representations of scene statistics in the primary visual cortex for inferring binocular disparity. *Brain Corporation*. La Jolla, CA November 1, 2011.

Evidence of cooperative and competitive mechanisms for stereo computation in macaque V1. Workshop: What role does spike synchrony or correlation play in sensory processing? Cosyne, The Canyons, Utah. February 26-27, 2007.

Neuronal Ensemble Recording in the Cat Primary Visual Cortex. *Dept. of Anatomy and Neurobiology*, Washington University School of Medicine, Saint Louis, MO. July 29, 2004.

Neuronal Ensemble Recording in the Cat Primary Visual Cortex. *Center for the Neural Basis of Cognition*. Carnegie Mellon University. Pittsburgh, PA. July 23, 2004.

Neuronal Ensemble Recording in the Cat Primary Visual Cortex. *Department of Molecular and Cell Biology,* University of California at Berkeley, Berkeley, CA. June 21, 2004.

Spatiotemporal analysis of synchronization of neural ensembles for spatial discriminations in cat striate cortex. *Sloan-Swartz Center*, Salk Institute for Biological Studies. La Jolla, CA. April 26, 2004.

Workshops Organized:

Samonds JM, Smith MA. What role does spike synchrony or correlation play in sensory processing? *Cosyne, The Canyons, Utah.* February 26-27, 2007

Presentations:

Samonds JM, Barr C, Poekler-Wells S, Boone HC, McGee AW, Priebe NJ. Can the mouse be used as a model system for strabismus? [Soc Neurosci abstr], 2022.

Samonds JM, Barr C, Boone HC, McGee AW, Priebe NJ. FMR1 KO mice exhibit deficits in behavior, eye alignment, and cortical activity during stereoscopic depth discrimination compared to wild type mice. [FENS abstr], 2022.

Samonds JM, Szinte M, Barr C, Montagnini A, Masson G, Priebe NJ. Dynamic visual processing coverage predicts observed differences in natural oculomotor behavior across mammals. [Soc Neurosci abstr], 2021.

Samonds JM, Choi V, Priebe NJ. Mice discriminate stereoscopic surfaces without fixating in depth. [Soc Neurosci abstr], 2019.
***Hot Topic SFN 2019**

Samonds JM, Lieberman S, Priebe NJ. Motion discrimination and the motion aftereffect in mouse vision. [Soc Neurosci abstr], 2018.

Samonds JM, Choi V, Priebe NJ. Binocular alignment in mice during stereoscopic discrimination of depth. [Soc Neurosci abstr], 2017.

Samonds JM, Geilser WS, Priebe NJ. Natural image and receptive field statistics predict saccade sizes. Gordon Research Conference on Eye Movements, 2017.

Samonds JM, Priebe NJ. Natural saccadic eye movements of the awake, running mouse. [Soc Neurosci abstr], 2016.

Huang G, Ramachandran S, Samonds JM, Lee TS, Olson CR. Contextual modulation is responsible for image familiarity effect in V1 and V2 neurons. [Soc Neurosci abstr], 2016

Samonds JM, Choi V, Priebe NJ. Binocular alignment in mice during stereoscopic discrimination of depth. [VSS abstr], 2016.

Choi V, Joo S, Samonds JM, Huk AC, Priebe NJ. Binocular integration in mouse using stereoscopic cues to guide behavior [Soc Neurosci abstr], 2016.

Samonds JM, Lee TS, Kuhlmann S. Non-uniform surround modulation enhances orientation tuning for neurons in mouse primary visual cortex. [Soc Neurosci abstr], 2015.

Zhang Y, Li X, Samonds JM, Poole B, Lee TS. Relating functional connectivity in V1 neural circuits and 3D natural scenes using Boltzmann machines. [Cosyne], 2015.

Samonds JM, Li Y, Zhang Y, Lee TS. Late responses of V2 neurons are enhanced by global scene context of natural movies. [Soc Neurosci abstr], 2014.

Samonds JM, Potetz BR, Tyler CW, Lee TS. Evidence of stereoscopic surface disambiguation and interpolation in the responses of V1 neurons. [Cosyne], 2014.
***Travel Award**

Li X, Samonds JM, Lui Y, Lee TS. Pairwise interaction of V1 disparity neurons depends on spatial configural relationship between receptive fields as predicted by 3D scene statistics. [Soc Neurosci abstr], 2012.

Samonds JM, Li X, Tyler CW, Lee TS. Neuronal interactions in area V2 and their role in stereoscopic three-dimensional shape processing. [Soc Neurosci abstr], 2012.

Samonds JM, Potetz BR, Tyler CW, Lee TS. Dynamics of binocular disparity tuning explained by a neural network model with recurrent interactions. [Soc Neurosci abstr], 2011.

Lindsay G, Poole B, Doiron B, Samonds JM, Lee TS. Quality of tuning curves and their effect on population coding. [Cosyne], 2011.

Samonds JM, Poole B, Lee TS. V1 interactions reduce local uncertainty about binocular disparity over time. [Soc Neurosci abstr], 2010.

Poole B, Lenz I, Lindsay G, Samonds JM, Lee TS. Connecting scene statistics to probabilistic population codes and tuning properties of V1 neurons. [Soc Neurosci abstr], 2010.

Samonds JM, Poplin RE, Lee TS. Binocular disparity in the surround biases V1 responses to ambiguous binocular stimuli within the classical receptive field. [Soc Neurosci abstr], 2009.

Samonds JM, Potetz BR, Poplin RE, Lee TS. Neuronal interactions reduce local feature uncertainty. [Soc Neurosci abstr], 2008.

Samonds JM, Potetz BR, Lee TS. Implications of neuronal interactions on disparity tuning in V1. [*Soc Neurosci abstr*], 2007.

Samonds JM, Potetz BR, Lee TS. Evidence of cooperative and competitive mechanisms for stereo computation in macaque V1. OIST Workshop on Cognitive Neurobiology, Onna Village, Okinawa, Japan, 2007.

Samonds JM, Potetz BR, Lee TS. Neurophysiological Evidence of Cooperative Mechanisms for Stereo Computation. [*NIPS*], 2006.

Samonds JM, Potetz BR, Lee TS. Evidence of cooperative and competitive mechanisms for stereo computation in macaque V1. [*Soc Neurosci abstr*], 2006.

Potetz BR, Samonds JM, Lee TS. Disparity and luminance preference are correlated in macaque V1, matching natural scene statistics. [*Soc Neurosci abstr*], 2006.

Samonds JM*, Potetz B, Lee TS. Cooperative processing of spatially distributed disparity signals in macaque V1. [VSS abstr] *J Vision* 6(6):831a, 2006.
***Student Travel Award**

Zhou Z*, Samonds JM, Bernard MR, Bonds AB. Synchronous activity in cat visual cortex encodes collinear and cocircular contours. [VSS abstr] *J Vision* 5(8):675a, 2005.
***Student Travel Award**

Bernard MR, Samonds JM, Zhou Z, Bonds AB. An integration model of detection and quantification of synchronous firing within cell groups. [VSS abstr] *J Vision* 5(8)676a, 2005.

Samonds JM, Bonds AB. Quantitative analysis of cooperation and structure in the cat striate cortex. *Workshop on Coding of Visual Information in the Brain, Isle of Skye, Scotland*, 2004.

Brown HA, Samonds JM, Bonds AB. Area 18 contributes to contrast adaptation of Area 17 cells in the cat. [VSS abstr] *J Vision* 4(8):224a, 2004.

Samonds JM*, Brown HA, Bonds AB. Relationships between the spatiotemporal spike train structure and cortical synchronization. [VSS abstr] *J Vision* 4(8):17a, 2004.
***Student Travel Award**

Samonds JM, Allison JD, Brown HA, Bonds AB. Cooperative Synchronized Assemblies and Orientation Discrimination. [VSS abstr] *J Vision* 3(9):152a, 2003.

Brown HA, Allison JD, Samonds JM, Thomas AM, Bonds AB. Characterization of area 18 modulation from stimulation outside the receptive field of area 17 cells in the cat. [VSS abstr] *J Vision* 3(9):373a, 2003.

Bonds AB, Samonds JM, Allison JD. Spike train analysis reveals cooperation between Area 17 neuron pairs that enhances fine discrimination of orientation. *Annual Meeting of the Society for Mathematical Psychology*, 2002.

Samonds JM, Allison JD, Brown HA, Bonds AB. Spike train analysis reveals cooperation between Area 17 neuron pairs that enhances fine discrimination of orientation. [VSS abstr] *J Vision* 2(7):196a, 2002.

Brown HA, Allison JD, Samonds JM, Bonds AB. Area 18 contribution to spatial integration of receptive fields of area 17 cells in the cat. [VSS abstr] *J Vision* 2(7):582a, 2002.

Brown HA, Allison JD, Samonds JM, Bonds AB. Nonlocal origin of response supression from stimulation outside the Classic Receptive Field in Area 17 of the cat. [VSS abstr] *J Vision* 1(3):200a, 2001.

Allison JD, Smith KR, Atherton ME, Samonds JM, Bonds AB. Temporal frequency tuning of cross orientation inhibition in the striate cortex of cats. [ARVO abstr] *Invest Ophthalmol Vis Sci*, 2000.

Invited Reviewer:

eLife
Neuron
Journal of Neuroscience
Nature Communications
Cell Reports
eNeuro
Journal of Vision
Signal Processing
Journal of General Physiology
PLOS Computational Biology
Journal of Neurophysiology
European Journal of Neuroscience
Journal of Computational Neuroscience
Network: Computation in Neural Systems
Journal of Neuroscience Methods
Vision Research
Behavioral and Brain Functions