ALEX H. WILLIAMS

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EDUCATION

Stanford University. Stanford, CA ***2015-present***
PhD in Neuroscience *(in progress).* ***Advisor:*** *Surya Ganguli*
Coursework:
Probabilistic Graphical Models (CS 228)
Distributed Algorithms and Optimization (CME 323)

University of California, San Diego. La Jolla, CA ***2014-2015***
Neurosciences Graduate Program. ***Advisor:*** *Terrence Sejnowski* *(transferred to Stanford after one year)*
Coursework:
Neurosciences graduate survey courses (Molecular, Systems, Cognitive, Neuroanatomy)
Dynamical Systems, Control Theory, Convex Optimization (MAE 280A, MAE 280B, ECE 273)

Bowdoin College. Brunswick, ME ***2008-2012***
Bachelor of Arts in Neuroscience - Minor in Computer Science **GPA 3.956**
Honors: Summa cum Laude (top 2% of class), honors thesis in neuroscience
Awards: Sumner Increase Kimball Prize (most outstanding undergraduate research in the natural sciences); Sarah and James Bowdoin Scholar all semesters (top 20% of class); James Bowdoin Cup (top GPA of varsity athletes)
Coursework:
Experimental Biology (Neurophysiology, Molecular Neurobiology)
Applied Mathematics (Probability and Statistics, Differential Equations, Linear Algebra)
Computer Science (Data Structures, Computer Architectures)

OTHER RESEARCH POSITIONS

Sandia National Laboratories. Livermore, CA ***June-Sept 2016***
Visiting Researcher. *Advisor:* ***Tamara Kolda***
Dimensionality reduction of trial-structured neural data by tensor decompositions

Brandeis University. Waltham, MA ***2012-2014***
Research Technician. *Advisor:* ***Eve Marder***
Computational modeling of homeostatic plasticity and modulation of neural circuits

NATIONAL LEVEL AWARDS AND FELLOWSHIPS

Department of Energy Computational Science Graduate Fellowship (DOE CSGF)	Sept 2014 – present
"Best Performer" – DREAM8 Challenge, Whole-cell Parameter Estimation	Oct 2013
"Most Creative Method" – DREAM8 Challenge, Whole-cell Parameter Estimation	Aug 2013
Brain Corporation Prize (*awarded by popular vote to an article on www.scholarpedia.org*)	July 2013
Phi Beta Kappa Inductee (*alpha chapter of Maine)*	Oct 2011
Barry S. Goldwater Scholarship *(national-level selection process)*	Mar 2011
Beckman Scholar Award *(national-level award, institutional selection)*	2011 – 2012
Goldwater Honorable Mention *(national-level selection process)*	Mar 2010

ORIGINAL RESEARCH PUBLICATIONS

Williams AH, O'Donnell C, Sejnowski T, O'Leary T *(in press)*. Dendritic trafficking faces physiologically critical speed-precision tradeoffs. *eLife.* (Biorxiv preprint doi: *10.1101/037374*)

Dickinson PS, Kurland SC, Qu X, Parker BO, Sreekrishnan A, Kwiatkowski MA, **Williams AH**, Ysasi AB, Christie AE (2015). Distinct or shared actions of peptide family isoforms: II. Multiple pyrokinins exert similar effects in the lobster stomatogastric nervous system. *J Exp Biol*.

Karr JR, **Williams AH**, Zucker JD, Raue A, Steiert B, Timmer J, Kreutz C, DREAM8 Parameter Estimation Challenge Consortium, Wilkinson S, Allgood BA, Bot BM, Hoff BR, Kellen MR, Covert MW, Stolovitzky GA, Meyer P (2015). Summary of the DREAM8 parameter estimation challenge: Toward parameter identification for whole-cell models. *PLoS Computational Biology.* 11(5): e1004096.

O'Leary T, **Williams AH**, Franci A, Marder E (2014). Cell types, network homeostasis and pathological compensation from a biologically plausible ion channel expression model. *Neuron*. 82(4):809-21.

Caplan JS, **Williams AH**, Marder E (2014). Many parameter sets in a multicompartment model oscillator are robust to temperature perturbations. *J Neurosci*. 34(14):4963-75.

Williams AH, Calkins A, O'Leary T, Symonds R, Marder E, Dickinson PS (2013). The neuromuscular transform of the lobster cardiac system explains the opposing effects of a neuromodulator on muscle output. *J Neurosci*. 33(42): 16565-75.

O'Leary T, **Williams AH**, Caplan J, Marder E (2013). Correlations in ion channel expression emerge from homeostatic tuning rules. *Proc Natl Acad Sci.* 110(28):E2645-54

Williams AH, Kwiatkowski MA, Mortimer AL, Marder E, Zeeman ML, Dickinson PS (2013). Animal-to-animal variability in the phasing of the crustacean cardiac motor pattern: an experimental and computational analysis. *J Neurophysiol*. 109: 2451-65.

REVIEW PUBLICATIONS AND BOOK CHAPTERS

Williams AH, Hamood AW, Marder E (2014). Neuromodulation in Small Networks. *Encyclopedia of Computational Neuroscience*.

Williams AH, O'Leary T, Marder E (2013). Homeostatic Regulation of Neuronal Excitability. *Scholarpedia*, 8(1): 1656.

WORKSHOPS & SUMMER COURSES

Junior Scientist Workshop on Theoretical Neuroscience (Participant). ***September 2016***
Janelia Research Campus. Ashburn, VA. Organized by*:* ***Shaul Druckmann, Ann Hermundstad***
Research Presentation: A Speed-Precision Tradeoff for Trafficking in Dendrites
Tutorial Presentation: Matrix and Tensor Decompositions of High-Dimensional Neural Data

Methods in Computational Neuroscience Course (Student). ***August 2013***
Woods Hole Oceanographic Institute. Woods Hole, MA. Organizers: ***Michale Fee, Mark Goldman***

POSTERS & PRESENTATIONS

Williams AH, O'Donnell C, Sejnowski T, Marder E, O'Leary T (2015). Control of spatially patterned gene expression in dendrites [Poster]. *2015 Society for Neuroscience Conference*, Chicago, Illinois.

Williams AH, O'Donnell C, Sejnowski T, Marder E, O'Leary T (2015). Control of spatially patterned gene expression in dendrites [Poster]. *HHMI Meeting*, Asburn, VA.

Williams AH, O'Leary T, Marder E (2014). Homeostatic conductance regulation in multicompartment conductance-based model neurons [Poster]. *2014 Society for Neuroscience Conference*, Washington, D.C.

Williams AH, Zucker J (2013). Parameter fitting as statistical inference: an outsider's perspective [Invited Talk, DREAM8 "Best Performer" award]. *2013 RECOMB/ISCB conference*. Toronto, Canada.

Williams AH, Caplan J, Marder E (2013). Temperature Compensation in a pacemaker model [Poster]. *2013 Society for Neuroscience Conference*. San Diego, California.

O'Leary T, **Williams AH**, Caplan J, Marder E (2013). Correlations in ion channel expression emerge from homeostatic regulation mechanisms [Poster]. *2013 Society for Neuroscience Conference*. San Diego, California

Symonds RM, **Williams AH**, Calkins AM, Dickinson PS (2013). Predicting muscle output from neural input: An assessment of the neuromuscular transform in the crustacean cardiac system [Poster]. *2013 Society for Neuroscience Conference*. San Diego, California

Franci A, O'Leary T, Drion G, **Williams AH**, Marder E, Sepulchre R (2013). Homeostatic principles are consistent with sensitivity analysis of neuronal rhythmicity [Poster]. *2013 Society for Neuroscience Conference*. San Diego, California.

O'Leary T, **Williams AH**, Caplan J, Marder E (2013). How conductance distributions are shaped by activity-dependent regulation rules [Poster]. *Twenty-Second Annual Computational Neuroscience Meeting (CNS 2013).* Paris, France.

Williams AH, Mortimer AL, Zeeman ML, Marder E, Dickinson PS (2012). The source and consequences of animal-to-animal variability in the phasing of a motor pattern: a theoretical and experimental investigation of the crustacean cardiac ganglion [Poster]. *2012 Society for Neuroscience Conference*. New Orleans, Louisiana.

Dickinson, PS, Calkins, A, **Williams AH**, Symonds R (2012). Interactions of cycle frequency, burst duration, and neuropeptide modulators in determining contraction amplitude of the *Homarus americanus* heart [Poster]. *2012 Society for Neuroscience Conference*. New Orleans, Louisiana.

Williams AH, Mortimer AL, Zeeman ML, Dickinson PS (2012). Network-to-network variability in the relative timing of neuron firing in the cardiac ganglion of *Homarus americanus* [Poster]. *Maine Biological and Medical Sciences Symposium*. Bar Harbor, Maine.

Calkins A, **Williams AH** and Dickinson PS (2012). The effect of cycle frequency and duration on the contraction amplitude and frequency of the *Homarus americanus* heart [Poster]. *Maine Biological and Medical Sciences Symposium*. Bar Harbor, Maine.

Williams AH (2011). How excitatory chemical synapses modulate rhythmic neuronal oscillations in heterogenous two-cell networks [Oral presentation]. *Dynamic Neural Networks: The Stomatogastric System (Satellite Event at 2011 Society for Neuroscience Conference)*. Washington D.C.

Williams AH, Zeeman ML, Berkman JM, Dickinson PS (2011). Circuit dynamics and network properties of the crustacean cardiac ganglion [Poster]. *2011 Society for Neuroscience Conference*. Washington D.C.

Dickinson PS, Syed AH, **Williams AH**, Ysasi AB, Wiwatpanit T, Calkins AM, Sreekrishnan A, Magno JL, Matsuuchi MM, Berkow SW, Christie AE (2011). Distribution of pyrokinin-like peptides in the lobster, *Homarus americanus* [Poster] *2011 Society for Neuroscience Conference.* Washington D.C.

Open-Source Code (primary author and maintainer)

PyNeuron-Toolbox.
github.com/ahwillia/PyNeuron-Toolbox
A Python library that augments NEURON (neuron.yale.edu/) simulations. Provides functions to an API to download morphology files from neuromorpho.org, generate plots and animations of reconstructed neural morphologies, and other convenience functions.

NonNegLeastSquares.jl
https://github.com/ahwillia/NonNegLeastSquares.jl
High-performance active-set methods for non-negative least squares problems.

Einsum.jl
https://github.com/ahwillia/Einsum.jl
A flexible metaprogramming tool to specify nested nested loop computations with Einstein summation notation