

Marco Arieli Herrera Valdez

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Education

University of Arizona.

Ph.D Mathematics (expected August, 2009).

Ph.D. Physiology (August, 2008).

M.Sc. Mathematics, minor in Neuroscience, May, 2002.

Universidad Nacional Autónoma de México (UNAM), Facultad de Ciencias.

B.Sc. Actuarial Science. August, 1997.

Positions

Arizona State University

Department of Mathematics and Statistics and Mathematical, Computational, and Modeling Sciences Center, Fall, 2008-present. Postdoctoral scholar. Research brief. Detailed biophysical modeling of membrane excitability and integration of synaptic input in drosophila motor neurons during development. Experimental data is being used to build single and multicompart-ment models to explore possible schemes of synaptic connectivity. Models are used to characterize the effects of selective knock down/out of voltage-dependent channels, and possible compensatory mechanisms triggered by manipulations, such as changes in the dendritic structure of the neurons. Characterization is being done using probability and dynamical systems theory.

University of Arizona

Graduate Program in Mathematics 8/2008-present. Geometry of reduced biophysical models of membrane excitability. Graduate training on probability, stochastic processes, dynamical systems, and computer simulation of biological processes.

*Interdisciplinary Program in Physiological Sciences 1/03-8/2008. Relationship between nearly coincident spiking and common excitatory synaptic input in motor neurons. Speciality in systems neurophysiology. Multiple unit recordings on freely behaving animals, data analysis and modeling of neural networks. *Research Assistant.**

*Arizona Research Laboratories, Division of Neurobiology, 1/01 - 1/03. Research Assistant. Data analysis and modeling of dendritic trees from the antennal lobe of the moth *Manduca Sexta*.*

Mathematics Department, 11/97-5/01. Graduate Computer Assistant, 7/99 - 5/01. Assistant Network administrator of a linux based system. Tasks included software-hardware help for linux and windows systems, and teaching seminars on linux and windows applications.

Teaching Assistant, 10/97 - 6/99. Courses taught: Algebra, Calculus, Statistics, and Mathematics in Modern Society (applied mathematics).

Research Visiting Scholar, UNAM Foundation, 8/97-6/98. Fellowship award for outstanding academic performance, 1997.

Universidad Nacional Autónoma de México

College of Science, UNAM, 8/96 - 8/97.

Research Assistant. Fellowship from the National Council for Science and Technology (CONACyT), 1996.

Teaching Assistant, Mathematics Department, 8/96 - 8/97. Courses taught: Calculus, Probability and Statistics.

Athletic Department, UNAM, 1/94 - 8/97.

High School Head Coach.

Publications

Articles

Herrera-Valdez M.A. and Lega J. (2009). A simple, generic and physiologically relevant model of cardiac pacemaker dynamics. *Submitted.*

Herrera-Valdez M.A. and Lega J. (2009). Characterization of membrane excitability in reduced biophysical models. *In preparation.*

Herrera-Valdez M.A. and Fuglevand A.J. (2009). Relationship between nearly coincident spiking and common excitatory synaptic input predicted by a model of spiking motor neurons. *In preparation.*

Herrera-Valdez M.A., Duch, C., and Crook, S. (2009). Passive current transfer in wildtype and genetically modified *Drosophila* motoneuron dendrites. *Abstract submitted for CNS 2009.*

Posters

Herrera-Valdez M.A., Fuglevand, A.J. (2008). Relationship between nearly coincident spiking and common excitatory synaptic activity in motor neurons. Society for Neuroscience Meeting. Washington, D.C. November 18-23, 2008.

Herrera-Valdez M.A., Fuglevand, A.J. (2008). Relationship between nearly coincident spiking and common excitatory synaptic activity in motor neurons. Mechanisms of Plasticity and Disease in Motor Neurons. University of Washington, Seattle, June 26-29, 2008.

Thome A., Skaggs W. E., Herrera-Valdez M.A., McNaughton B.L, Barnes C.A. (2007). Effects of performance accuracy on intra-cycle α - and γ -band cross frequency coupling between temporal lobe sites of behaving monkeys. Society for Neuroscience Meeting, 07-A-34312-SfN.

Workshops, courses, and professional meetings

Meetings, Courses and Workshops attended

Annual Meeting of Society for Neuroscience, 1998-2000, 2004, 2008.

Conference in Dynamical Systems in Physiology. Mathematics and Bioengineering Departments, Purdue University, October 2008.

Annual Meeting of the Society for Industrial and Applied Mathematics, 2008.

Short course in Mathematical Physiology. Mathematical Biosciences Institute, Ohio State University, 10/07.

Workshop in Neural Networks. Mathematical Biosciences Institute, Ohio State University, 10/02.

Methods in Computational Neuroscience. Marine Biological Laboratories, Woods Hole, MA, 8/02.

Neuron Simulation Environment Summer Course. San Diego Super Computer Center, 6/01.

Mexican Mathematical Society (SMM) annual meetings, 1995-1998.

Lectures and workshops given

Using nearly coincident spiking to predict common synaptic input to motor neurons. Computational Physiology seminar, Wilfrid Laurer University, Waterloo, Canada. November, 2008.

Predicting common synaptic input to motor neurons. Biomathematics seminar, ASU. October, 2008.

A low dimensional, biophysical model of cardiac excitability. Biomathematics workshop, Annual Meeting of the Society for Industrial and Applied Mathematics, July, 2008.

Introduction to the Ventral Tegmental Area. Neural Systems Memory and Aging Seminar, U. of A. August, 2007.

Space-dependent responses and synchronization with hippocampal local field potentials are exhibited by spiking activity in neurons of the ventral-tegmental area. Physiological Sciences Seminar, Department of Physiology, U. of A. August 2005.

Phase-space analysis predicts sexually dimorphic ocular scanning of facial expressions in *Rhesus* monkeys. Physiological Sciences Seminar, Department of Physiology, U. of A. August 2004.

Input frequency gates olfactory responses in multiglomerular interneurons of the antennal lobe of *Manduca Sexta*. Physiological Sciences Seminar, Department of Physiology, U. of A. August 2003.

Neural network of the primate primary visual cortex, layer 4C α . Biomathematics seminar, Facultad de Ciencias, UNAM, 5/02.

Computer reconstructions of dendritic trees based on real morphology. Facultad de Ciencias, UNAM, 05/02. Conference.

Morphological properties of dendrites: Fractal dimensions. Mathematics Colloquium, University of Arizona, 03/02. Lecture.

Coupling between glomeruli in passive dendritic trees from the antennal lobe of *Manduca Sexta*. Antennal lobe seminar, ARLDN, University of Arizona, 10/01. Lecture.

Models of neural networks of integrate and fire cells. Applied Mathematics Seminar, University of Arizona, 11/01. Lecture.

Dynamical systems and neural systems, introduction to computational neurobiology. Mathematics Colloquium, University of Arizona, 04/01. Lecture.

Stochastic modeling of ionic channels. Applied Mathematics Brown Bag Seminar, University of Arizona, 04/01.

Cryptography session for the workshop on High school mathematics. Department of Mathematics, University of Arizona, 02/01.

Financial applications of probability and stochastic processes. Research review.SMM 1997. Lecture.

Training and skills

- Graduate training in Mathematics and Physiology.
 - Graduate training includes courses probability, stochastic processes, dynamical systems, cellular and systems physiology.
 - Research collecting electrophysiological data and performing computer simulation of biological processes. Extensive experience with multiple unit recordings on freely behaving animals, data analysis and modeling of neural networks. - Past and current research involves modeling of dendritic trees using biophysically detailed models from the nervous system of Manduca Sexta and Drosophila.
- Programming and scripting: Python, C/C++, Pascal, Matlab, HOC (Neuron), latex and HTML. Also, network administration of linux-based systems.
- Courses taught: Algebra, Calculus, Differential Equations, Set Topology, Probability, Statistics, Mathematics in Modern Society, and Systems Physiology.

Fellowships

- Diversity Fellowship, NSF, University of Arizona, 2008.
- Fellowship award for outstanding academic performance, Fundacion UNAM, 1989-1992, 1994-1997.

Languages

Spanish (native speaker), English (written and verbal), basic understanding written and spoken italian, and written portuguese and french .

Athletic and extracurricular activities

Radio broadcasting. ITESM 89.5, Mexico City. Program: "Traveling waves". Music and literature for young people.

College Football. *Condors*-UNAM, 1993 - 96. Position: Running Back. Merits:
"Pumas" selection team 1994 - 96.

Football coach. UNAM Football Club, 1993 - 97. Spring & summer: Head Coach
for junior high school and pop warner categories. Responsible for coaching
and coordinating the Spring Youth Football Program involving nearly 180
children, and 30 coaches.

Offensive Coordinator for the High school Football team "Tigers, UNAM",
1996. National Championship Game.

Offensive Coordinator for the High school Football team "Gamos", 1994 -
95. Two National Championship games. National Champions 1995.