

Curriculum Vitae – Revised Jan 2019

James Patrick Roach

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Education

PhD Neuroscience, University of Michigan (UM), 2018
Neural Systems and Behavior Course, Marine Biological Laboratory, 2017
B.S. Chemistry, Mathematics minor, Florida International University (FIU), 2012
B.S. Biological Sciences with Honors, FIU, 2012
MIT Quantitative Biology Workshop, 2012
A.S. Audio Production, New England Institute of Art, 2004

Fellowships and Awards

- UM Neuroscience Student Innovator Award, 2018
- UM Rackham Pre-doctoral Fellowship, 2017-2018
- UM/ Tel Aviv University (TAU) Global Exchange Travel Fellowship, 2016
- Dynamic Days Student Travel Award; 2016, 2017, 2018
- UM Rackham Interdisciplinary Workshop Grant, 2015-2017
- UM Rackham Conference Travel grant; 2013, 2014, 2015, 2016, 2017, 2018
- OCNS Conference Travel Award; 2013, 2015, 2016
- NSF Graduate Research Fellowship; 2013-2018
- UM Rackham Merit Fellowship; 2012-2018
- FIU Robert J. Smiddy Excellence in Research Award; 2012
- NIH MARC Undergraduate Fellowship; 2010-2012
- SEAGEP Undergraduate Research Award; 2009

Research Experience

Interdisciplinary Scholar in Experimental and Quantitative Biology, Cold Spring Harbor Laboratory, 2019 –

Research Area: Systems and Theoretical Neuroscience: Drs Tatiana Engel and Anne Churchland

NSF Graduate Research Fellow, UM, 2012 – 2018

Research Area: Computational Neuroscience: Dr. Michal Zochowski

UM/ TAU Global Exchange Fellow, TAU, 2016

Research Area: Cellular Neurophysiology: Dr. Uri Ashery

Undergraduate researcher, FIU, 2011-2012

Research Area: Computational chemistry: Dr. David Chatfield

NIH MARC Undergraduate fellow, FIU, 2008-2012

Research area: Neurobiology of communication: Dr. Philip Stoddard

SROP Undergraduate fellow, Michigan State University, 2010

Research area: Reproductive neuroendocrinology: Dr. Juli Wade

Teaching Experience

Guest Lecturer, Neuroscience Grad. Prgm, UM 2016; Course Circuits and Computational Neuroscience

Graduate Student Instructor, Neuroscience Grad. Prgm., UM, 2014; Course: Circuits and Computational Neuroscience.

Graduate Student Instructor, Dept. of Molec. and Integ. Physiol., UM, 2013; Course: Human Physiology.

Learning Assistant, Dept. of Phys., FIU, 2009-2010; Courses; Physics Lab I&II.

Peer workshop leader, Dept. of Bio. Sci., FIU, 2009; Courses: General Biology I.

Publications

Roach JP, Bolaji E, Lavi A, Ashery U, Zochowski MR. (*in preparation*). Neural excitability and presynaptic mechanisms interact to shape network burst dynamics.

Roach JP, Ognjanovski N, Aton SJ, Sander LM, Zochowski MR. (*in preparation*). The cyclic nature of REM and NREM facilitates sleep dependent memory consolidation.

Roach JP, Sander LM, Booth V, Zochowski MR. (*in revision*) Acetylcholine mediates dynamic switching between information coding schemes in neuronal networks. *Front. Syst. Neurosci.*

Roach JP*, Pidde O*, Katz E, Wu J, Ognjanovski, N, Aton SJ, Zochowski, MR. (2018) Resonance with subthreshold oscillatory drive organizes activity and optimizes learning in neural networks. *Proceeding of the National Academy of Sciences.* 115(13), E3017-E3025. DOI: 10.1073/pnas.1716933115 (* authors contributed equally)

Johnson AM, **Roach JP**, Hu A, Stamatovic SM, Zochowski MR., Andjelkovic AV. (2018). Connexin 43 gap junctions contribute to brain endothelial barrier hyperpermeability in familial cerebral cavernous malformations type III by modulating tight junction structure. *FASEB J.* 32(5):2615-2629 doi: 10.1096/fj.201700699R

Roach, JP, Sander L.M., Zochowski, MR (2016). Memory recall and spike frequency adaptation. *Physical Review E.* 93(5), 052307. DOI: 10.1103/PhysRevE.93.052307

Roach, JP, Ben-Jacob, E, Sander, LM, Zochowski, MR (2015). Formation and dynamics of traveling waves in a cortical model of cholinergic modulation. *PLoS Computational Biology.* 11(8): e1004449. DOI: 10.1371/journal.pcbi.1004449

Morozov, AN*, **Roach, JP***, Kotzer, M, & Chatfield, DC (2014). A possible mechanism for redox control of human neuroglobin activity. *Journal of Chemical Information and Modeling*, 54(7), 1997–2003. DOI:10.1021/ci5002108. (* authors contributed equally)

Gavassa, S, **Roach, JP**, Stoddard P (2013). Social regulation of electric signal plasticity in male *Brachyhyppopomus gauderio*. *Journal of Comparative Physiology A.* 5: 375-384. DOI:10.1007/s00359-013-0801-2

Cohen, RE, **Roach, J**, Wade, J (2012). The distribution of estrogen receptor β mRNA in male and female green anole lizards. *Brain Research.* 1430: 43- 51. DOI:10.1016/j.brainres.2011.10.047

Book Chapters and Invited Reviews

Skilling, QM*, **Roach, JP***, Althaus, AL, Murphy, GG, Sander, LM, Zochowski MR (2017) Modifications in network structure and excitability may drive differential activity dependent integration of granule cells into Dentate Gyrus circuits during normal and pathological adult neurogenesis. In: van Ooyen and Butz (Eds.), *The Rewiring Brain: Computational Approach to structural plasticity in the adult brain*. San Diego: Academic Press. 409-424. (* authors contributed equally)

Invited and Contributed Talks

Sleep 2018, Baltimore, MD, 2018.

Sleep dependent changes in network dynamics are mediated through an interaction between REM and NREM states.

UM Neuroscience Spring symposium, Ann Arbor, MI, 2018.

Subthreshold resonance organizes network firing patterns and supports sequence learning. GRS Sleep Regulation and Function, Galveston, TX, 2018.

Competition or concert? How REM and NREM interact during sleep dependent memory consolidation.
Dynamic Days 2017, Silver Spring, MD, 2017.
Sub-threshold resonance facilitates sequential learning in biophysical neural networks
APS March Meeting, Baltimore, MD, 2016.
Spike frequency adaptation is a possible mechanism for control of attractor preference in auto-associative neural networks.
Tel Aviv University- University of Michigan Neuroscience Symposium, Tel Aviv, IL, 2015.
Traveling waves in a model of cholinergic modulation.
Organization for Computational Neuroscience, Quebec, QC, 2014.
The interplay of intrinsic excitability and network topology in spatiotemporal pattern generation in neural networks.
FIU Biology Honors Thesis Seminar, Miami, FL, 2012
An automated method for the determination of electroreception thresholds in weakly electric fish
βββ Biology Honors Society Undergraduate Life Research Symposium, Miami, FL, 2012
The presence of a disulfide bond in human neuroglobin determines heme-apoenzyme hydrogen bonding: a possible mechanism for redox control of neuroprotective activity.
Annual Biomedical Research Conference for Minority Students, St. Louis, MO, 2011
Development of a Rapid and Reliable Method for the Determination of Electroreception Thresholds in Weakly Electric Fish Using Classical Conditioning
FIU MBRS mini-symposium, Miami, FL, 2011
Automated determination of electroreception thresholds in weakly electric fish using classical conditioning *Best Undergraduate Talk
Michigan State Univ. Summer Research Opportunities Program, E. Lansing, MI, 2010
Distribution of estrogen receptor β mRNA expression in the green anole lizard brain

Poster Presentations

Society for Neuroscience, San Diego, CA, 2018
Cholinergic and nonadrenal control of memory consolidation across sleep-wake states.
Dynamic Days USA, Denver, CO, 2018
Modulation of network function across sleep-wake states.
Society for Neuroscience, Washington, DC, 2017
Sub-threshold resonance organizes activity and optimizes learning in neural networks.
Society for Neuroscience, San Diego, CA, 2016
Spike frequency adaptation and memory selectivity.
Organization for Computational Neuroscience, Jeju, KR, 2016
Memory recall and spike frequency adaptation.
Dynamic Days USA, Durham, NC, 2016.
Spike frequency adaptation is a possible mechanism mediating dynamics of attractor preference in auto-associative neural networks.
Society for Neuroscience, Chicago, IL, 2015.
Spike frequency adaptation regulates network sensitivity to synaptic heterogeneities in a cortical model of cholinergic modulation.
Organization for Computational Neuroscience, Prague, CZ, 2015.
Modeling the formation and dynamics of cortical waves induced by cholinergic modulation.
Society for Neuroscience, San Diego, CA, 2013.
Muscarinic receptor sensitization and synaptic homeostasis: a computational study of activity dependent M-current activation and network potentiation.
Organization for Computational Neuroscience, Paris, FR, 2013.

Network topology and intrinsic excitability of the existing network drive integration patterns in a model of adult neurogenesis.

Society for Neuroscience, New Orleans, LA, 2012

Differential signal modulation in response to social environment: Prospective mates and competitors drive enhancement of distinct signal features in the electric fish, *Brachyhypopomus gauderio*.

Animal Behavior Society, Bloomington, IN, 2011

A method for determination of electroreception thresholds in weakly electric fish.

Professional Service and Outreach

Ad hoc reviewer. Scientific Reports, 2016

Neural Networks Journal Club, UM, 2015-2017

Coordinated journal club scheduling, managed website, invited outside speakers, secured competitive funding.

Recruiting Coordinator, Neuroscience Graduate Program, UM, 2014

Planned and directed the logistics of prospective student interviews and social activities during the 2014 application cycle.

Brains Rule!, Ann Arbor, MI, 2015

Mentored a group of undergraduate neuroscience students as they performed an interactive electrophysiology demonstration to 6th grade students.

Brains Rule!, Ann Arbor, MI, 2013

Presented an exhibit on gross neuroanatomy to 6th grade students.

FIU QBIC Science Cafe: Alternative Energy, Miami, FL, 2012

Developed and presented an exhibit on manual generation of electricity with motors and energy efficiency of appliances for school aged children.

University of Miami Brain Fair, Miami, FL, 2012

Developed exhibit on action potentials in the electric organ, trained freshman biology students to present the exhibit to school aged children.

Columbus MAS scholars program 2010-2011

Mentored high school students during data analysis portion of a behavioral experiments.