



2014 Collaborative Research in  
Computational Neuroscience (CRCNS)  
PI Meeting

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**CRCNS PI Meeting**  
**October 16-18, 2014**  
**Tempe Mission Palms Hotel and Conference**  
**Center**  
**Tempe, AZ**

# Program

# Workshop on Open Science and Resources for Computational Neuroscience

Thursday, October 16, 2014

Arizona State University, Memorial Union, Pima Room

## MORNING SESSION

- 8:45 Welcome, Ken Whang, National Science Foundation & Yuan Liu, National Institutes of Health
- 9:00-9:10 Richard Gerkin, Arizona State University  
*Introduction to the Workshop Themes*
- 9:10-9:30 Yoonsuck Choe, Texas A&M University  
*Open Web Atlas for High-resolution 3D Mouse Brain Data*
- 9:30-10:00 Shreejoy Tripathy, University of British Columbia  
*NeuroElectro.org: Making the World's Neurophysiology Data Available for Reuse*
- 10:00-10:30 Mitra Hartmann, Northwestern University  
*The Digital Rat: Tools for Modeling the Vibrisso-Tactile Natural Scene*
- 10:30-10:50 Coffee Break
- 10:50-11:30 Lydia Ng, Allen Institute for Brain Science  
*Overview of the Allen Brain Atlas Data, Tools, and API*
- 11:30-12:00 Friedrich Sommer, University of California, Berkeley  
*The NeuroData Without Borders Project and the CRCNS.org Repository*
- 12:00-1:00 Lunch on Your Own

## AFTERNOON SESSION

- 1:00-1:40 Stephen Larson, OpenWorm.org  
*OpenWorm: Open Collaboration in Computational Neuroscience Focused on C. elegans*
- 1:40-2:10 Sharon Crook, Arizona State University  
*Collaborative Modeling with NeuroML and the Open Source Brain Project*
- 2:10-2:40 Richard Gerkin, Arizona State University  
*SciUnit: Data-driven Validation of Models for Neuroscience*
- 2:40-3:00 Afternoon Break
- 3:00-4:00 Panel Discussion on Open Science and Resources

**CRCNS Main Meeting**  
October 16-18, 2014  
**Tempe Mission Palms Hotel and Conference Center**

**THURSDAY, October 16, 2014**

5:00-8:00      Registration Available  
6:00-9:00      Reception, Courtyard of Tempe Mission Palms Hotel and Conference Center

**FRIDAY, October 17, 2014**

8:00-5:00      Registration Available  
8:30              Welcome

8:40-9:00      Ramping vs. Stepping: Continuous and Discrete Latent Dynamical Models of Decision  
Signals Underlying Spike Trains in Parietal Cortex  
*Jonathan Pillow, Kenneth Latimer, Jacob Yates, Miriam Meister, Alex Huk*

9:00-9:20      Signal and Noise in the Retina's Population Code for Direction  
*Eric Shea-Brown, Joel Zylberberg, Jon Cafaro, Max Turner, Fred Rieke*

9:20-9:40      How Dynamic is Encoding? State-dependent Feature Selectivity in Tactile Sensing  
*Clarissa Shephard, Christian Waiblinger, Cornelius Schwarz, Garrett B. Stanley*

9:40-10:00      A Nonparametric Bayesian Approach to Uncovering Rat Hippocampal Population Codes  
During Spatial Navigation  
*Zhe Chen, Scott Linderman, Matthew A. Wilson*

10:00-10:10      Discussion led by *Frederic Theunissen*

10:10-10:30      Break

10:30-10:50      Adaptation Tunes Cortical Dynamics to a Critical Regime during Vision  
*Woodrow Shew, Wesley Clawson, Jeff Pobst, Yahya Karimippanah, Ralf Wessel*

10:50-11:10      Cytoskeletal Mechanisms of Dendrite Arbor Shape Development  
*Giorgio A. Ascoli, Dan N. Cox*

11:10-11:30      Modeling the Effects of Neuronal Morphology on Dendritic Chloride Diffusion and  
GABAergic Inhibition  
*Namrata Mohapatra, Songqing Lu, Fidel Santamaria, Peter Jedlicka*

11:30-11:50      Synaptic Input Required for Firing is Modulated by Extracellular Electric Fields  
*Belen Lafon, Asif Rahman, Marom Bikson, Lucas C. Parra*

11:50-12:00      Discussion led by *William L. Kath*

12:00-2:00      Box Lunch and Poster Session 1

- 2:00-2:50      Plenary Lecture: High-Throughput Experimental and Computational Exploration of the Cortex  
*Anton Arkhipov, Allen Institute for Brain Science*
- 2:50-3:10      Overview of Open Science and Resources Workshop  
*Friedrich Sommer, University of California, Berkeley*
- 3:10-3:30      Discussion of federal funding opportunities
- 3:30-3:50      Break
- 3:50-4:10      Molecular Simulation of Calcium Transients in a Spine  
*Mary Kennedy, Thomas Bartol, Daniel Keller, Justin Kinney, Chandrajit Bajaj, Kristen Harris, Terrence Sejnowski*
- 4:10-4:30      Atypical PKCs in the Maintenance of Memory: Molecular Model, Experimental Verification  
*Harel Z. Shouval, Sajiya J. Jalil, Todd Charlton Sacktor*
- 4:30-4:50      Computational Modeling of the Molecular Machinery Involved in Membrane Fusion  
*Maria Bykhovskaia, Chung-Yuen Hui, Anand Jagota, Troy Littleton*
- 4:50-5:00      Discussion led by *Fidel Santamaria*
- 6:00            Banquet at Tempe Mission Palms Hotel and Conference Center  
Plenary Lecture: Sleights of Mind  
*Stephen Macknik, SUNY Downstate Medical Center*

#### **SATURDAY, October 18, 2014**

- 8:00-5:00      Registration Available
- 8:30            Welcome
- 8:40-9:30      Plenary Lecture: Pre-processing of Sensory Information for Cortical Associative Learning: Distinct Roles for Nicotinic and Muscarinic Cholinergic Receptors  
*Christiane Linster, Cornell University*
- 9:30-9:50      Cortical Variability, Perception-based Decisions, and Network Activity  
*Yuwei Cui, Liu D. Liu, James M. McFarland, Christopher C. Pack, Daniel A. Butts*
- 9:50-10:10    Cognitive Modulation of Oculomotor Activity in the Frontal Cortex of Monkeys Performing a Simple Reaction-time Task with Reward Bias  
*Christopher K. Hauser, Dantong Zu, M Gabriela Costello, Terrence R. Stanford, Emilio Salinas*
- 10:10-10:30   Break

- 10:30-10:50 Neural Constraints on Learning  
*Patrick T. Sadtler, Kristin M. Quick, Matthew D. Golub, Steven M. Chase, Stephen I. Ryu, Elizabeth C. Tyler-Kabara, Byron M. Yu, Aaron P. Batista*
- 10:50-11:10 Phase Transitions in the Auditory Cortex of Gerbils During Reinforcement Learning Indicating Strategy Change  
*Robert Kozma, Frank Ohl*
- 11:10-11:30 Mixed Selectivity and Multiplexing of Visual and Cognitive Encoding during Category Learning  
*Arup Sarma, Xiao-Jing Wang, David J. Freedman*
- 11:30-11:50 A Novel Neocortical Beta Origin Hypothesis: Converging Evidence from Humans, Computational Modeling, Monkey, and Mouse  
*Stephanie Jones, Christopher Moore*
- 11:50-12:00 Discussion led by *Ranu Jung*
- 12:00-2:00 Box Lunch with Poster Session 2
- 2:00-2:20 Emergence of a Reliability Code in the Owl's Midbrain  
*Fanny Cazettes, Brian J. Fischer, Jose Pena*
- 2:20-2:40 Encoding Models Reveal How and When the Meaning of Communication Calls is Extracted by the Avian Auditory Cortex  
*Julie Elie, Hedi Soula, Frederic Theunissen*
- 2:40-3:00 Key Features from Texture, Shading, and Color Flows Enable Surface Inferences  
*Roland Fleming, Steven W. Zucker*
- 3:00-3:10 Discussion led by *Bruno Olshausen*
- 3:10-3:30 Break
- 3:30-3:50 Neural Restoration via Loop-based Reinforcement: A Mechanism of Therapeutic High Frequency Stimulation in Parkinson's Disease  
*Sabato Santaniello, Michelle M. McCarthy, Erwin B. Montgomery, John T. Gale, Nancy Kopell, Sridevi V. Sarma*
- 3:50-4:10 Computation-Enabled Ventilatory Control System (CENAVEX)  
*Ranu Jung, Sylvie Renaud, James Abbas, Yannick Bornat, Brian Hillen, Adeline Zbrzeski, Ricardo Siu, Jonathan Castelli, Brett Davis, Florian Kolbl*
- 4:10-4:30 Hierarchical Topographic Factor Analysis: A Computationally Efficient Method for Computing Full-brain Functional Connectivity  
*Kenneth A. Norman, Jeremy R. Manning, Kimberly L. Stachenfeld, Rajesh Ranganath, Naseem Al-Aidroos, Alexa Tomparry, Nicholas Turk-Browne, David M. Blei*
- 4:30-4:50 Cortical Representation of Phonetic, Syntactic and Semantic Information during Speech Perception and Language Comprehension  
*Jack L. Gallant, Alex T. Huth, Wendy A. de Heer, Lydia L. Mjur, Thomas L. Griffiths, Frederic E. Theunissen*
- 4:50-5:00 Discussion led by *Luisa Ciobanu*

**Dinner on your own. Social gathering to be announced!**

## **Poster Session 1**

### **#1 Multimodal fMRI and EEG Neuroimaging Investigation of Binocular Rivalry**

Abhrajee Roy, Sucharit Kytal, Vadim Petruk, Sheng He, Steve Engel, Bin He

### **#2 Time Integration in Mushroom Bodies and Olfaction Learning**

Thiago Mosquero, Martin Strube-Bloss, Maxim Bazhenov, Brian Smith, Ramon Huerta

### **#3 Deep Brain Stimulation to the Parkinsonian Subthalamic Nucleus Can Restore Function in Striatal Networks: A Model**

Michelle M. McCarthy, Nancy Kopell, Xue Han

### **#4 Origin and Propagation of Parkinsonian Beta Oscillations in the Basal Ganglia-thalamo-cortical Loop**

Xue Han, Boston University

### **#5 Coherent Neuronal Ensembles are Rapidly Recruited when Selecting a Movement Plan**

Bijan Pesaran, Nathaniel Daw

### **#6 Ultra-rapid Object Localization: Shortcuts in the Brain's Visual Hierarchy?**

Florence Campana, Jacob Martin, Levan Bokeria, Ben Trans, Xiong Jiang, Simon Thorpe, Maximilian Riesenhuber

### **#7 Laminar Structure of Gamma Activity in Cat Visual Cortex**

Urs Koester, Charles Gray

### **#8 A Model for VTA Circuitry: Toolbox for the Study of Addictions**

A. Kuznetsov, B. Gutkin, M. Mamelli, C. Lapiash

### **#9 Do V1 Neurons Have Receptive Fields?**

Bruno Olshausen, Urs Koester, Charles Gray, Chris Rozell

### **#10 Advancing Models of Shape Selectivity in V4**

Dina Popovkina, Eric Nicholas, Majid Moshtagh, Anitha Pasupathy, Wyeth Bair

### **#11 Does Rate Remapping Interfere with Phase Coding in Hippocampal Place Cells?**

Honi Sanders, Daoyun Ji, John Lisman

### **#12 Odor Transformations through Multiple Layers of the Insect Olfactory System**

Pavel Sanda, Tiffany Kee, Nitin Gupta, Mark Stopfer, Maxim Bazhenov

### **#13 Central Pattern Generators (CPGs) Must Integrate Sensory Feedback in order to Respond Adaptively in Variable Environments**

K. M. Shaw, D. N. Lyttle, J. P. Gill, M. J. Cullins, J. M. McManus, H. Lu, P. J. Thomas

**#14 Artificial Intelligence in Systems Medicine: Finding a Treatment for Paralysis**

W. Baumgartner, D.M. Waldera-Lupa, D. Pape, I. Georgiev, I. Grichtchenko, L. Hunter, K. Stuhler, K. Cohen, B. Grimpe

**#15 A Mutual Connectivity Analysis (MCA) Framework with Convergent Cross-mapping and Non-metric Clustering**

Axel Wismueller, Xixi Wang, Adora M. DSouza, Lutz Leistritz

**#16 Impact of Multivariate Granger Causality Analyses with Embedded Dimension Reduction on Network Modules**

Lutz Leistritz, Axel Wismueller, Mahesh Nagarajan, Herbert Witte, Britta Pester, Christoph Schmidt

**#17 The Hierarchical Topographic Factor Analysis MATLAB Toolbox**

Jeremy R. Manning, Kimberly L. Stachenfeld, Rajesh Ranganath, Kenneth A. Norman, David M. Blei

**#18 Converging Catalogues, Warehouses, and Deployment Logistics into a Federated "Data Distribution"**

Yaroslav O. Halchenko, Michael Hanke

**#19 NeuroML: Model Exchange in Computational Neuroscience**

Sharon Crook, Suzanne Dietrich

**#20 Principles of High Fidelity, High Density Neural Recording**

Caroline Moore-Kochlacs, Jorg Scholvin, Justin P. Kinney, Jacob G. Bernstein, Nancy Kopell, Ed S. Boyden

**Poster Session 2**

**#21 Cognitive Strategies and Neural Correlates of Hierarchical Latent Inference**

D. McNamee, J. Gläscher, P. Bossaerts, J. P. O'Doherty

**#22 Getting Ready to Stop: Neural Correlates of a Bayesian Belief and Its Motor Consequence**

Sien Hu, Jaime Ide, Sheng Zhang, C.-S. Ray Li

**#23 Involvement of the Vibrissae in Sensing Fluid Flow**

Y.S.W. Yu, M.M. Graff, P.R. Jones, Y.B. Man, A.E. Beverage, D.J. Cesta, N.A. Patankar, V. Gopal, M.J.Z. Hartmann

**#24 A Comprehensive Neuromechanical Model of Spinal Control of Locomotion: Experimental Model Verification and Testing Model Predictions**

Boris I. Prilutsky, Sergey N. Markin, Alexander N. Klishko, Natalia A. Shevtsova, Ilya A. Rybak, Michel A. Lemay

#25 Long Term Reactivation in Hippocampus: Experimental Evidence and Information Geometric Approach

Jean-Marc Fellous, Masami Tatsuno

#26 Potential of IVIM MRI as a Cerebral Microvascular Biomarker

Gabrielle Fournet, Alexander M. Cerjanic, Jing-Rebecca Li, Denis Le Bihan, Bradley Sutton, Luisa Ciobanu

#27 A Point Process Filter to Estimate Optimal Placement of DBS Electrodes in the Subthalamic Nucleus  
Uri Eden

#28 Modeling the Relationship between Extracranial and Intracranial K-complexes in Humans

Eric Halgren, Donald Hagler, Sergey Gratiy, Istvan Ulbert, Rachel A. Mak-McCully, Nima Dehghani, Matthieu Rolland, Joseph Madsen, Sydney S. Cash

#29 Organization of Left-right Coordination of Neuronal Activity in the Mammalian Spinal Cord  
Locomotor CPG: Insights from Computational Modeling

Ilya A Rybak, Ronald M Harris-Warrick, Ole Kiehn

#30 Robust Inference for Nonstationary Spike Trains

Matthew Harrison, Asohan Amarasingham

#31 A Common High-dimensional Linear Model of Representational Spaces in Human Cortex

James Haxby

#32 Active Acoustic Sensing: Representing Space through Sound

Cynthia F. Moss, Melville Wohlgemuth, Ninad B. Kothari, Timothy K. Horiuchi

#33 Optimal Prediction of Moving Sound Source Direction in the Owl

Brian J Fischer, Weston Cox

#34 Time-domain Multiplexing of Multiple Items in an Auditory Coding Bottleneck

J.M. Groh, V.C. Caruso, J.A. Lee, D. Pages, S. Tokdar

#35 Structured Patterns of Dendritic Inhibition Revealed by Array Tomography

Erik Bloss, Jennifer Colonell, Bill Karsh, William Kath, Richard Fetter, Nelson Spruston

#36 Fully-automated Multi-objective Optimization for Fitting a Realistic Neuron Model to Experimental Data

Aushra Abouzeid, Nelson Spruston, William L. Kath

#37 Hippocampal Spine Head Sizes are Highly Precise

Thomas M Bartol, Cailey Bromer, Justin Kinney, Kristen Harris, Terry Sejnowski



#38 The Contribution of Active Dendritic Properties to Temporal Integration in a Network  
Melanie M. Lee, Emre R.F. Aksay, Mark S. Goldman

#39 Beyond the Single Cycle: Alterations in Neuronal Properties and Input/Output Functions Lasting throughout the Theta Network State  
Giovanni Talei Franzesi, Annabelle C. Singer, Suhasa B. Kodadaramaiah, Christoph Borgers, Nancy Kopell, Edward S. Boyden

#40 Effects of General Anesthetics on Somatosensory Cortical Neurons  
Francisco J. Flores, Suhasa B. Kodandaramaiah, Ian R. Wickersham, Gregory Holst, Giovanni Talei-Franzesi, Annabelle S. Singer, Nancy Kopell, Christoph Borgers, Craig Forest, Emery N. Brown, Edward S. Boyden

#41 Assistive Respiratory Pacing of the Diaphragm in the Rat Model Based on Ventilatory and Electromyographic Recordings  
Ricardo Siu, Brian Hillen, Brett Davis, Adeline Zbrzeski, Yannick Bornat, Jonathan Castelli, James Abbas, Sylvie Renaud, Ranu Jung

#42 Mechanisms of Interneuronal Control of Spontaneous Oscillations in a Full-scale Parallel Computer Model of the CA1 Network  
Marianne Bezaire, Kelly Burk, Ivan Soltesz

#43 The Distribution of Octopamine and Tyramine and their Receptors in the Honey Bee Brain  
Irina Sinakevitch, Brian H. Smith