

Rachel Kalmar

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Education

Stanford University, Neurosciences Ph.D. Program. 2004 –
University of California at San Diego, BS in Physics/Biophysics 1998-2002
BS in Physics/Biophysics. Graduated cum laude, with distinction from Department of Physics

Honors and Awards

Bio-X Graduate Student Fellowship, 2005 - 2008
NSF Graduate Fellowship, Honorable Mention, 2003 and 2005
Undergraduate Research Program, Cold Spring Harbor Laboratory, 2002
UCSD Undergraduate Research Scholarship*, 2000-1 & 2001-2
Howard Hughes Undergraduate Honors Thesis Program*, 2000-2001
Howard Hughes Undergraduate Summer Research Program*, 2000
American Association of University Women Scholarship, 2000
UCSD Warren College Honors Student, 1999 - 2002
American Radio Relay League Scholarship, 1997

Academic and Research Experience

Drs. Krishna Shenoy and Bill Newsome, Stanford University Fall 2004 - present
Thesis research. Studying neural dynamics of planning on single-trials, in the context of decision-making tasks. Project entails training of rhesus macaque monkeys, sterile surgeries, recording of quantitative behavioral and neural data, and computational methods for data analysis and modeling.

Computational Neuroscience: Vision Course, Cold Spring Harbor Summer 2006
2 week course on computational modeling and simulation in the context of research in the visual system. Lecture series focused on psychophysics, neurophysiology, computation, and their interactions.

Okinawa Computational Neuroscience Course, Okinawa, Japan Summer 2005
2 week course on “Predictions, Reward, and Decisions.” Lecture series spanned topics from machine learning to neural circuits for reward and motivation. Course project: exploration vs. exploitation in a matching task.

Dr. Brian Wandell, Stanford University Spring 2005
Graduate student rotation project. Learned techniques for acquiring and analyzing functional MRI signals. Explored retinotopic maps of normal and visually-impaired subjects, using fMRI data collected by other members of the Wandell lab.

Dr. Krishna Shenoy, Stanford University Winter 2005
Graduate student rotation project. Characterized variability in motor reach planning signals, recorded from macaque monkeys chronically implanted with 100-electrode arrays. Learned about basic science and engineering aspects of building neurally-controlled motor prostheses.

Dr. William Newsome, Stanford University Fall 2004
Graduate student rotation project. Recorded from choice-predictive neurons in superior colliculus of awake, behaving macaque monkeys. Compared choice-predictivity based on local field potential (LFP) recordings and spike data, analyzed temporal and spectral structure present in spike-triggered average LFP.

Dr. E.J. Chichilnisky, The Salk Institute 1999 - 2003
Research assistant. Studied ensemble visual motion signals in primate retinal ganglion cells using extracellular multielectrode recordings and comparison to human psychophysics. Characterized functional asymmetries in ON and OFF ganglion cells of primate retina. Built physiology and psychophysics rig, involved in development of 512-electrode array.

Dr. Anthony Zador, Cold Spring Harbor Laboratory Summer 2002
Undergraduate Research Program. Received grant to spend summer working on research project. Employed local field potential recordings *in vivo* in primary auditory cortex (A1) of the anesthetized rat to characterize response properties of auditory neurons, using natural sounds. Compared linear estimates of spectro-temporal receptive fields to investigate nonlinearity of A1 response properties.

Professor David Kleinfeld, Department of Physics, UCSD Spring 2002
Teaching assistant for Biophysical Measurements Lab (Physics 173/273). Conducted the neurobiology portion of upper division undergraduate/graduate course. Responsibilities included teaching students to set up electrophysiology rigs, design research projects, perform voltage clamp recordings from xenopus oocytes, analyze data.

Insightful Brain Workshop, University of Rochester Spring 2001
Invited participant. Week-long workshop of lectures and laboratory demonstrations, on topics of visual perception and cognition, sensory-motor coordination, computational modeling of neuronal circuits and cortical physiology.

Professor Jeff Butler, Mathematics Department, UCSD 1999-2000
Teaching assistant for Multivariable calculus (Math 10C). Conducted two discussion sections a week, held office hours, led review sessions, designed and maintained course website.

7th Grade Brain Day Winter 2005-2007
Conducted a hands-on brain anatomy and discussion day at a local middle school with other Stanford Neuroscience graduate students.

Publications

Research Papers

Chichilnisky EJ, Kalmar RS (2003) Temporal resolution of ensemble visual motion signals in primate retina. *J Neurosci* **23**(17):6681-6689.

Chichilnisky EJ, Kalmar RS (2002) Functional asymmetries in ON and OFF ganglion cells of primate retina. *J Neurosci* **22**(7):2737-47.

Conference abstracts and posters

Rivera Z, Kalmar R, Afshar A, Santhanam G, Yu BM, Ryu SI, Shenoy KV (2007) Single-trial representation of uncertainty about reach goals in macaque PMd. *Society for Neuroscience annual meeting*. In press.

Shenoy KV, Santhanam G, Ryu SI, Afshar A, Yu BM, Gilja V, Linderman MD, Kalmar RS, Cunningham JP, Kemere CT, Batista AP, Churchland MM, Meng TH (2006, invited talk) Increasing the performance of cortically-controlled prostheses. *Proc. of the 28th Annual International Conf. of the IEEE EMBS*, New York, NY: 6652-6656.

Kalmar RS, Gilja V, Santhanam G, Ryu SI, Yu BM, Afshar A, Shenoy KV. PMd delay activity during rapid sequential movement plans. Program No. 519.17. 2005 Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience.

Gilja V, Kalmar RS, Santhanam G, Ryu SI, Yu BM, Afshar A, Shenoy KV. Trial-by-trial mean normalization improves plan period reach target decoding. Program No. 519.18. 2005 Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience.

ES Frechette, MI Grivich, RS Kalmar, AM Litke, D Petrusca, A Sher, EJ Chichilnisky. Ensemble retinal motion signals and limits on behavioral speed discrimination. Program No. 935.8. *2004 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2004. Online.

Kalmar RS, Sher A, Givich MI, Petrusca D, Litke AM, Chichilnisky EJ. Receptive field microstructure

- of mammalian retinal ganglion cells revealed by large scale multielectrode recording. Program No. 698.5. *2003 Abstract Viewer and Itinerary Planner*. Washington, DC: Society for Neuroscience, 2003. CD-ROM.
- Grivich MI, Petrusca D, Kalmar RS, Sher A, Chichilnisky EJ, Litke AM. Classification of guinea pig retinal ganglion cells using large scale multielectrode recordings. Program No. 698.7. *2003 Abstract Viewer and Itinerary Planner*. Washington, DC: Society for Neuroscience, 2003. CD-ROM.
- Litke AM, Bezayiff N, Chichilnisky EJ, Dabrowski W, Grillo AA, Grivich MI, Grybos P, Hottowy P, Kachiguine S, Kalmar RS, Petrusca D, Sher A. A multielectrode array system with 512 electrodes for large scale recording of retinal ganglion cell activity. Program No. 429.18. *2003 Abstract Viewer and Itinerary Planner*. Washington, DC: Society for Neuroscience, 2003. CD-ROM.
- Litke AM, Bezayiff N, Chichilnisky EJ, Cunningham W, Dabrowski W, Grillo AA, Grivich M, Grybos P, Hottowy P, Kachiguine S, Kalmar RS, Mathieson K, Petrusca D, Rahman M, Sher A (2003) What does the eye tell the brain? Development of a system for the large scale recording of retinal output activity. In: IEEE Nuclear Science Symposium - Medical Imaging Conference Record (to be published in the IEEE Transactions on Nuclear Science). pp N30-34. Portland, Oregon: IEEE Trans. Nucl. Sci.
- Chichilnisky EJ, Kalmar RS. Spike timing precision in an ensemble code for visual motion. FASEB retina meeting, Vermont. July 2002.
- Chichilnisky EJ, Kalmar RS. Ensemble visual motion in primate retinal ganglion cells. *Society for Neuroscience Abstracts* **27**:397.5 (2001).
- Chichilnisky EJ, Kalmar RS. Functional asymmetries in ON and OFF ganglion cells of primate retina. *Investigative Ophthalmology and Visual Science* **42/4**:3633 (2001).

* Research for these programs was conducted in the laboratory of Dr. E.J. Chichilnisky. See Academic Experience.

**except summer 2002

Programming Skills

LISP, Matlab, Mathematica, Applescript, HTML/CSS, FORTRAN

Extracurricular Activities

Officer and founding member of Bionexus, student-postdoc group, Summer 2005 – present
 Neuroscience Seminar Series Representative, September 2005 – present
 Webmaster, Neurostudents website, September 2005 – present
 Brazilian dance, regular performer with Sambao, Bay Area-based samba group, October 2005 - present
 Estudio Internacional Sampere, intensive Spanish study in Spain, Summer 2002 & Spring 2004
 Co-taught weekly Cuban salsa and Rueda de Casino class, Fall 2003
 PlazaCuba intensive dance workshop in Havana, Cuba, Summer 2003
 Teaching assistant, Biophysical Measurements Lab, UCSD, Spring 2002
 Teaching assistant, Multivariable Calculus, UCSD, 1999-2000
 Organized Organic Foods Festival and Green Energy Fair at UCSD, 1999
 Society of Women Engineers, 1997-1999
 Air Force Reserve Officer Training Corps (AFROTC), 1997-1998
 Eisendrath International Exchange, Semester Study in Israel, 1995

Avocations

travel, mountain unicycling, African, Brazilian, and Cuban dance, photography, hiking, knitting