Alexay Kozhevnikov

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Summary

I am a Ph.D. with a diverse background in physics and technology (mesoscopic physics, radio-frequency and millimeter-wave measurements, microfabrication, cryogenics) and biology (systems neuroscience, electrophysiology, mathematical analysis of biological data, imaging, molecular biology) looking for an academic position that will allow me to pursue research focusing on addressing fundamental problems in neuroscience by applications of novel experimental techniques.

Education and training

Neuroinformatics Course, Marine Biological Laboratory, Woods Hole, MA (2004).
Neurobiology Course, Marine Biological Laboratory, Woods Hole, MA (2002).
Ph.D. – Yale University, Department of Physics, 2001 (GPA 3.9/4.0)
M.S. – Yale University, Department of Physics, 1996.
B.S. equivalent – Moscow State University, Biophysics, 1995, with excellence (GPA 4.0/4.0).

Experience

Postdoctoral Fellow, McGovern Institute and Department of Brain and Cognitive Science, Massachusetts Institute of Technology, Cambridge, MA, USA (07/2003 to present)

Research topic: Song learning in juvenile songbirds.

Brief description of project:

I am carrying out and analyzing chronic neural recordings in juvenile birds that are learning to mimic their tutor's song. The focus is to understand the neural mechanisms of the vocal performance evaluation that allow the bird to achieve a nearly perfect match between its song and the song of its tutor.

Post-doctoral Researcher, Department of Biological Computation and Theoretical Physics, Bell Laboratories, Lucent Technologies, Murray Hill, NJ, USA (05/2001 to 06/2003).

Research topic: Neural mechanisms of sequence generation in a songbird.

Brief description of project:

I was studying the brain dynamics of a songbird during singing. I have performed microsurgeries and chronic implantations as well as single-neuron electrophysiological recordings in birds during singing. I have also carried out mathematical analysis of collected data. Using the motorized microdrive developed at Bell Labs, I have performed the first recordings ever made from identified neurons in premotor nucleus HVC of a songbird. Recordings from these neurons revealed a novel neural code – these neurons fire extremely sparsely during singing. A population of these neurons forms a representation of time in the song control system.

Graduate Assistant in Research, Yale University, New Haven, CT, USA (01/1996 to 04/2001).

Thesis Topic: Electron dynamics and coherence effects in mesoscopic hybrid normal metal - superconductor devices.

Areas of expertise: Mesoscopic physics, high-sensitivity cryogenic RF and millimeter-wave measurements, microfabrication.

Brief description of projects:

I developed a setup for high-sensitivity transport and noise measurements of mesoscopic solid-state devices at high frequencies (0.1 - 40 GHz). I was a member of the team that developed Radio-Frequency Single-Electron Transistor - one of the most sensitive and the fastest electrometers up-to-date. Performed solid-state device fabrication (photolithography, electron beam lithography, thin film deposition) and was responsible for the installation and operation of Nabity electron-beam lithography system at Yale. Carried out cryogenic (down to 40 mK) measurements of sub-micron sized solid-state devices in order to study the non-equilibrium electron dynamics and phase-coherence effects in hybrid normal metal - superconductor devices.

Teaching Assistant and Math and Science Tutor (part-time), Yale University, New Haven, CT, USA (09/1995 to 04/2001).

Instructor in introductory Physics Laboratory course at Yale University Summer School (summer 2000). Acting instructor (1999) and teaching assistant (1996-1998) in the graduate Superconductivity Lab, in a class of typically 16 students. In charge of grading weekly problem sets in an intermediate Physics class of 190 students (1995 - 1996). Math and Science Tutor at Trumbull College, Yale University (1996 - 2001).

Programmer, Capital Regent Securities, Moscow, Russia (04/1995 - 08/1995).

Using MS Access developed a networked database management system for securities quotations and operations of a small brokerage firm. The system started being used for securities trades only 2 months after the development process started.

Assistant in Research (part-time), Moscow State University, Moscow, Russia (08/1994 - 03/1995).

Developed software and performed numerical modeling of convective motions and non-equilibrium ion distributions in liquid solutions. Designed an analyzer of human motions and used it for goal-directed motion analysis.

Honors and Awards

John Sloane Fellowship, Yale University, 1996-1997.
International Scientific Foundation Fellowship, Moscow State University, 1995.
Moscow Mayor's Office Fellowship, Moscow State University, 1994-1995.
Keldysh Fellowship, Moscow State University, 1993-1994.

Other Skills and Interests

Computer: Win/Mac/Unix, data acquisition (LabVIEW) and analysis (Matlab, IgorPro), numerical and analytical modeling (C++, Mathematica), database management system development (MS Access).
Languages: fluent English and Russian (native language), conversational German and French.
Other interests: RF/wireless communications, computer networks/security, biotechnology.

Publications
Journal Articles

"Songbird nucleus HVC does not transmit auditory information to a basal ganglia learning circuit during singing", A.A. Kozhevnikov and M.S. Fee, submitted to PNAS (2004).

"Premotor activity of identified neurons in nucleus HVC of a songbird", A.A. Kozhevnikov and M.S. Fee, submitted to Journal of Neuroscience (2004).

"Sleep bursts in the songbird nucleus RA are driven by input from the premotor pathway rather than a basal-ganglia pathway", R.H. Hahnloser, A.A. Kozhevnikov and M.S. Fee, submitted to Journal of Neuroscience (2004).

"Phase Sensitive Shot Noise in an Andreev Interferometer", B. Reulet, A. A. Kozhevnikov, D. E. Prober, W. Belzig, and Yu. V. Nazarov, ***Physical Review Letters*** 90, 066601 (2003).

"An ultra-sparse code underlies the generation of neural sequences in a songbird", R.H. Hahnloser*, A.A. Kozhevnikov*, and M.S. Fee, ***Nature,*** 419, 65-69 (2002).
* - these authors contributed equally to this work

"Observation of Photon-Assisted Noise in a Diffusive Normal Metal - Superconductor Junction," A.A. Kozhevnikov, R.J. Schoelkopf, D.E. Prober, ***Physical Review Letters*** 84, 3398 (2000).

"Measurements of Shot Noise in Diffusive Normal Metal - Superconductor Junctions," A.A. Kozhevnikov, R.J. Schoelkopf, L.E. Calvet, M.J. Rooks, D.E. Prober, ***Journal of Low-Temperature Physics*** 118, 671 (2000).

"Radio-Frequency Single-Electron Transistor: a Fast and Sensitive Electrometer Analogous to the Radio-Frequency Superconducting Quantum Interference Device," P. Wahlgren, R.J. Schoelkopf, A.A. Kozhevnikov, P. Delsing, D.E. Prober, T. Claeson, ***Journal of Superconductivity*** 12, 741 (1999).

"The Radio-Frequency Single-Electron Transistor (RF-SET): A Fast and Ultrasensitive Electrometer," R.J. Schoelkopf, P. Wahlgren, A.A. Kozhevnikov, P. Delsing, D.E. Prober, ***Science*** 280, 1238 (1998).

"Observation of "Photon-Assisted" Shot Noise in a Phase-Coherent Conductor," R.J. Schoelkopf, A.A. Kozhevnikov, D.E. Prober, M.J. Rooks, ***Physical Review Letters*** 80, 2437 (1998).

"Frequency Dependence of Shot Noise in a Diffusive Mesoscopic Conductor," R.J. Schoelkopf, P.J. Burke, A.A. Kozhevnikov, D.E. Prober, M.J. Rooks, ***Physical Review Letters*** 78, 3370 (1997).

"Study of Correlations of Parameters of Simple Goal-directed Movements," A.A. Kozhevnikov, ***Russian Physical Thought*** *(Russkaya Fizicheskaya Mysl')*, No. 1, p.100 (1995).

Book chapters

"Neural Mechanisms of Sequence Generation in the Songbird", M.S. Fee, A.A. Kozhevnikov, R.H. Hahnloser, Ann. New York Academy of Sciences, 1016, 153-170 (2004).