Department of Physics
Pavillon MacDonald
150 Louis Pasteur
Ottawa ON Canada
K1N 6N5

Dr. Kristin R. Swanson
Department of Pathology
Department of Applied Mathematics
University of Washington
Seattle, WA, 98195

Dear Dr. Swanson:

I am writting to apply for Research Scientist or Post-doctoral position in your group. I'm currently a post-doctoral fellow at Prof. Andr Longtin's group in the Department of Physics at U Ottawa. I finished my PhD under the supervision of Prof. Rachel Kuske and Prof. Yue-Xian Li in the Department of Mathematics at University of British Columbia in 2009.

During my post-doctoral fellowship, I mainly focus on the experimental data analysis and modelling of the nervous systems with interested topics ranging from behavior and communication to neuronal network and ionic mechanisms. In collaboration with Prof. John Lewis's lab at Biology, we investigate the relationship between motion of the free-swimming electric fish and the contrasts and chirps of the communication signals. We analyse the time series data obtained from in vivo recording and image data obtained from the simultaneous video-taping using various statistical and mathematical methods. We also model the sensory signals and motion of the fish. In collaborate with Prof. Len Maler's lab at Faculty of Medicine, we study the transmission of sensory information at different cellular levels, e.g. from peripheral receptors to central neurons in the brain, through in vivo experiments and modelling. In collaboration with Prof. Cathy Morris at Ottawa Hospital Research Institute and Prof. Bla Jos at Physics, we discover the activity of single node of Ranvier caused by brain traumatic injury and stochastic propagation of action potentials along the axon with a chain of nodes . On the other hand, the above collaborating work with experimentalists also triggers new theories/phenomena on the nonlinear dynamical systems, for example envelope mode-locking and noised induced coherence suppression that we found.

During my PhD study, I mainly working on the stochastic analysis and simulation on the non-linear dynamical systems, especially neuronal models. We derived a general framework for the activity (i.e. coherence resonance) of excitable systems in the vicinity of Hopf bifurcation under the influence of noise, using lambda-omega system as a model. This work was then extended to study the interaction and competition of the coupling and noise on the synchrony in two weakly coupled neurons. We demonstrated a new phenomenon induced by noise, mixed-mode oscillations. Later we investigated the spike time reliability, especially we showed that the intrinsic frequency of extrinsic noise has no direct relationship with spike time reliability for parameters corresponding to quiescent states in the underlying system.

It would be my honour to join you team working on the brain tumor modeling, and to use my current knowledge to analyze clinical/experimental data, and to learn more techniques on the medical images. Thanks for your consideration! I look forward to hearing from you.

Yours Faithfully,

Na Yu

Na Yu

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Education

Ph.D Mathematics, University of British Columbia, Canada, 2009.
Thesis title: *Stochastic Phase Dynamics in Neuron Models and Spike Time Reliability*
Thesis advisor: Prof. Rachel Kuske and Prof. Yue-Xian Li

M.S. Mathematics, University of Science and Technology Beijing, China, 2002.

B.S. Mathematics, Hebei University, China, 1999

Positions Held

Post-doctoral Fellow, Department of Physics, University of Ottawa. Sponsor: Prof. André Longtin. 2009-present.

Teaching and Research Assistant, Department of Mathematics, University of British Columbia. 2003-2008.

Research Fellow, Beijing Institute of International Economics and Trade, Beijing. 2002-2003.

Publications

Na Yu, Ginette Hupé, John Lewise and André Longtin, Coding Conspecific Identity and Motion in the Electric Sense, submitted.

Jason Middleton, Na Yu, André Longtin and Leonard Maler, Routing the flow of sensory signals using plastic responses to bursts and isolated spikes: experiment and theory, *Journal of Neuroscience* 31, 2461-2473 (2011).

Na Yu, Yue-Xian Li and Rachel Kuske, Spike Time Reliability In Two Cases of Threshold Dynamics, submitted.

Na Yu, Rachel Kuske and Yue-Xian Li, Stochastic Phase Dynamics and Noise-Induced Mixed-Mode Oscillations in Coupled Oscillators, *Chaos* 18:15112-15126 (2008).

Na Yu, Rachel Kuske and Yue-Xian Li, Stochastic Phase Dynamics: Multi-Scale Behavior and Coherence Measures, *Physical Review E*, 73:056205-05212 (2006).

Lequan Min and Na Yu, Analytical Criteria for Local Activity of Two-Port CNN with Three and Four State Variables and Applications, *International Journal of Bifurcation and Chaos*, 12:931-963 (2002).

Na Yu and Lequan Min, Analytical Criteria for Local Activity of CNN with Two Ports and Application to Smoothed Chua's Circuit, *Journal of University of Science and Technology Beijing*, 9:65-73 (2002).

Lequan Min and Na Yu, Application of Local Activity Theory of Cellular Neural Network with Two Ports to the Coupled Lorenz-Cell Model, *Communications in Theoretical Physics*, 37:759-767 (2002).

Paper in Preparation:

Na Yu, Béla Joós, André Longtin, Catherine E. Morris, Modeling Various Activities of Blebbed Node of Ranvier Due to the Left-Shifted Nav Channel and the Propogation along Axon in Traumatic Brain Injury. (manuscript writing).

Na Yu and André Longtin, Coherence Surpression: When Beat Frequency meets Intrinsic Neuron Frequency, (manuscript writing, invited paper).

Na Yu and André Longtin, Fish counting: Analysis and Modeling, (manuscript writing).

Na Yu, Ginette Hupé, John Lewise and André Longtin, Fish in motion: contrast, distance and chirps, (manuscript writing).

Na Yu and André Longtin, Envelop Locking in Integrate-and-Fire Neural Oscillators, (70% finished).

Presentations

Gordon Research Conference in Sendory coding and Natural Enviorment, Lewiston, ME (July 2010).
How can fish recognize their neighbors?

Invited talk, SIAM Conference on the Life Sciences, Pittsburgh, PA (July 2010).
Representing Signal Mixtures using Plastic Responses to Bursts and Isolated Spikes: Experiment and Theory.

International Conference on Mathematical Biology and Annual Meeting of The Society for Mathematical Biology, Vancouver, BC (July 2009).
Spike Time Reliability In Two Cases of Threshold Dynamics

Rhythms in the Hypothalamus and Pituitary, American Institute of Mathematics, Palo Alto, CA (August 2008).
Numerical Study on Spike Time Reliability

Workshop for Young Researchers in Mathematical Biology, Mathematical Bioscience Institute, Ohio State University, Columbus, OH (September 2007).
Stochastic Phase Dynamics and Noise-Induced Mixed-Mode Oscillations in Coupled Oscillators

Synchronous Rhythms in the Brain, Peter Wall Institute for Advanced Studies, Vancouver, BC (June 2007).
Stochastic Phase Dynamics and Noise-Induced Mixed-Mode Oscillations in Coupled Oscillators

Workshop on Dynamical Systems with Emphasis on Extended Systems, MSRI, Berkeley, CA (January 2007)
Stochastic Phase Dynamics and Noise-Induced Mixed-Mode Oscillations in Coupled Oscillators

Summer School in Systems Biology Dynamics, McGill University, Montreal, QC (May 2006).
Effects of Noise on Quiescent 'Neurons'

Connecting Women in Mathematics across Canada II, Banff International Research Station, Banff, AB (July 2005).
Noise-Induced Coherence and Synchrony in Quiescent 'Neurons'

Teaching

Lab Tutor, Fourth Summer School in Computational Neuroscience, U Ottawa. June 2010.
Duties included tutoring students with daily assignments (various skills of data analysis and mathematical

modeling) in computer lab and offering advices for their final projects (open questions in computational neuroscience).

Substitute Lecturer, Dept. of Mathematics, UBC. Summer 2008.
Differential Calculus (Math 184, class size: 86).

Lecturer, Dept. of Mathematics, UBC. Fall 2006.
Differential Calculus (Math 184, class size: 54). Overall quality of instructor's teaching: 4/5. Written student evaluations available upon request.

Workshops Instructor, Dept. of Mathematics, UBC. Fall 2007 and Winter 2008.
Differential Calculus with Physical Applications (Math 180, class size $\approx$ 30).
Integral Calculus (Math 101, Math 103, Math 105, class size $\approx$ 30).

Teaching Assistant, Dept. of Mathematics, UBC. 2003-2008.
Differential Calculus (Math 100, Math 180, Math 185), Integral Calculus (Math 103, Math 105), Linear Algebra (Math 223), Multivariable and Vector Calculus (Math 263), Linear Differential Equations (Math 265), Introduction to Probability (Math 302).

External Training

Training Course on Fundamentals of Genomics, Michael Smith Laboratories, UBC, (July 2007).

Summer School on Systems Biology Dynamics, McGill University, (May 2006).

Programing Skills

Skilled in Matlab programming, XPPAUT and XMGR.

Familiar with Visual Basic programming and Maple.

Experienced in using LaTeX for scientific document typesetting, Windows Office, and limited C and HTML experience.

References

André Longtin
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Rachel Kuske
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