AGENDA

Symposium AM Session
BSB 3.03.02, Loeffler Seminar Rm

9:00       Opening remarks by Neurosciences Institute Director, Charles Wilson

9:15-10:00 An Introduction to Power-Law Dynamics
Given by Larry Abbott

10:00-11:00 Dietmar Plenz, National Institute of Mental Health, NIH
Neuronal Avalanches and Coherence Potentials: Critical Brain Dynamics

Break 15 min

11:15-12:15 John Beggs, University of Indiana
The Criticality Hypothesis: How Brains Might Optimize Information Processing

12:15-1:15 Break for Lunch (see handout for UTSA eateries)

Symposium PM Session
BSB 3.03.02, Loeffler Seminar Rm

1:15-2:15 Fidel Santamaria, University of Texas at San Antonio
The Interactions That Slow You Down: Power Law Adaptation in Single Neurons

2:15-3:15 Larry Abbott, Columbia University
Multiple Timescales in Networks of Spiking Neurons

Break 15 min

3:30-4:30 Panel Discussion & Podcast Recording
About the Panel

Larry Abbott is William Bloor Professor of Neuroscience, Physiology & Cellular Biophysics, and Biological Sciences at Columbia University. He is also Co-Director of the Center for Theoretical Neuroscience at Columbia’s College of Physicians & Surgeons, and a Member of The Kavli Institute for Brain Science. Dr. Abbott’s research involves the computational modeling and mathematical analysis of neurons and neural networks. Analytic techniques and computer simulation are used to study how single neurons respond to their many synaptic inputs, how neurons interact to produce functioning neural circuits, and how large populations of neurons represent, store, and process information. Areas of particular interest include spike-timing dependent forms of synaptic plasticity, transformations of sensory encoding in olfaction, and the dynamics of internally generated activity and signal propagation in large neural networks.

John Beggs is Associate Professor of Biophysics at Indiana University. He studied applied and engineering physics at Cornell, where he obtained a B.S and an M.Eng. After teaching high school math and science in Samoa for two years with the Peace Corps, he obtained his Ph.D in Neuroscience at Yale. He did postdoctoral work at the NIH prior to being appointed to his current position. Dr. Beggs’ main research focus is on emergent properties in networks of cortical neurons. Most recently, he and his collaborators have been able to record up to 350 neurons simultaneously at high density and high temporal resolution for several hours, revealing detailed information about critical dynamics and functional connectivity.

Dietmar Plenz is Chief of the Section on Critical Brain Dynamics in the Intramural Research Program at the NIMH. He received his Ph.D. in Biology in 1993 at the Max Planck Institute of Biological Cybernetics, Germany, where he pioneered in vitro networks to study the emergence of neuronal population dynamics. He continued his investigations during a postdoctoral fellowship at the University of Tennessee, Memphis, and joined the faculty at the National Institute of Mental Health in 1998. He studies the self-organization of neural networks at many scales ranging from in vitro preparations to animals and humans by combining electrophysiological and imaging techniques with computer modeling. He received the NIH Director award for the discovery of neuronal avalanches in 2010.

Fidel Santamaria is Associate Professor of Biology at the The University of Texas at San Antonio. He earned a B.S in Physics at Universidad Nacional Autonoma de Mexico, and a Ph.D in Computational Neuroscience from Caltech under the mentorship of Prof. James Bower. Prior to his current position, Dr. Santamaria was a postdoctoral fellow in the lab of Prof. George Augustine at Duke University, where his simulations and experimental studies determined that dendritic spines alter intraneuronal molecular diffusion according to a power law. His current research is aimed at understanding how dendritic complexity affects biochemical computation over a wide range of spatial scales in real and modeled neurons. In conjunction with his in vitro studies, Dr. Santamaria has been instrumental in developing high-performance computing infrastructure and tools for modeling biological systems at UTSA. His research is funded by multiple Divisions within the National Science Foundation, including Emerging Frontiers (EF), Human Resource Development (HRD), and Integrated Organismal Systems (IOS).