



2nd Annual Mathematics Distinguished Lecture

Thursday, October 14th, 2010

12:30 - 1:30 pm (Refreshments at 12:00 pm)

3rd floor Library Apse (West)

Professor William L. Kath

Engineering Sciences and Applied Mathematics
Neurobiology and Physiology
Northwestern University

Computational Modeling of Neurons

With its approximately 100 billion neurons and 200 trillion connections, the human central nervous system is astoundingly complex. Nevertheless, experimental advances are rapidly revealing new insights about the workings of neurons and the networks in which they are connected. Simultaneously, computational models of neurons have grown swiftly in terms of both their capability and utility. When constrained by experimental data, such models greatly enhance the observations and provide tools to construct new experimentally testable predictions.

In this talk I will describe how this two-pronged approach has helped explain some of the function of hippocampal CA1 pyramidal neurons, a group of principal cells in a region of the brain that is important for the formation of new memories. The models and experiments indicate that these relatively large neurons integrate and process their inputs in a two-stage manner, in that they first combine inputs in localized parts of the dendritic tree before making an ultimate determination whether or not to signal downstream neurons with an action potential.

Bill Kath is a professor in the Departments of Engineering Sciences and Applied Mathematics & Neurobiology and Physiology. From 2005-2010 he was the Co-Director of the Northwestern Institute on Complex Systems at Northwestern University. His research interests include computational neuroscience, nonlinear optics, linear and nonlinear wave propagation and nonlinear dynamics. He received the NSF Presidential Young Investigator Award in 1985, was elected a Fellow of the Optical Society of America in 2007, and elected a Fellow of the Society for Industrial and Applied Mathematics in 2010. He has over 150 peer reviewed publication and 4 US patents.

<http://www.uccs.edu/math/colloquium>

Students are strongly encouraged to participate