LARRY ABBOTT

Can a state of chaos be a good thing for the human mind? Activity recorded from neurons in the brain often looks random or chaotic. How do we make sense of the world and produce precisely controlled responses when so much of the activity in our brains is chaotic? Professor Larry Abbott will show how brain circuits can switch between chaotic and well-controlled patterns of activity, illustrating these points with computer demonstrations of network models. He will also discuss how chaos may be essential for a healthy brain and demonstrate what goes wrong when activity is insufficiently chaotic.

Larry Abbott is a professor of theoretical neuroscience and co-director of the Center for Theoretical Neuroscience at Columbia University. He received his Ph.D. in physics at Brandeis University in 1977 and spent ten years working in theoretical particle physics. His research in neuroscience involves the mathematical modeling and analysis of neurons and neural networks, using analytic techniques and computer simulation to show how populations of neurons interact to produce functional circuits. The goal is to determine the mechanisms by which networks of neurons represent, store, and process information. Recent research topics include multi-timescale models of synaptic plasticity, analysis of network dynamics with applications to sensory processing, and modeling olfactory processing in the fly. Abbott is the recipient of an NIH Pioneer Award and is the co-author of a widely used textbook on theoretical neuroscience.

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13th ANNUAL

MIND/BRAIN LECTURE SERIES

The Swartz Foundation's scientific and philosophical perspective on theoretical neuroscience is that capabilities of the brain—from sensory perception to learning to consciousness—intrinsically derive from biophysical properties and anatomical pathways…*the mind is the brain at work.*

Recent neuroscience research has led us to better understand the relationship between the mind and the brain, requiring the collaboration of investigators from a wide range of disciplines: cognitive science, computer science, electrical engineering, mathematical physics, theoretical neurobiology, etc. The application of systems analysis to distributed brain dynamics is also providing a deeper interpretation of brain activity imaging and data analysis related to human behavior. The Swartz Foundation and Stony Brook University present this ongoing lecture series to acquaint the University community and the public with current research in neuroscience.

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are proud to present

an exploration into

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with

Larry Abbott

Monday, March 2, 2009

at 4:30 pm

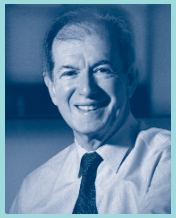
Staller Center for the Arts

"Theoretical neuroscience has experienced explosive growth over the past 20 years. In addition to bringing new researchers into the field with backgrounds in physics, mathematics, and engineering, theoretical approaches have helped to introduce new ideas and shape directions of neuroscience research."
—Larry Abbott

THE SWARTZ FOUNDATION

The Swartz Foundation was established by Jerry Swartz in 1994 to explore the application of physics, mathematics, and engineering principles to neuroscience, as a path to better understanding the mind/brain relationship.

To achieve these goals, the Swartz Foundation supports research at 11 centers for theoretical neuroscience: The Salk Institute, California Institute of Technology, New York University, University of California at San Francisco, Brandeis University, University of California at San Diego, Cold Spring Harbor Laboratory, and most recently, Columbia, Princeton, Yale, and Harvard universities. In general, our objective is to understand the distributed dynamics of brain activity and identify principles of brain function in relation to cognition and behavior. Targeted research projects range from experimental investigations of brain circuitry to computational modeling of large-scale neuronal networks to exploration of nonconscious mental processing—all utilizing physical and mathematical principles. The Swartz Foundation also organizes and sponsors neuroscience workshops and meetings. Core themes have included communication in brain systems, neurobiology of decision making, and large-scale neural network modeling.



Dr. Jerome Swartz co-founded Symbol Technologies Inc. in 1975 and was its chairman of the board and chief scientist until retiring in 2004. Swartz received a B.E.E. degree from the City University of New York and a Ph.D. in electrical engineering from Brooklyn's Polytechnic University, where he was the recipient of National Science Foundation and Ford Fellowships.

Swartz is an expert in the allied engineering physics fields of electro-optics, laser systems, and optical design, with particular application to new product development. He is credited with some 200 U.S. patents and 30 published papers. He is a member of the National Academy of Engineering and a Fellow of the IEEE. Under his leadership, Symbol Technologies was awarded the 1999 National Medal of Technology, the highest honor for technical innovation in the United States. Swartz is a trustee of the Stony Brook Foundation, Cold Spring Harbor Laboratory, and the University of California at San Diego.

More information is available at *www.theswartzfoundation.org*

13th ANNUAL SWARTZ FOUNDATION

MINDBRAINLECTURE

PROBING THE MYSTERIES OF THE MIND

SENSE FROM CHAOS:

CONTROLLING THE DYNAMIC NETWORKS OF THE BRAIN

Larry F. Abbott, Ph.D.
William Bloor Professor of
Theoretical Neuroscience and
Co-director of the Center for Theoretical
Neuroscience, Columbia University

Monday, March 2, 2009
4:30 pm

Staller Center for the Arts, Main Stage
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