Dr. Kristen Harris: Nanoscale analysis of structural synaptic plasticity

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Bio: Kristen Harris is Professor of Neuroscience and Fellow in the Center for Learning and Memory at the University of Texas at Austin. For more than two decades, her laboratory has pursued understanding of structural synaptic plasticity in the developing and mature nervous system using three-dimension reconstruction from serial section electron microscopy (3DEM). Dr. Harris received training in neuroscience earning her M.S. from the University of Illinois, Ph.D. from Northeastern Ohio University's College of Medicine, and postdoctoral training at Massachusetts General Hospital. She then served on the faculty of the Harvard Medical School, Boston University, and the Medical College of Georgia, where she was Director of the Synapses & Cognitive Neuroscience Center. She has been the recipient of several awards including the Alfred P. Sloan Research Fellowship, Packard Foundation Grant, Georgia Research Alliance Eminent Scholar, Javits Merit Award, Brain Research Foundation Fellowship and others. She serves on the scientific advisory boards for the Max Planck Institute for Brain Research in Frankfurt, the HHMI – Janelia Research Campus in Virginia, and the Allen Institute for Brain Research in Washington.

Abstract: There will be three main themes in this presentation. We will discuss new findings emerging from densely reconstructed volumes of synapses and other structures in the hippocampus, a critical brain region for learning and memory. We will show that saturating long-term potentiation (LTP), a cellular mechanism of learning and memory, leads to the silent growth of synapses. This silent growth appears to be the basis for the spontaneous unsaturation of LTP a couple hours later, at which time new LTP can be achieved. These findings provide obvious parallels to the advantage of spacing learning episodes over time versus massed learning as is done when students cram for a test, but only obtain short term memory of the material. Finally, we will describe new efforts to enhance 3D analysis from serial section electron microscopy in large imaging fields that maintain the high resolution needed to investigate subcellular structures that are the basis of cellular support for synaptic plasticity.