ABOUT BCS
RESEARCH
ACADEMICS
PEOPLE

- **Faculty**
- Staff
- Researchers
- Postdocs
- Graduate Students
- Undergrad Students

NEWS & EVENTS
DIVERSITY & OUTREACH
GIVING

BCS Website
BCS People
MIT Wide

SEARCH

People / Faculty

Elly Nedivi, Ph.D.
Professor of Neurobiology

Department of Brain and Cognitive Sciences
Building: 46-3239
Lab: Nedivi Lab
Email: nedivi@mit.edu

Molecular Genetic Analysis of Synaptic Plasticity

The capacity of the brain to modify connections in response to levels of activity is termed plasticity. Plasticity is a prominent feature of brain development, and in the adult underlies learning and memory and adaptive reorganization of sensory maps. To understand the cellular mechanisms that underlie activity-dependent plasticity in the developing and adult brain, we are identifying and characterizing the participating genes and the function of the proteins they encode. This work began with the cloning of a large number of activity-regulate genes that we termed candidate plasticity genes (CPGs). Although only a small subset of these genes have been pursued to date, it is clear that the pool is highly enriched for genes that are relevant to neuronal and synaptic function.

One CPG characterized in depth, CPG2, has emerged as a key component of a specialized postsynaptic endocytic mechanism devoted to internalization of synaptic proteins, including glutamate receptors. Another, CPG15, plays a dual role in the brain: as a survival factor that rescues cells from apoptosis, and as a growth and differentiation factor that affects process outgrowth and synaptic maturation.

In collaboration with Dr. So's group in the Dept. of Mechanical Engineering at MIT w e have fabricated a custom designed multi-photon microscope for chronic *in vivo* imaging of neuronal morphology in the intact rodent cerebral cortex. Using this system we have imaged and reconstructed the dendritic trees of neurons in visual cortex of *thy1* -EGFP transgenic mice. These mice express EGFP in a random subset of neurons sparsely distributed within the superficial cortical layers that are optically accessible through surgically implanted cranial windows. Chronic imaging of the same neurons over a period of months, revealed an unexpected degree of remodeling in adult neurons. Establishing the baseline dynamics of dendritic remodeling now allows us to examine the brains of mice deficient in specific CPGs and ask how they compare with normal brains.

Loebrich S, Nedivi E. The function of activity-regulated genes in the nervous system. Physiol Rev. 2009 Oct;89(4):1079-103. Review.

Holtmaat A, Bonhoeffer T, Chow DK, Chuckowree J, De Paola V, Hofer SB, Hübener M, Keck T, Knott G, Lee WC, Mostany R, Mrsic-Flogel TD, Nedivi E, Portera-Cailliau C, Svoboda K, Trachtenberg JT, Wilbrecht L. Long-term, high-resolution imaging in the mouse neocortex through a chronic cranial window.

Nat Protoc. 2009;4(8):1128-44. Epub 2009 Jul 16.

Lee WC, Chen JL, Huang H, Leslie JH, Amitai Y, So PT, Nedivi E. A dynamic zone defines interneuron remodeling in the adult neocortex. Proc Natl Acad Sci U S A. 2008 Dec 16;105(50):19968-73. Epub 2008 Dec 9.

Fujino T, Wu Z, Lin WC, Phillips MA, Nedivi E. cpg15 and cpg15-2 constitute a family of activity-regulated ligands expressed differentially in the nervous system to promote neurite growth and neuronal survival. J Comp Neurol. 2008 Apr 10;507(5):1831-45

Additional Publications

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
77 Massachusetts Ave Cambridge, MA 02139
(tel) 617.258.9344