

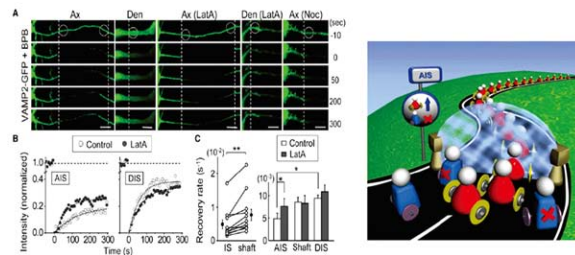
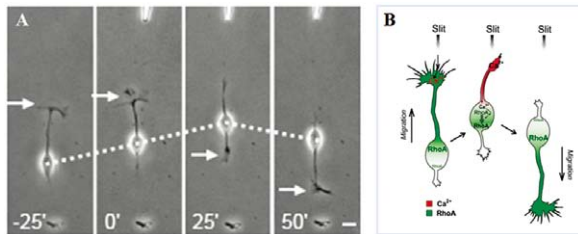


# Research Team for Neural Development and Plasticity

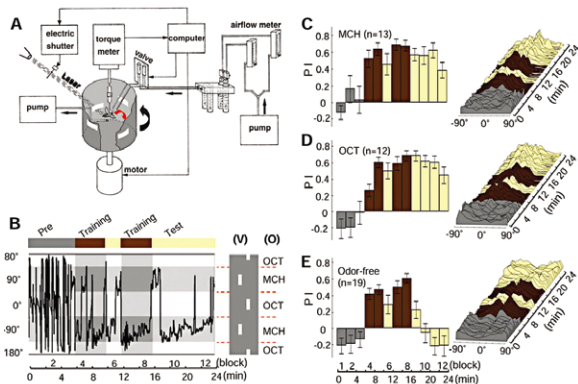
The brain consists of billions of nerve cells, called neurons, which make specific connections (called synapses) among them to form many neural circuits to perform various brain functions, including processing, storage, and retrieval of information. Each neuron is a polarized cell. It sends out many highly arborized dendrites on one end for receiving input signals and a single long axon on the other end for delivery of output signals to distant target neurons. How does the neuron develop this polarize structure during early differentiation? How does the neuron find its appropriate place in the brain? How does the growing axon find its appropriate target cell to make synaptic connections (known as synaptogenesis)? How does the efficacy of synaptic transmission change upon repetitive use of the synapse (known as synaptic plasticity)?

How does the synaptic plasticity provide the learning and memory capacity of the neural circuit? These outstanding questions remain to be answered in the field of neuroscience.

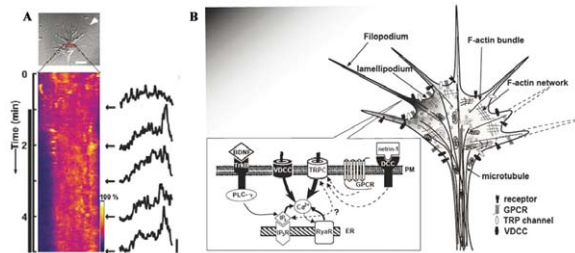
The recommended group of investigators from the Institute of Neuroscience, CAS has made important contributions in the past ten years to the field of neuroscience. They have developed novel experimental approaches at the cellular and molecular levels that allowed them to make new discoveries that offer insights into the cellular process of neuronal polarization, guidance of neuronal migration and axon pathfinding, synaptogenesis, synaptic plasticity and learning/memory mechanisms. These findings are published in top journals in biology and have attracted attention of the international neuroscience community.



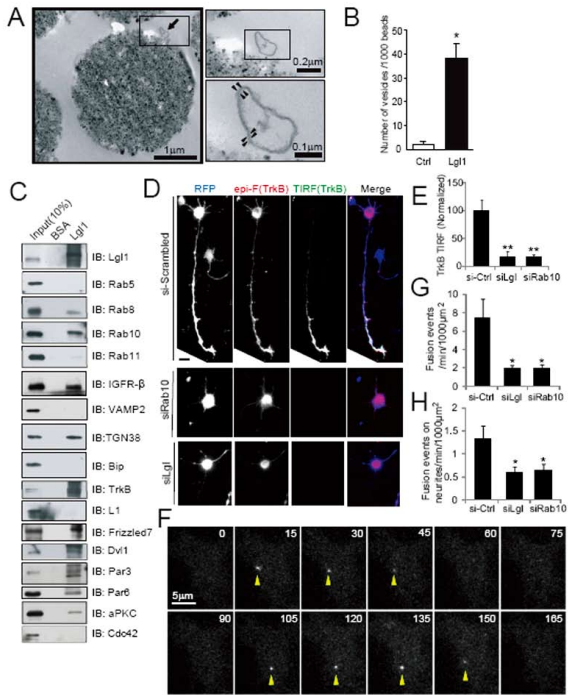
Polarized distribution and selective transport of axonal protein



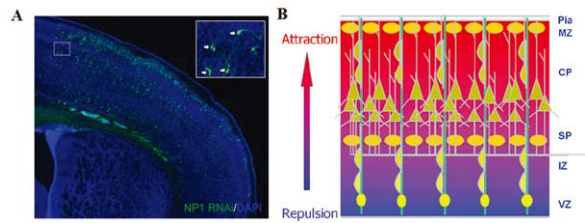
Crossmodal Interaction between Olfactory and Visual Learning in *Drosophila*



Calcium signaling in growth cone guidance

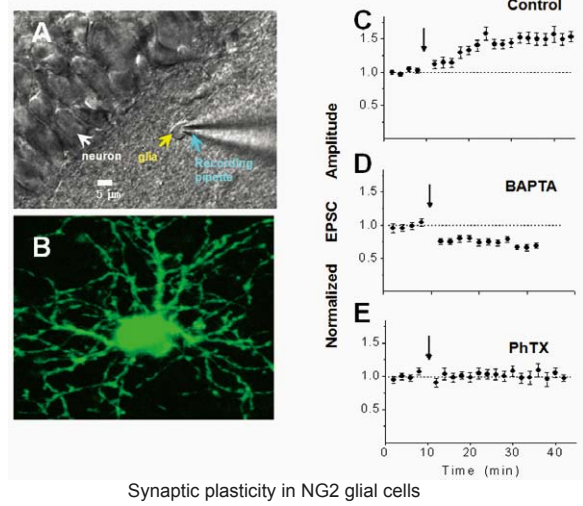


Lgl1 and Rab10 Affect the Polarized Membrane Trafficking in Developing Neurons



The gradient of Semaphorin-3A promotes the radial migration of cortical neurons

Among the six awardees, three were honored as the outstanding contributors to the studies. Dr. Mu-ming Poo (PU Muming) made ground-breaking discoveries in clarifying the neural plasticity beyond the synaptic sites and in addressing how the neuronal polarity is established and maintained. Dr. YUAN Xiaobing made significant contribution to clarifying the  $Ca^{2+}$  signaling in axon guidance, the traction mechanism for neuronal migration, and the signal transduction mechanisms underlying the guidance of neuronal migration. Dr. LUO Zhenge has demonstrated a mechanism regulating polarized membrane addition during axon development, identified important extracellular cues promoting axonal growth, and found intracellular mechanism governing neuromuscular synapse formation and refinement.



Synaptic plasticity in NG2 glial cells

**Presynaptic Unsilencing: Searching for a Mechanism**  
*Neuron*, 2006, 50:345-346

Nascent synaptic networks have a high incidence of silent synapses. In this issue of *Neuron*, Shen et al. show that a brief burst of action potentials rapidly awakens silent synapses by increasing the availability of synaptic vesicles for fusion through BDNF-triggered presynaptic actin remodeling mediated by the small GTPase Cdc42.

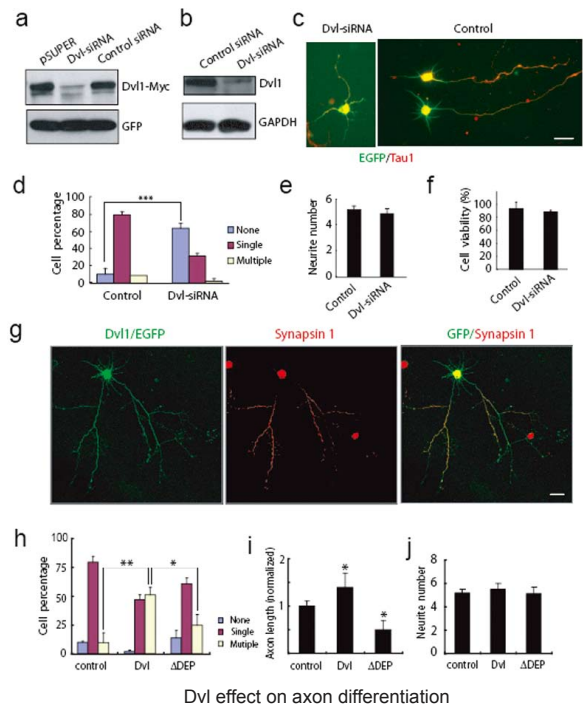
In this issue of *Neuron*, Shen and colleagues perform a comprehensive analysis of silent synapses by carrying out a phenomenal number of paired recordings in developing hippocampal cultures. Their results provide a fresh look at these silent synapses and their switching to active ones. The authors uncover a presynaptic mechanism that enables rapid conversion of nonfunctional synapses to functional ones. Although most of the time, these silent synapses are not functional, they are not silent. The authors discuss the implications of their models discussed above the authors do not encounter NMDA responses prior to the synapse awakening. Nevertheless, unsilencing is still sensitive to APV. This APV

同期杂志发表评论指出:该工作意外地发现了与早期沉默突触假说不同的新机制...清晰地阐明了突触发育早期沉默突触转化为功能突触的深入机制...很好地解释了早期研究发现的“一些互不联系的现象”。

**Neuron**

封面文章: Shen ... Duan S' Activity-induced rapid synaptic maturation mediated by presynaptic cdc42 signaling. *Neuron*, 2006, 50: 404-414

Activity-Induced Rapid Presynaptic Maturation



Dvl effect on axon differentiation