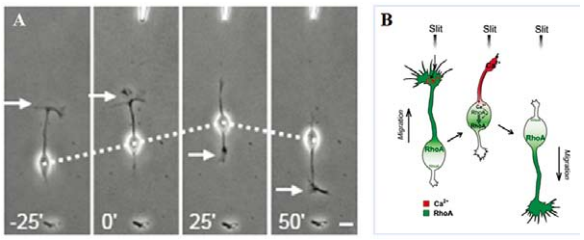
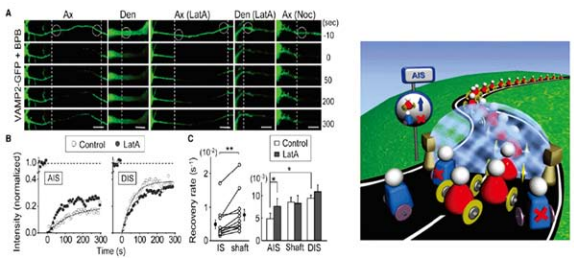
Research Team for Neural Development and Plasticity

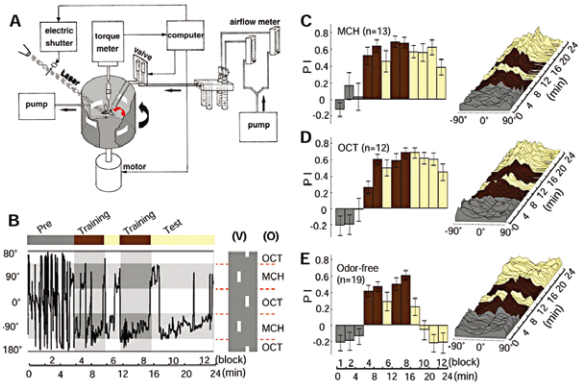
The brain consists of billions of nerve cells, called neurons, which make specific connections (called synapses) among them to form many neural circuits to perform various brain functions, including processing, storage, and retrieval of information. Each neuron is a polarized cell. It sends out many 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.

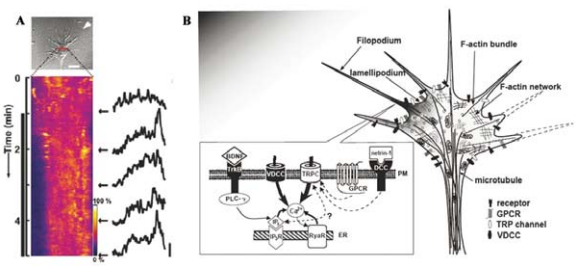




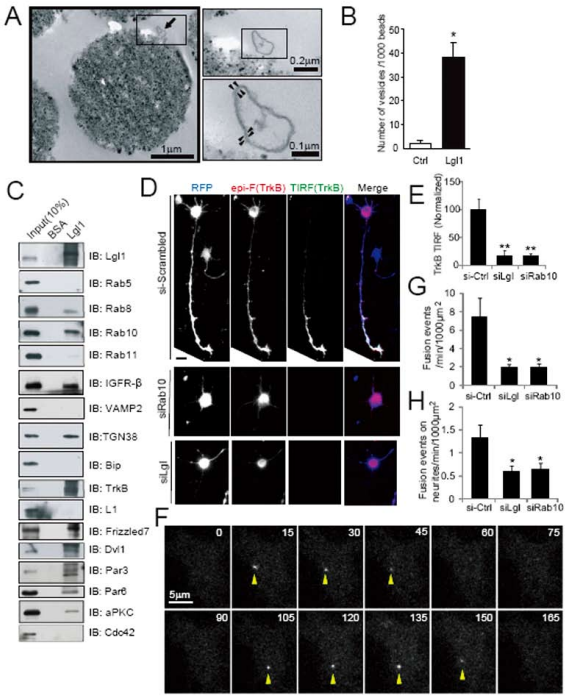
Polarized distribution and selective transport of axonal protein



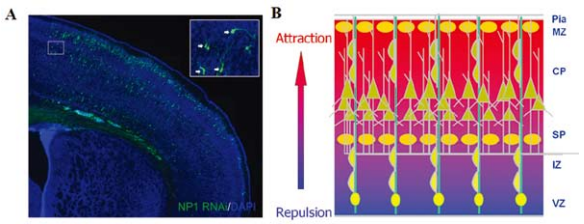
Crossmodal Interaction between Olfactory and Visual Learning in Drosophila



Calcium signaling in growth cone guidance

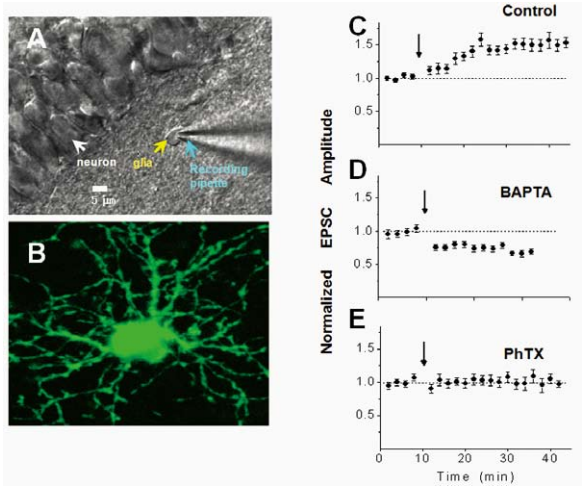


Lgl1 and Rab10 Affect the Polarized Membrane Trafficking in Developing Neurons

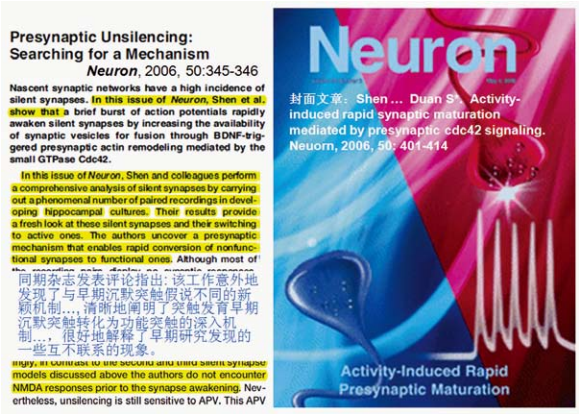


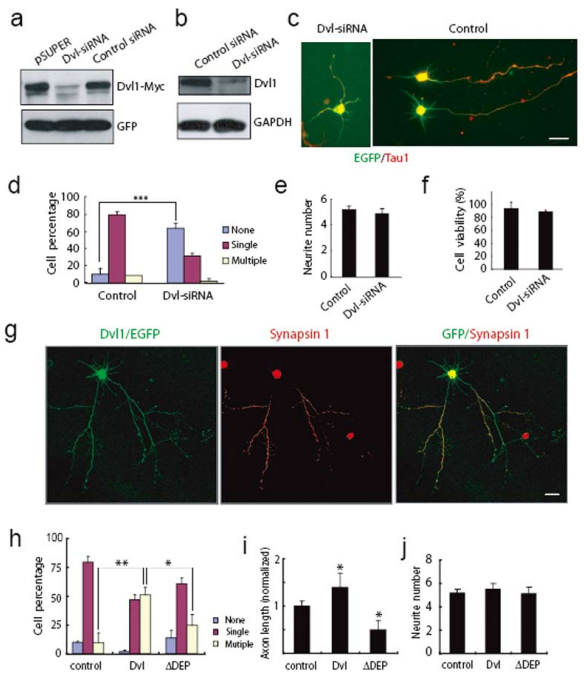
The gradient of Semaphorin-3A promotes the radial migration of cortical neurons

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





Dvl effect on axon differentiation