CHANG LAB
Laboratory of Electrophysiology and Behavioral Neuroscience

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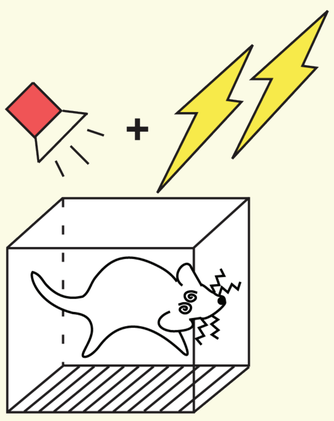
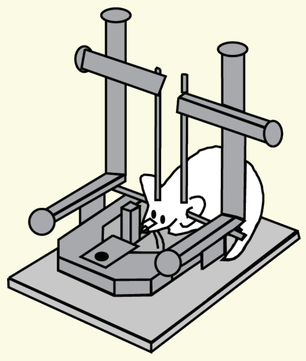
The Chang Lab is launched in Institute of Systems Neuroscience at National Tsing Hua University on August, 2015. We use multiple approaches to study the extended fear circuitry in behaving rats, including lesion, pharmacology, pharmacogenetics, and functional tracing. We also use *in vivo* electrophysiology to look into interactions among brain structures at the circuitry level. The long-term goal is to understand 1) the neural basis of fear learning, memory, and expression, 2) the interactive brain information processing, 3) the adaptive behavioral strategies, and 4) how stress impacts the modulation process.

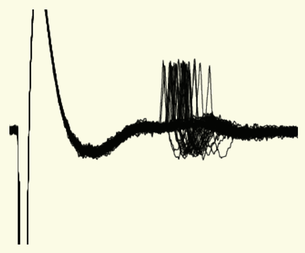
Research Approaches



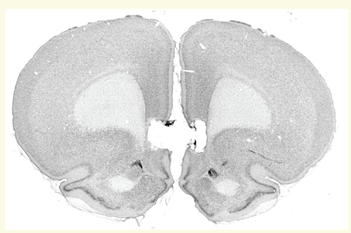
Behavior We use Pavlovian fear conditioning and extinction to study the extended fear neural circuitry under normal and pathophysiological conditions. After a few pairings of tones and mild foot shocks, rats acquire learned fear responses to the tone as indicated by freezing. Fear responses are subsequently extinguished with tone-alone trials, and fear retrieval after extinction is context dependent.



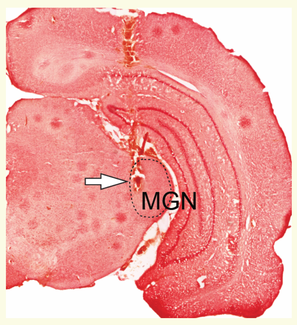
Stereotax Surgery The whole animal brain surgeries are conducted for *in vivo* electrophysiology studies, as well as intra-cranial manipulations such as lesions, cannula implants for microinjections of pharmacological agents, functional anatomy, and immunohistochemistry.



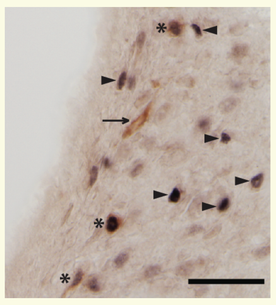
Electrophysiology *In vivo* extracellular single unit recordings are conducted in anesthetized animals, to study the interactions among different brain structures, synaptic plasticity, and the input-output relationship.



Lesions The most classical approach to examine the function of a brain structure is to take it out and see the changes in behavior!



Behavioral Pharmacology Tiny drops of pharmacological agents (on the scale of nano- to microliters) are microinjected into brain areas to modulate the level of certain neurotransmitters in awake behaving rats. This approach allows us to assess how the activity of the structure of interest shapes behaviors.



Functional Anatomy and Immunohistochemistry Tract-tracing is used to identify anatomical projections from one structure to the other, and cFos immunohistochemisty is quantified to identify their activity during behavior tasks.