Satoshi Kojima, PhD

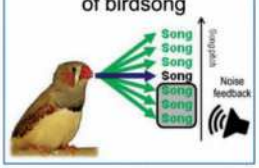
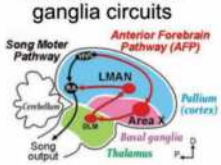
Principal Investigator

SENSORY & MOTOR SYSTEMS NEUROSCIENCE GROUP
Korea Brain Research Institute (KBRI)

Office : 5-2
Lab : wet lab 5-1
Tel : +82-53-980-8420
Fax : +82-53-980-8339
E-mail : skojima@kbri.re.kr
http://sites.google.com/site/kojimakbri/

Behavioral and neural mechanisms of vocal learning

Humans are excellent vocal learners. Infants learn to produce complex vocal patterns of their native language from their parents. Research in our laboratory focuses on the question of how animals learn to produce their complex vocalizations from other individuals during a critical period of development, and more broadly, how experience during early life shapes the functioning of the nervous system and individuals' perception and behavior. To address these questions we mainly study passerine songbirds such as the zebra finch. Songbirds are one of the few animals that show vocal learning like humans, and thus they are great and unizue model systems for studying the neural substrates of vocal learning, as well as developmental learning of complex motor skills. Songbirds are also recognized as a powerful model system for studying the function of basal ganglia circuits in reinforcement (trial-and-error) learning, because they are thought to develop their vocal patterns in a trial-and-error process using a specialized basal ganglia-thalamo-cortical circuit.

Aim	Understanding neural substrates of vocal learning and its critical period
Tool	Electrophysiology + phamacology + Ca^{2+} imaging + behavioral manipulation
TARGET	Behavioral manipulation of birdsong 
	Function of basal ganglia circuits 
	Recording, manipulation, and imaging of neural activity in free-moving birds 

Curriculum Vitae

2015~Present : Principal Investigator, KBRI
2003~2014 : Postdoctoral Fellow and Research Specialist, Univ of California, San Francisco, USA
2000~2003 : Postdoctoral Fellow, Sophia University, Japan

Academic Credential

2000 : Ph.D., Neurobiology, Hokkaido Univ, Japan
1997 : M.S., Neurobiology, Hokkaido Univ, Japan
1995 : B.S., Biology, Hokkaido Univ, Japan

Awards/Honors/Memberships

2014 : Cozzarelli Prize of the National Academy of Science, USA
2014 : Yong Investigator's Award of the Japanese Society for Comparative Physiology and Biochemistry
2015~Present : Councilor, Japanese Society for Comparative Physiology and Biochemistry
1998~Present : Member, Society for Neuroscience
1997~Present : Member, Japan Society for Neuroscience

Research keywords

Vocal learning, Imitation, songbird, Critical period, Reinforcement learning, Basal ganglia, Electrophysiology, Ca^{2+} imaging.

Key techniques

in-vivo electrophysiology and pharmacological manipulation in free-moving birds, Ca^{2+} imaging in free-moving birds, Behavioral manipulation and operant conditioning in birds.

Research Interests/Topics

- Understanding how songbirds regulate their vocal patterns using the basal ganglia-thalamo cortical circuit and the auditory feedback.
- Understanding how young songbirds develop their song by imitating their tutor, and how such learning ability declines with age.
- Investigating how the studies of songbirds will contribute to our understanding of the neural substrates underlying human speech learning and basal ganglia-related motor control and disorders, and how such understanding might be harnessed to ultimately benefit humans.

Research Publications (selected)

- **Kojima S.***, Kao MH, Doupe AJ, Brainard MS. The avian basal ganglia are a source of rapid behavioral variation that enables vocal motor exploration. *J Neurosci, 38,9635-9647, 2018.* (*corresponding author)
- **Kojima S**, Kao MH, Doupe AJ. Task-related 'cortical' bursting depends critically on basal ganglia input and is linked to vocal plasticity. *Proc Natl Acad Sci USA, 110,4756-4761, 2013.*
- **Kojima S**, Doupe AJ. Social performance reveals unexpected vocal competency in young songbirds. *Proc Natl Acad Sci USA, 108,1687-1692, 2011.*
- **Kojima S**, Doupe AJ. Activity propagation in an avian basal ganglia-thalamocortical circuit essential for vocal learning. *J Neurosci., 29,4782-4793, 2009.*