

Japan-U.S. Brain Research Cooperation Program
Group Joint Study Project Program FY2011 - FY2013: Report

Field: behavior, system, cognition

1. Principal Researcher

Name Kazuo Funabiki

Title Vice Head

Affiliation Systems Biology, Osaka Bioscience Institute

2. Project Title:

A micro-endoscope system for in vivo imaging of populations of neurons in the avian auditory midbrain.

3. Japanese Group

Names, Titles and Affiliations of Principal Researcher and Collaborating Research Members

Kazuo Funabiki Vice Head Osaka Bioscience Institute (Principal)

Ichiro Nakahara Graduate Student, Kyoto University Graduate School of Life Sciences

Hidetaka Yashiro Graduate Student, Doshisha University, Faculty of Life and Medical Sciences

Hiroshi Riquimaroux Professor, Doshisha University, Faculty of Life and Medical Sciences

4. U.S. Group

Names, Titles and Affiliations of Principal Researcher and Collaborating Research Members

Jose Luis Pena Associate Professor, Albert Einstein College of Medicine (Principal)

Michael Beckert Graduate Student, Albert Einstein College of Medicine

Masakazu Konishi Professor, California Institute of Technology

Ashida Go Research Associate University of Maryland

Catherine Carr Professor, University of Maryland

5. Research Period, from/to (mm/dd/yyyy) and total number of years.

From 4/1/2011 to 3/31/2014, total 3 years

6. Abstract, Results, and Research Significance (300 words):

Japan group (Osaka Bioscience Institute, Systems Biology, Funabiki et al,) developed a fiber-bundle based confocal micro-endoscopy, which enables in vivo Ca imaging of circuits in deep brain area with cellular resolution. US Group (Albert Einstein College of Medicine, Pena's group) has been studying neural mechanisms for sound localization in the barn owl. This collaboration was planned to apply the above micro-endoscope system to the analysis of auditory midbrain circuits of the barn owl, where auditory space map exists. In 2011, Prof. Pena came to OBI, Japan, and we duplicated one endoscope system for experiments in US. In 2011, 2012, we established the micro-endoscopic recording system with auditory stimuli using chicken brain and Ca indicator dye (Oregon Green BAPTA AM-1) or GCaMP with virus vector. In 2013, we started experiments with barn owl's midbrain. The experiment in owls is on the way, and Michael Beckert (Graduate Student in Pena's group) continues to do experiments in US, and Japan group will keep contributing in data analysis.

Using this US-Japan collaboration grant, we published several papers regarding the owl's auditory coincidence detector neurons (nucleus laminaris: NL). (Funabiki et al, J.Neurosci, 2011, Ashida et al, J.Neurophysiol, 2012, Ashida et al, Front Comput Neurosci, 2013a, 2013b). The first one (Funabiki et al, 2011) was related to the in vivo intracellular recording of NL neurons in vivo, which, for the first time, revealed that auditory coincidence detector neurons reproduce sound waveform in the postsynaptic membrane potential by synaptic integration.

Latter three papers (Ashida et al, 2012, 2013a, 2013b) are about theoretical analysis of the experimental data(Funabiki et al, 2011).

7. Other (Research-related concerns, particular points of note):

We had to ship the endoscope probe many times between US and Japan in this collaboration project. So, it might better be possible if we could use this grant for the shipping of the instruments and goods in case the expense is related to the collaboration.

*Please attach any reference materials as necessary.