INT Symposium on “Advanced Photonic Imaging in Neuroscience”

11th and 12th July 2019 Marseille, France

SEIDEMANN Eyal

Professor of Neuroscience and Psychology

eyal@austin.utexas.edu

Team Seidemann

Department of Psychology, University of Texas, USA

Eyal Seidemann is a professor of Neuroscience and Psychology at the University of Texas at Austin. He received his Ph.D. in Neuroscience from Stanford University. His lab studies the cortical mechanisms that mediate visual perception and visually guided behavior.

S3-L5 ‘*Toward an all-optical bi-directional interrogation of topographic population codes in primate visual cortex.*’

To understand the neural basis of perception and cognition, we need techniques for measuring and manipulating neural population responses in behaving animals. Optical-genetic methods provide a powerful tool for achieving this goal, but the use of these techniques in behaving macaques, an important animal model for studying human perception, has been limited. Our goal is to develop an optical-genetic toolbox for “reading” and “writing” neural population codes at spatial scales of functional topographic maps in the cortex of behaving macaques. To achieve this goal, we use viral vectors to co-express red-shifted opsins and calcium indicators in excitatory neurons in macaque primary visual cortex (V1). To measure and manipulate neural population responses, we developed a widefield imaging and stimulation setup that allows us to generate arbitrary spatiotemporal patterns of optogenetic stimulation while simultaneously imaging the evoked calcium responses. Our preliminary results show that: (1) We can generate spatiotemporal patters of neural population responses at the scale of orientation columns (diameter of ~0.3mm); (2) The cortical responses evoked by patterned optogenetic stimulation display various surprising nonlinearities; (3) The optogenetic-evoked responses are interacting nonlinearly with visually evoked responses; (4) The optogenetic-evoked responses can strongly affect perceptual judgements even at low cortical-stimulation light levels (<1mW/mm^2). We are now working toward using this novel tool to test specific hypotheses regarding the nature of the neural code in primate V1.