
NRP SEMINAR ANNOUNCEMENT

Speaker: Kenji Mizuseki, Rutgers University, NJ, USA

Title: Temporal Coordination of Neuronal Activity in the Entorhinal-Hippocampal Circuit

Date: 21 Feb 2012 (Tue)

Time: 11.00 to 12.00nn

Venue: NRP Seminar Room 4-08, Level 4, Proteos Building

ABSTRACT

Although hippocampal theta oscillations are believed to be essential for the formation and retrieval of episodic memories, it is not clear how the information is handled in the hippocampal formation during theta states. We simultaneously recorded the activity of many (~100) neurons and local field potentials from multiple layers of the hippocampus and entorhinal cortex of rats performing spatial tasks. The temporal delays between population activities in successive anatomical stages were much longer (~60 msec) than expected from axon conduction velocities and passive synaptic integration of feed-forward excitatory inputs. We suggest that the temporal windows set by the theta cycles allow for local circuit interactions and thus a considerable degree of computational independence in subdivisions of the hippocampus-entorhinal cortex loop.

The hippocampal CA1 region is one of the most extensively studied regions of the brain and most studies tacitly assume that pyramidal neurons in this region represent a homogeneous cell population. However, using high spatial resolution silicon probes, we found that deep and superficial pyramidal cells were strikingly different in terms of firing rate, burst propensity, spatial representation, entrainment by slow oscillations of sleep, preferred gamma phase during waking and preferred theta phase during REM sleep. Thus, CA1 pyramidal cells in adjacent sub-layers can address their targets jointly or differentially, depending on brain states and oscillations, thereby form functionally distinct streams.

Mizuseki,K., Sirota,A., Pastalkova,E., and Buzsaki,G. (2009). Theta oscillations provide temporal windows for local circuit computation in the entorhinal-hippocampal loop. *Neuron* 64, 267-280.

Mizuseki,K., Diba,K., Pastalkova,E., and Buzsaki,G. (2011). Hippocampal CA1 pyramidal cells form functionally distinct sublayers. *Nat. Neurosci.* 14, 1174-1181.

Mizuseki,K., Royer,S., Diba,K., and Buzsaki,G. (2012). Activity dynamics and behavioral correlates of CA3 and CA1 hippocampal pyramidal neurons. *Hippocampus.* (in press).

ALL ARE WELCOME (No pre-registration is required)