PROGRESS IN NEUROSCIENCE PINS

Seminar Series of the
Brain & Mind Research Institute
Weill Cornell Medical College (WCMC)
&
The Graduate Program in Neuroscience of
WCMC and Sloan Kettering Institute

Thursday, 9/21/17, 4 PM, coffee at 3:45 PM
Weill Auditorium

"Making, Breaking, and Linking Memories"

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Abstract

A fundamental goal of neuroscience is to understand how information is encoded and stored in the brain. The physical or functional representation of a memory (the memory trace or "engram") is thought to be sparsely encoded over a distributed memory network. However, identifying the precise neurons which make up a memory trace has challenged for scientists since Karl Lashley's "search for the engram" in the 1950's (Josselyn, 2015; Lashley, 1950; Josselyn, 2010; Josselyn et al., 2015). Moreover, it was not known why one neuron (rather than its neighbour) was involved in a given memory trace. We previously showed that lateral amygdala (LA) neurons with increased levels of the transcription factor CREB (cAMP/Ca^{++} Responsive Element Binding protein), are preferentially activated by fear memory expression, suggesting they are selectively recruited into the memory trace (Han et al., 2007). We, and others, went on to show that these neurons were critical components of the memory network by selectively ablating (Han et al., 2009) or inactivating them (Zhou et al., 2009). These findings established a causal link between a specific neuronal subpopulation and memory expression, thereby identifying critical neurons within the memory trace. Furthermore, these results suggest that at least within the LA, e**ligible neurons compete for inclusion in a memory trace, and that the winners of this competition are determined by relative CREB function.** Although competition between neurons, axons and synapses is necessary for refining neural circuits in development, little is known about competition between neurons in the adult brain. **Our recent results suggest that this neuronal competition during memory formation limits the overall size of the memory trace (number of "winning" neurons) and is a mechanism that links** (or disambiguates) related memories in the LA (Rashid, et al., 2016)

Recent Relevant Publications:

1. Rashid AS, Yan C, Mercaldo V, Hsiang HW, Park S, Cole CJ, De Cristofaro A, Yu J, Ramakrishnan C, Lee SY, Deisseroth K, Frankland PW*, **Josselyn SA*** (2016). Competition between engrams influences fear memory formation and recall. *Science,* 353, 383-7
2. Han JH, Kushner SA, Yiu AP, Hsiang HL, Buch T, Waisman A, Bontempi B, Neve RL, Frankland PW & **Josselyn SA** (2009) Selective erasure of a fear memory. *Science*. 323. 1492-1496

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