

## **Adult-born neurons are required for online processing of pattern separation**

Jia-Min Zhuo<sup>1</sup>, Kevin Guerra<sup>1</sup>, Ali Mohammad, Nicholas T. M. Robinson<sup>1</sup>, Xuan Gu<sup>1</sup>, Mark E. Bucklin<sup>1</sup>, Brian D. Allen<sup>2</sup>, Jacob G. Bernstein<sup>2</sup>, Matthew P. Elam<sup>1</sup>, Kim-lien T. Le<sup>1</sup>, Edward S. Boyden<sup>2</sup>, Xue Han<sup>1,\*</sup>

1. Biomedical Engineering Department, Boston University, Boston, MA, USA
2. Synthetic Neurobiology Group, Media Lab and McGovern Institute, Massachusetts Institute of Technology, Cambridge, MA, USA

### **Abstract**

Adult-born neurons in mammalian dentate gyrus have been implicated in a number of hippocampus-dependent functions. However, direct determination of the causal role of adult-born neurons in behavior has been difficult. Here, we implemented optogenetic tools optimized for use in adult-born neurons, and selectively silenced adult-born neurons at defined times during spatial pattern recognition tasks. We found that adult-born neurons are critical in spatial pattern recognition, and transiently silencing them at specific developmental age, during the online processing of information retrieval period, profoundly impaired animal's behavioral performance.