Short term memory (STM) is crucial for animals to hold information for a small period of time. Persistent or recurrent neural activity, together with neural oscillations, is known to encode the STM at the cellular level. However, the coding mechanisms at the microcircuitry level remain a mystery.

Tian et al. performed two-photon imaging on behaving mice to monitor the activity of neuronal microcircuitry. We discovered a neuronal subpopulation in the medial prefrontal cortex (mPFC) that exhibited emergent properties in a context-dependent manner underlying a STM-like behavior paradigm. These neuronal subpopulations exclusively comprise excitatory neurons and mainly represent a group of neurons with stronger functional connections. Microcircuitry plasticity was maintained for minutes and was absent in an animal model of Alzheimer's disease (AD). Thus, these results point to a functional coding mechanism that relies on the emergent behavior of a functionally defined neuronal assembly to encode STM [1].

1)
Tian Y, Yang C, Cui Y, Su F, Wang Y, Wang Y, Yuan P, Shang S, Li H, Zhao J, Zhu D, Tang S, Cao P, Liu Y, Wang X, Wang L, Zeng W, Jiang H, Zhao F, Luo M, Xiong W, Qiu Z, Li XY, Zhang C. An Excitatory Neural Assembly Encodes Short-Term Memory in the Prefrontal Cortex. Cell Rep. 2018 Feb 13;22(7):1734-1744. doi: 10.1016/j.celrep.2018.01.050. PubMed PMID: 29444427.