Mnemonic decision-making has long been hypothesized to rely on hippocampal dynamics that bias memory processing toward the formation of new memories or the retrieval of old ones. Successful memory encoding may be best optimized by pattern separation, whereby two highly similar experiences can be represented by underlying neural populations in an orthogonal manner. By contrast, successful memory retrieval is thought to be supported by a recovery of the same neural pattern laid down during encoding. Here we examined how hippocampal pattern completion and separation emerge over time during memory decisions. We measured electrocorticography activity in the human hippocampus and posterior occipitotemporal cortex (OTC) while participants performed continuous recognition of items that were new, repeated (old), or highly similar to a prior item (similar). During retrieval decisions of old items, both regions exhibited significant reinstatement of multivariate high-frequency activity (HFA) associated with encoding. Further, the extent of reinstatement of encoding patterns during retrieval was correlated with the strength (HFA power) of hippocampal encoding. Evidence for encoding pattern reinstatement was also seen in OTC on trials requiring fine-grained discrimination of similar items. By contrast, hippocampal activity showed evidence for pattern separation during these trials. Together, these results underscore the critical role of the hippocampus in supporting both reinstatement of overlapping information and separation of similar events [1)].

1)
Lohnas LJ, Duncan K, Doyle WK, Thesen T, Devinsky O, Davachi L. Time-resolved neural reinstatement and pattern separation during memory decisions in human hippocampus. Proc Natl Acad Sci U S A. 2018 Jul 13. pii: 201717088. doi: 10.1073/pnas.1717088115. [Epub ahead of print] PubMed PMID: 30006465.