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**Cellular correlates of assembly formation during
memory-related network oscillations
in the mouse hippocampus in vitro**

Promotionsfach: Physiologie
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The selective recruitment of neurons into transient assemblies is a fundamental concept for representations within neuronal networks. Such assemblies comprise groups of pyramidal cells which fire together in determinate temporal order. In the mammalian hippocampus, such assemblies are believed to underlie spatial memory consolidation. Despite its conceptual importance, little is known about how individual neurons are bound into functional groups.

We describe a cellular mechanism underlying assembly formation in memory-related hippocampal networks. A defined subgroup of CA1 pyramidal cells was entrained by the network during sharp wave-ripple oscillations while the remaining neurons were consistently inhibited. Action potentials of participating cells had peculiar properties: they were generated in the axon without prior somatodendritic excitation and were facilitated by tonic activation of axonal GABA_A receptors.

These findings provide a new mechanism by which transient representation of memory traces in hippocampal networks may be implemented at the cellular level.