Changing the Mind of Mice : Inception of Memories During Sleep

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ABSTRACT

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Sleep is now recognized to be crucial for the consolidation of preexisting memory traces. One important model to study memory in rodent is the spatial memory, as hippocampal neurons have been shown to code for spatial locationof the animal. This correlate between animal behavior and hippocampal neuronal activity is so strong that those «place cells » assemblies are believed to support the *cognitive map*, which is the mental representation of space in the animal brain. During sleep, those place cells assemblies show reactivations of recent waking experience, and this replay would be instrumental in the process of memory consolidation.

Here we show that neuronal reactivations can be used to induce a new artificial place/reward association during sleep. We designed a protocol where intracranial rewarding stimulations were triggered by a hippocampal place cell during sleep. We were able to induce an explicit memory trace, leading to a goal-directed behavior toward the place field artificially associated to reward.

These results show first that it is possible to create an artificial explicit memory during sleep that is used during subsequent waking period to drive a goal directed behavior. But more importantly, it demonstrates the causal role
of place cells on the mental representation of space, and that hippocampal cell assemblies still conveyed the same spatial information during sleep as it did during wakefulness.

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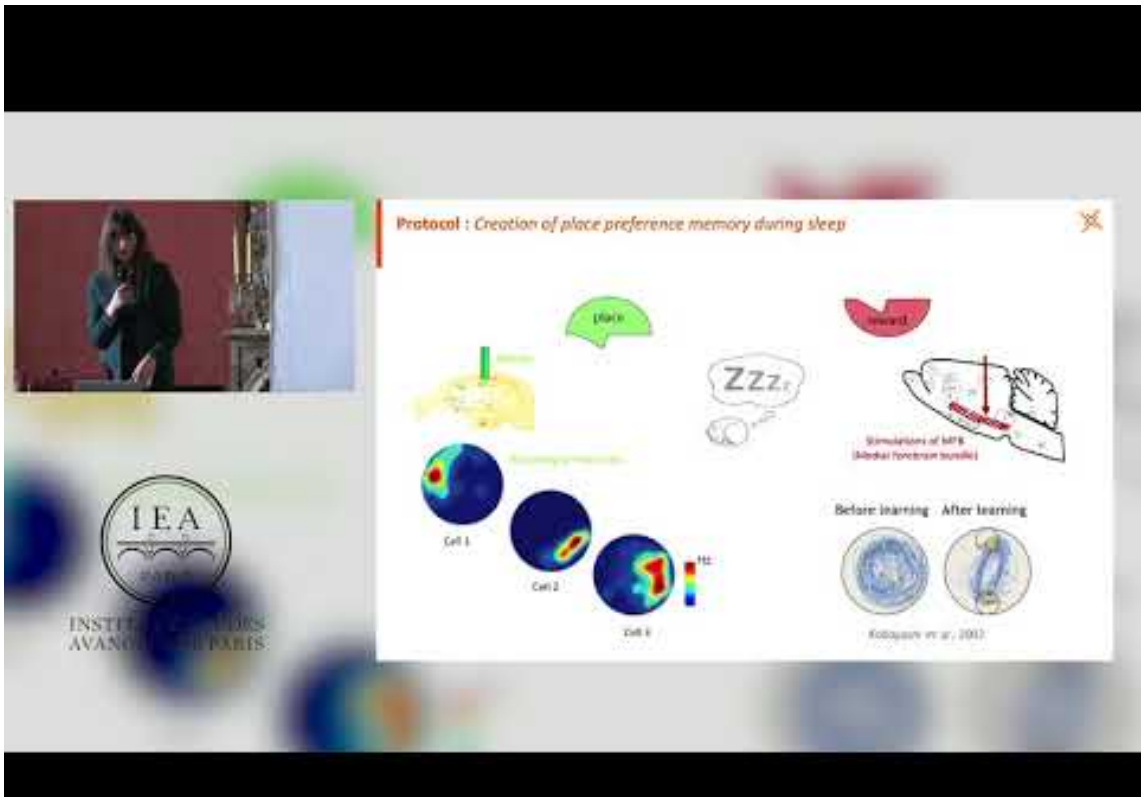

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