Sleep enforces the temporal sequence in memory

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We have usually quite strong memories of past events like an exciting holiday or a jolly birthday party. However it is not clear how the brain keeps track of the temporal sequence in such memories: did Paul spill a glass of wine before or after Mary left the party?

Previous findings from a research group headed by Jan Born at the University of Lübeck have confirmed the widely held view that long-term memories are formed particularly during sleep, and that this process relies on the brain replaying recently encoded experiences during the night. The same research group now provides evidence that sleep not only strengthens the content of a memory but also the particular order in which they were experienced, probably by a replay of the experiences in "forward" direction.

Students were asked to learn triplets of words presented one after the other. Afterwards they slept, whereas in a control condition no sleep was allowed. Later, recall was tested by presenting one word and asking which one came before and which one came after during learning. Sleep was found to enhance word recall, but only when the students were asked to reproduce the learned words in forward direction.

This finding shows that sleep associated consolidation of memories enforces the temporal structure of the memorized episode that otherwise might be blurred to a timeless puzzle of experiences.

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