

Sleeping brain's complex activity mimicked by simple model

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Researchers have built and tested a new mathematical model that successfully reproduces complex brain activity during deep sleep, according to a study published in *PLOS Computational Biology*.

Recent research has shown that certain patterns of neuronal activity during [deep sleep](#) may play an important role in [memory consolidation](#). Michael Schellenberger Costa and Arne Weigenand of the University of Lübeck, Germany, and colleagues set out to build a computational model that could accurately mimic these patterns.

The researchers had previously modeled the activity of the sleeping cortex, the brain's outer layer. However, sleep patterns thought to aid memory arise from interactions between the cortex and the thalamus, a central brain structure. The new model incorporates this thalamocortical coupling, enabling it to successfully mimic memory-related sleep patterns.

Using data from a human sleep study, the researchers confirmed that their new model accurately reproduces brain activity measured by electroencephalography (EEG) during the second and third stages of non-rapid eye movement (NREM) sleep. It also successfully predicts the EEG effects of stimulation techniques known to enhance memory consolidation during sleep.

The new model is a neural mass model, meaning that it approximates and scales up the behavior of a small group of neurons in order to

describe a large number of neurons. Compared with other sleep models, many of which are based on the activity of individual neurons, this [new model](#) is relatively simple and could aid in future studies of memory consolidation.

"It is fascinating to see that a model incorporating only a few key mechanisms is sufficient to reproduce the complex brain rhythms observed during [sleep](#)," say senior authors Thomas Martinetz and Jens Christian Claussen.

More information: Schellenberger Costa M, Weigenand A, Ngo H-VV, Marshall L, Born J, Martinetz T, et al. (2016) A Thalamocortical Neural Mass Model of the EEG during NREM Sleep and Its Response to Auditory Stimulation. *PLoS Comput Biol* 12(9): e1005022. [DOI: 10.1371/journal.pcbi.1005022](#)

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