

DBMR Research Conference

Langhans Auditorium
Murtenstrasse 31, 3008 Bern

Date: Monday, November 4, 2024, 5pm – 6pm

Title: Hacking Emotional Memories During Sleep

Speaker: Dr. Mattia Aime, Centre de Recherche en Neurosciences de Lyon
Recipient of the Johanna Dürmüller-Bol DBMR Research Award 2023

Bio: Dr. Mattia Aime is a System Neuroscientist with a fervent pursuit: to unravel the intricate neuronal mechanisms governing memory consolidation and emotional processing during sleep. His approach entails harnessing cutting-edge in vivo optical and electrophysiological methodologies to delve into the neuronal dynamics within the rodent brain as it encodes memories during sleep. The utilization of advanced technologies, including 2-photon imaging, in sleeping animals remains a niche expertise mastered by only a handful of researchers worldwide.

Thus far, his investigations have unveiled a unique reconfiguration of neuronal circuits within the mouse prefrontal cortex during sleep. This reorganization precipitates a phenomenon known as somato-dendritic decoupling, wherein the activity of dendrites (neuronal inputs) become decoupled from somas (neuronal outputs). This phenomenon plays a pivotal role in optimizing the processing of emotional information during sleep, particularly in discriminating between safety and danger cues, thereby enhancing the organism's survival prospects in its environment.

Dr. Aime's overarching aim is to elucidate how the brain leverages emotions to prioritize salient information during wakefulness and subsequently consolidates it during sleep, thereby optimizing behavioral responses and ensuring adaptability to environmental stimuli. By deciphering these intricate neural mechanisms, he endeavors to contribute to the understanding of how individuals and species perpetuate their existence through adaptive behavioral responses, facilitated by the intricate neuronal processes occurring during sleep.

Abstract: The prefrontal cortex (PFC) is essential for encoding emotional information related to environmental danger or safety during both wakefulness and rapid eye movement (REM, or paradoxical) sleep. It integrates direct synaptic inputs from the basolateral amygdala (BLA)—a central hub for associative learning and emotional valence encoding—as well as inputs from other cortical and subcortical networks, to exert top-down control over behavioral responses during wakefulness. The heightened activity of both the BLA and PFC during sleep contributes to the encoding and long-term storage of emotional experiences, consistent with dreaming. This process is thought to partly rely on high concentrations of acetylcholine in the cortex during REM sleep; however, the underlying mechanisms remain unclear. Here, Dr. Aime will present his latest data on the synaptic mechanisms of the BLA-PFC pathway during REM sleep, where he identified a segregated pattern of activation in BLA synaptic boutons within the PFC, responsible for the valence discrimination of emotional memories, directly modulated by acetylcholine.

Host: Prof. Dr. Volker Enzmann, Regenerative Neuroscience, Department for BioMedical Research, University of Bern & member of the Johanna Dürmüller-Bol DBMR Research Award Committee.

The DBMR Research Conference takes place from 5 pm – 6 pm and will be followed by an apéro.

Next DBMR Research Conference: Monday, December 2, 2024, 5pm-6pm

Speaker: Oliver Soehnlein, MD, PhD, Institute of Experimental Pathology, University of Münster

Title: **New concepts of neutrophil maturation – a matter of location**



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