MASTER 2 Fundamental and Clinical Neurosciences

Internship proposal 2026-2027

(internship from January to June 2027)

Host laboratory: Lyon Neuroscience Research Center CRNL. Inserm U1028 - CNRS UMR5292 - UCBL. Centre Hospitalier Le Vinatier - Bâtiment 462 - Neurocampus. 95 boulevard Pinel. 69675 Bron Cedex

Host team: PAM. https://pam-lyon.cnrs.fr/

Internship supervisors: Judith Nicolas, Post-doc CRNL, judith.nicolas@inserm.fr; Laure Peter-Derex, PUPH CRNL / HCL, laure.peter-derex@chu-lyon.fr

Project title: Sleep-Dependent Modulation of Repetition-Induced Episodic Memory Consolidation

Project summary: Memory consolidation is the process by which newly acquired memories are transformed into more stable and long-lasting forms. These consolidation processes rely on replays of neuronal firing patterns associated with the initial encoding during offline periods, when memory encoding is in pause, enabling the integration of memories into long-term memory networks. Sleep following initial learning is known to provide a privileged window for such processes, as compared to quite wakefulness. Rehearsal during encoding is also known to promote memory consolidation. However, the interactions between sleep-dependent and rehearsal-induced consolidation are scarcely understood, particularly in conditions involving memory deficits, such as those observed in many patients with epilepsy. Indeed, rehearsal may represent a compensatory strategy, especially in case of hippocampal dysfunction, by enabling a rapid transfer of representations from the hippocampus to the neocortex and accelerating the formation of memory traces that are less dependent on the hippocampus.
This project aims at investigating the role of sleep-dependent and rehearsal-Induced memory consolidation in patients with epilepsy and in healthy young adults, in order to gain insights into mechanisms that allows our memory to be strengthened. The trainees will perform data collection in healthy young adults including behavioral acquisition and brain activity measurements with surface EEG both at wake and at sleep. This internship will allow the trainees to acquire skills in cognitive paradigms as well as neurophysiological recordings and analyses. Following this internship, there will be opportunities to submit a PhD project proposal which will combine experiments in patients with epilepsy undergoing intracranial investigations and machine learning analysis to identify the replay mechanisms underlying these two types of consolation mediation.

3-5 recent publications :

Born, J., & Wilhelm, I. (2012). System consolidation of memory during sleep. Psychological Research, 76(2), 192-203. https://doi.org/10.1007/s00426-011-0335-6

Brodt, S., Gais, S., Beck, J., Erb, M., Scheffler, K., & Schönauer, M. (2018). Fast track to the neocortex : A memory engram in the posterior parietal cortex. Science, 362(6418), 1045-1048. https://doi.org/10.1126/science.aau2528

Nicolas, J., King, B. R., Lévesque, D., Lazzouni, L., Leroux, G., Wang, D., Grossman, N., Swinnen, S. P., Doyon, J., Carrier, J., & Albouy, G. (2025). Unraveling the neurophysiological correlates of phase-specific enhancement of motor memory consolidation via slow-wave closed-loop targeted memory reactivation. Nature Communications, 16(1), 2644. https://doi.org/10.1038/s41467-025-57602-2

Peter-Derex, L., Klimes, P., Latreille, V., Bouhadoun, S., Dubeau, F., & Frauscher, B. (2020). Sleep Disruption in Epilepsy : Ictal and Interictal Epileptic Activity Matter. Annals of Neurology, 88(5), 907-920. https://doi.org/10.1002/ana.25884

Schreiner, T., & Staudigl, T. (2020). Electrophysiological signatures of memory reactivation in humans. Philosophical Transactions of the Royal Society B: Biological Sciences, 375(1799), 20190293. https://doi.org/10.1098/rstb.2019.0293