



MASTER 2 Fundamental and Clinical Neurosciences

Internship proposal 2022-2023

(internship from January to June 2023)

Host laboratory:

Centre de Recherche en Neurosciences de Lyon (CRNL)
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Host team : PAM & SLEEP of CRNL (<https://www.crnl.fr/fr/>)

Internship supervisors :

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Project title : Intrusion of REM sleep in NREM sleep in human and mice, healthy and with sleep disorders

Project summary :

The understanding of sleep physiology has evolved considerably over the past 20 years with the demonstration, in rodents and humans, of spatio-temporal inhomogeneities in vigilance states, and the observation of micro-arousals during sleep and micro-sleeps during wakefulness. The transition between non-rapid-eye-movement (NREM) and REM sleep is however poorly studied. Neurophysiological signatures of REM sleep include muscle atonia (observed in EMG) and phasic events among which sawtooth waves (STW) detectable in the EEG and bursts of rapid eye movements recorded with the EOG. Among the EEG biomarkers of REM sleep, STW are good candidates for the study of REM sleep micro-intrusions in NREM sleep. Indeed, our pilot data suggest that they precede the onset of REM episodes by several minutes, and are associated with brief intrusions of muscle atonia. These observations are likely to be modulated by conditions affecting REM sleep such as narcolepsy (<https://www.youtube.com/watch?v=tEx5AWhCdJM>). The objective of our project is to determine, from EEG/EOG/EMG recordings, the sequence and delays of occurrence of REM sleep biomarkers (STW, atonia, rapid eye movements) in NREM sleep in healthy subjects and narcoleptic patients as well as in wild-type and narcoleptic mice. This original work will bring crucial knowledge on sleep physiology and muscle tone regulation, and their dysregulation in narcolepsy. It will also help identifying new diagnostic biomarkers for narcolepsy.

Recent publications :

- Frauscher B, von Ellenrieder N, Dolezalova I, Bouhadoun S, Gotman J, **Peter-Derex L**. Rapid Eye Movement Sleep Sawtooth Waves Are Associated with Widespread Cortical Activations. *J Neurosci*. 2020;40(46):8900-8912.
- Ruby P, Eskinazi M, Bouet R, Rheims S, **Peter-Derex L**. Dynamics of hippocampus and orbitofrontal cortex activity during arousing reactions from sleep: An intracranial electroencephalographic study. *Hum Brain Mapp*. 2021;42(16):5188-5203.
- Peter-Derex L**, Berthomier C, Taillard J, Berthomier P, Bouet R, Mattout J, Brandewinder M, Bastuji H. Automatic analysis of single-channel sleep EEG in a large spectrum of sleep disorders. *J Clin Sleep Med*. 2021;17(3):393-402.
- Peter-Derex L**, Magnin M, Bastuji H. Heterogeneity of arousals in human sleep: A stereo-electroencephalographic study. *Neuroimage* 2015 ; 123:229-44. doi: 10.1016/j.neuroimage.2015.07.057.
- Arthaud S, Libourel PA, Luppi PH, **Peyron C**. Insights on paradoxical (REM) sleep homeostatic regulation in mice using an innovative automated sleep deprivation method. *SLEEP* 2020, Jan 12. doi: 10.1093/sleep/zsaa003.
- Roman A, Meftah S, Arthaud S, Luppi PH, **Peyron C**. The inappropriate occurrence of REM sleep in narcolepsy is not due to a defect in homeostatic regulation of REM sleep. *SLEEP* 2018, 41(6). doi: 10.1093/sleep/zsy046.

Please send your proposal to marion.richard@univ-lyon1.fr for publication on the Master of Neuroscience website.