

MASTER 2 Fundamental and Clinical Neurosciences

Internship proposal 2025-2026

(internship from January to June 2026)

Host laboratory: CRNL, Bâtiment 462 - Neurocampus - CH le Vinatier, 95 bd Pinel, Bron-Lyon

Host team : Sleep Team; <https://nadiaurbainlab.wordpress.com>

Internship supervisors : Nadia Urbain, CR1 INSERM, nadia.urbain@inserm.fr

Project title : The sleep gatekeeper: a role for the zona incerta in sleep maintenance

Project summary :

This Master 2 project is to investigate how the zona incerta integrates sensory and motor inputs to ensure sleep stability and control sleep-wake transitions. Sleep is regulated by a complex interplay of subcortical and brainstem structures, among which the zona incerta recently emerged as a sleep promoting area. The zona incerta is a small nucleus extensively connected with other structures in the brain, acting as a key integrative hub for sensory, motor and visceral functions. We hypothesize that zona incerta cells are modulated by sensory processing and motor execution, while during sleep, they suppress unwanted or meaningless sensory- and movement-related activity, promoting sleep maintenance. On the other hand, incertal neurons may integrate sensory and motor inputs to promote awakening in alertness.

This Master 2 project aims 1- to clarify the activity of incertal cells across the sleep-wake cycle in mice; and 2- to explore the cortical gating of incertal activity. To achieve this, the candidate will combine electrophysiology with cutting-edge techniques, such as viral transfections, and optogenetics in mice.

3-5 recent publications :

Boscher F, Jumel K, Dvořáková T, Gentet LJ, Urbain N. (2024) Thalamocortical Dynamics during Rapid Eye Movement Sleep in the Mouse Somatosensory Pathway. *J Neurosci.* 44(25):e0158242024

Liu K, et al. (2017) Lhx6-positive GABA-releasing neurons of the zona incerta promote sleep. *Nature* 548: 582-587

Urbain N, Deschênes M (2007) Motor cortex gates vibrissal responses in a thalamocortical projection pathway. *Neuron* 56:714-725

Wang X, et al. (2020) Zona Incerta: An Integrative Node for Global Behavioral Modulation. *Trends Neurosci.* 43, 82–87