



## MASTER 2 Fundamental and Clinical Neurosciences

### Internship proposal 2024-2025

(internship from January to June 2025)

**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](mailto:nadia.urbain@inserm.fr)

**Project title :** Learning how to feel by doing in a playing mouse

#### Project summary :

Most sensory information is acquired through active navigation and motor exploration. A central issue in neuroscience is therefore to understand how sensory and motor activity interacts to select and process from the ongoing flow of sensory information what is relevant for a quick decision and an appropriate behavior.

The rodent somatosensory system, which is very fast and efficient, offers a particularly interesting experimental model to study sensory inputs processing. Faithful transmission of sensory information from the periphery to the neocortex is largely attributed to the principal relay thalamic nuclei. In high-order thalamic nuclei, which are integrative hubs, our previous studies showed that responses to sensory stimuli are delayed, impeded by inhibitory inputs; there, cortical inputs may exert top-down control over sensory afferents by direct projections and indirect projections through extra-thalamic inhibitory centers. We are developing in our lab a virtual reality environment to explore the role of high-order thalamic nuclei in active perception and learning.

The aim of this master project is to investigate the differential role of first- and high-order sensory thalamic nuclei in learning a new sensorimotor task. The candidate will familiarize him(her)self with behavior, electrophysiological recordings and optogenetic techniques in mice.

#### 3-5 recent publications :

- F. Boscher, K. Jumel, T. Dvorakova, L.J. Gentet and N. Urbain. Thalamocortical dynamics during Rapid Eye Movement Sleep in the Mouse Somatosensory Pathway. *bioRxiv* 2023.10.26.564196; <https://doi.org/10.1101/2023.10.26.564196>.
- La Terra, D., Bjerre, A.-S., Rosier, M., Masuda, R., Ryan, T.J., and Palmer, L.M. (2022). The role of higher-order thalamus during learning and correct performance in goal-directed behavior. *eLife* 11, 1–21. 10.7554/elife.77177.
- N. Urbain, P.A. Salin, P.A. Libourel, J.C. Comte, L.J. Gentet and C.C. Petersen (2015). Whisking-related changes in neuronal firing and membrane potential dynamics in the somatosensory thalamus of awake mice. *Cell Report*, 13: 647-656.
- N. Urbain and M. Deschênes (2007) Motor cortex gates vibrissal responses in a thalamocortical projection pathway. *Neuron* 56: 714-725.