



MASTER 2 Fundamental and Clinical Neurosciences

Internship proposal 2024-2025

(internship from January to June 2025)

Host laboratory:

MeLiS Laboratory
CNRS UMR 5284 | INSERM U1314, Université Claude Bernard Lyon 1
Institut NeuroMyoGène

Host team :

Behaviour, plasticity and memory in larval zebrafish: Randlett.

<https://www.randlettlab.com/>

https://inmg.fr/melis/en/team_randlett.php

Internship supervisor :

Owen RANDLETT, Group Leader, CRCN Inserm. owen.randlett@univ-lyon1.fr

Project title :

The role of melatonin receptors and identified neurons in modulating learning

Project summary :

Larval zebrafish are a very small and transparent model vertebrate that can be trained to form long-term memories. We have developed paradigms to train larvae to ignore repeated stimuli. This simple form of learning is known as habituation, and offers a tractable paradigm to study the general phenomenon of learning and memory. How the brain actually accomplishes this selective filtration of specific stimuli is still largely mysterious. Indeed, we have shown that habituation is a complex phenomenon that involves multiple independent plasticity events that each tune individual components of behaviour. Our group aims to gain insights into this process at the molecular, cellular and circuit levels.

We have found that Melatonin is a potent modulator of habituation learning, and does so through the cooperative action of two G protein coupled receptors (GPCRs). In this project, we will characterize the expression pattern of these melatonin receptors through transgenesis and in situ hybridization, and identify the role that these neurons play in learning using Ca²⁺ imaging, 2-photon laser ablation and optogenetics, and ask how Melatonin signaling through these receptors alters neuronal physiology and plasticity.

Methods: Ca²⁺ imaging, quantitative behaviour, transgenesis, optogenetics

3-5 recent publications :

Functional and pharmacological analyses of visual habituation learning in larval zebrafish. Lamiré LA, Haesemeyer M, Engert F, Granato M, Randlett O. *eLife* (2023) <https://doi.org/10.7554/eLife.84926.3>

pi_tailtrack: A compact, inexpensive, and open-source behaviour-tracking system for head-restrained zebrafish: Randlett O. *Journal of Experimental Biology* (2023) 226, jeb246335. doi:10.1242/jeb.246335

Regulation of Habituation Learning via Posttranslational Palmitoylation. Nelson JC, Witze E, Ma Z, Ciocco F, Frerotte A, Randlett O, Foskett JK, Granato M. *Current Biology* 2020 Jul 20;30(14):2729-2738.e4.

Distributed Plasticity Drives Visual Habituation Learning in Larval Zebrafish. Randlett O, Haesemeyer M, Forkin G, Shoenhard H, Schier AF, Engert F, Granato M. *Current Biology* (2019) 29(8):1337-1345

Whole-brain activity mapping onto a zebrafish brain atlas. Randlett O, Wee CL, Naumann EA, Onyeka N, David S, Fitzgerald JE, Ruben P, Lacoste AMB, Clemens R, Florian E, Schier AF. *Nature Methods* (2015) 12(11):1039–1046.