

MASTER 2 Fundamental and Clinical Neurosciences

Internship proposal 2025-2026

(internship from January to June 2026)

Host laboratory: MELIS, Université Lyon 1 - CNRS UMR 5284 - INSERM U1314, Faculté de Médecine et de Pharmacie, 3ème étage, aile D, 8 avenue Rockefeller, 69008 LYON

Host team : NeuraCel (Neurobiology and Aging of *C. elegans*), head of lab: Jean-Louis Bessereau <https://www.inmq.fr/bessereau/?lang=en>

Internship supervisors : Bérangère Pinan-Lucarré, Chargée de recherche INSERM, PhD, HDR, berangere.pinan-lucarre@univ-lyon1.fr

Project title : Characterization of novel synaptic complexes in *C. elegans*

Project summary : The synapse is an evolutionarily ancient structure. Using the worm *Caenorhabditis elegans*, we seek to elucidate new molecular mechanisms involved in synapse formation and function. We recently characterized a novel synaptic complex between two cell adhesion molecules of the IgLON family and an ortholog of the human $\alpha 7$ acetylcholine receptor, placing for the first time IgLONs at the core of synaptic assemblies (1).

Aim: The expression of the two IgLONs indicates that they could act at many other synapses, involving synaptic complexes different from the one already studied. To identify these synapses, we will combine the expression profiles of IgLONs to the whole-animal map of chemical synapses. The presence of IgLONs will be tested by confocal imaging, comparing the localization of each IgLON to that of specific synaptic reporters. This will be followed by *in vivo* characterization of new complexes involving IgLONs.

Technologies used: The trainee will implement skills in molecular biology, formal and molecular genetics (CRISPR gene editing), imaging (spinning disk microscopy, image analysis by Fiji) and structural prediction tools (AlphaFold).

Biomedical outcome: IgLONs are expressed in the human brain, particularly at certain synapses where their role is still unclear, and are deregulated in certain brain pathologies. This project could lead to the discovery of new molecular pathways by which IgLONs act, and new therapeutic targets. This project will be conducted in close collaboration with a team studying an IgLON-related disease.

3-5 recent publications : (1) Mialon M, ..., Bessereau, J.-L.* and Pinan-Lucarre, B.* (2024) A trans-synaptic IgLON adhesion molecular complex directly contacts and clusters a nicotinic receptor. *BioRxiv*, doi: 10.1101/2024.09.05.611427.

(2) Pinan-Lucarre, B.*, ..., and Bessereau, J.L. (2014). *C. elegans* Punctin specifies cholinergic versus GABAergic identity of postsynaptic domains. *Nature* 511, 466-470.

(3) Zhou, X., ..., Pinan-Lucarre, B.* and Bessereau, J.-L.* (2020) The netrin receptor UNC-40/DCC assembles a postsynaptic scaffold and sets the synaptic content of GABA_A receptors. *Nature Communications*; 11(1).