

Internship Proposal Academic Year 2018-2019

1. Host team :

Research Unit (e.g. Department or Institute) : Institut de la Vision
Research Unit Director : José-Alain Sahel
Research Team Director : Xavier Nicol
Team name : Mechanisms of sensory map development

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2. Internship project title:

Modulation of cellular adhesion by lipid-raft restricted cAMP signaling in developing axons

3. Internship Description :

The precise wiring between neurons is crucial for the sound function of the nervous system. Using retinal axons projecting to the brain as model, we aim at understanding the molecular mechanisms driving the developmental choice of axonal post-synaptic partners.

During the development of the nervous system, neurons extend their axon over long distances to reach their targets. This outgrowth is guided by attractive and repulsive cues present in the environment of extending axons that integrate these signals using signaling molecules including second messengers. Among them, cAMP is crucial for axon pathfinding, but also for a myriad of other unrelated processes. We aim at deciphering how these ubiquitous second messengers can orient specifically axon outgrowth, without modulating the other signaling pathways involving them. We previously demonstrated that lipid rafts, a compartment of the plasma membrane, confine the cAMP signals modulating axon guidance. However the downstream signaling pathways are unclear. Our preliminary data suggest that lipid raft-restricted cAMP signals regulate cellular adhesion at specific sites termed focal adhesions. The goal of this internship is to investigate this hypothesis.

Several cutting-edge technologies will be used for this projet: FRET imaging with subcellular resolution to monitor cAMP signals at focal adhesion sites, optogenetics (use of light-sensitive proteins) to drive cAMP elevation in developing axons with temporal control, *in utero* electroporation to validate *in vivo* our *in vitro* findings.

This project is open for a potential PhD work starting in October 2019.