

Internship Proposal Academic Year 2019-2020

1. Host team :

Research Unit (e.g. Department or Institute) :
Research Unit Director : Alexis Brice
Research Team Director : Nelson Rebola
Team name : **Cellular mechanisms of sensory processing**

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2. Internship project title:

Experience-dependent plasticity of cortical microcircuits

3. Internship Description :

In humans, the brain is essential for proper evaluation and interaction with the environment. However, it is also known that experience is instructive in the development of neuronal circuits. Nonetheless, the cellular mechanisms involved in the experience-dependent modification of the human brain are not completely known. A better understanding of the mechanisms that shape brain development and plasticity could help in the development of new therapies for neurological diseases like autism and schizophrenia.

Cortical networks are made of complex interactions between excitatory and inhibitory neurons. In the last years a great number of studies have highlighted how experience modifies excitatory neurons both at the functional and structural level. *How experience impacts local inhibitory neurons is much less understood.*

In this project, the student will evaluate the impact of sensory deprivation in both the function and connectivity of local interneurons in primary somatosensory cortex. Namely, the student will use a combination of new transgenic mouse models together with imaging techniques (Confocal and two-photon microscopy) to evaluate both *in vivo* and *in vitro* activity-dependent structural modifications of excitatory synapses in neocortical interneurons. The functional impact of the observed structural modifications will be evaluated by using optogenetic manipulation of cortical microcircuits together with electrophysiological approaches.

The project is based on promising preliminary results and is expected to be pursued during a PhD project.

