ENS – IISER Network / BIOSANTEXC Project

Internship Proposal Form

(Discipline/Field name): Biology and or Bioinformatic.

Internship title: Using Spatial Transcriptomic To Understand Cell Diversity

Keywords related with the subject (minimum 3): **Spatial Transcriptomic, genetic, development**

Name of the laboratory at ENS: IGFL

Name of the internship supervisor(s): Jonathan Enriquez

Email(s): jonthan.enriquez@ens-lyon.fr

Prerequisites for the internship: knowledge in developmental biology and/or Bioinformatics
Requested level: M2 students

Foreseen internship dates: April 1st- June 30, 2025

Internship proposal (description and expected training outcomes / half page min, 1 page max):
See next page

BIOSANTEXC is a project co-funded by the French Ministry of Europe and Foreign Affairs (Ministère de l'Europe et des Affaires Etrangères).

Position Available: M2 Student in Bio-computing or Developmental Biology

We are seeking a talented M2 student with expertise in one or both of the following fields:

1. **Bio-computing**: To enhance our analysis of data derived from single-cell sequencing and spatial transcriptomics. The primary focus will be on investigating transcriptional trajectories, gene networks, and cell-cell interactions. We are looking for someone who can contribute their skills and insights to advance our research in these areas.
2. **Developmental Biology**: A student with a background in genetics. Prior experience working with genetic data or techniques is a strong advantage.

Project Overview:

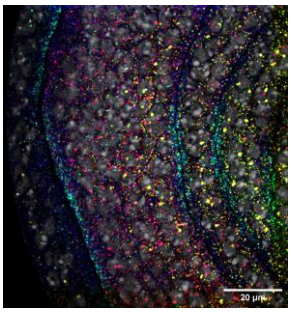
As the Renaissance philosopher Michel de Montaigne once said, "Life is in perpetual motion." In the animal kingdom, locomotion is a fundamental behavior for finding food, seeking mates, or evading predators. Precise movement in animal appendages depends heavily on the morphology of muscles, which are controlled by the wiring of motoneuron axon terminals. These terminals regulate the timing and intensity of muscle contractions. However, the developmental coordination between muscles and motoneurons to establish and maintain these axon-muscle connections throughout adulthood remains largely unknown.

At our lab, we aim to unravel the genetic program that governs the development and maintenance of muscle morphologies and the architecture of the axon-muscle connectome in *Drosophila* legs at the single-cell level. To achieve this, we utilize cutting-edge techniques, including single-cell RNA profiling, a novel 3D spatial transcriptomics approach, and genetic tools to visualize and selectively modify the genotype of individual cells in both developing and adult organisms.

Our research is supported by state-of-the-art microscopy (confocal and STED) and advanced behavioral technology (the Flywalker) to investigate the effects of genetic manipulations on cell architecture and locomotion.

Key Research Questions:

1. **Muscle Morphology Development**: Is there a muscle-specific genetic program that regulates the development of muscle morphology in parallel with the general process of myogenesis?
2. **Muscle Innervation Development**: What are the molecular and cellular mechanisms that control the formation of the axon-muscle connectome?
3. **Muscle Innervation Maintenance**: Is there a genetic program in adult motoneurons (MNs) and muscles that actively preserves the architecture of muscle innervation once it has been established?



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IGFL

Enriquez team

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