

MASTER 2 Fundamental and Clinical Neurosciences

Internship proposal 2023-2024

(internship from January to June 2024)

Host laboratory:

Institut de génomique fonctionnelle de Lyon

CNRS / INSERM Unit number: ENS de Lyon, CNRS UMR 5242, UCBL1, I

Lab location: 32-34 avenue Tony Garnier

Host team:

Development and function of the neuromuscular system

Internship supervisors :

Jonathan Enriquez

team leader, CR1

Email: jonathan.enriquez@ens-lyon.fr

Project title:

Building and maintaining the architecture of the axon-muscle connectome

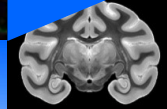
Project summary :

Life is constantly in motion, as the Renaissance philosopher Michel De Montaigne once said. One common behavior animals use to find food, mates, or evade predators is locomotion. In animal appendages, the morphology of muscles is key in ensuring precise movement. These muscles are innervated by a unique wiring of motoneuron axon terminals that control the timing and intensity of muscle contraction. However, how muscles and motoneurons coordinate their development to establish these unique axon-muscle connections and maintain them throughout adult life remains largely unknown.



At our lab, we aim to define the genetic program controlling the development and maintenance the axon-muscle connectome architecture in *Drosophila* legs at the single-cell level. To achieve our goals, we employ single-cell RNA profiling and a novel 3D spatial transcriptomic approach combined with genetic techniques to visualize and selectively modify the genotype of individual cells in a developing or adult

Please send your proposal to marion.richard@univ-lyon1.fr for publication on the Master of Neuroscience website.



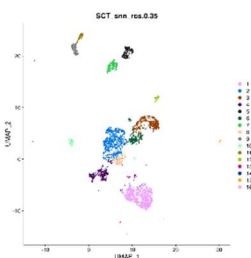
organism. We use state-of-the-art microscopy and a unique behavioral technology to analyze the impact of these genetic manipulations on cell architecture and locomotion.

With these technologies our research addresses three key questions:

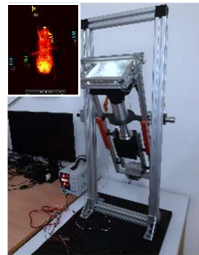
Q1: Development of Muscle Innervation - What are the molecular and cellular mechanisms controlling the building of the axon-muscle connectome?

Q2: Maintenance of muscle innervation. - Is there a genetic program in adult MNs and muscles actively maintaining the architecture of the muscle innervation once it is established?

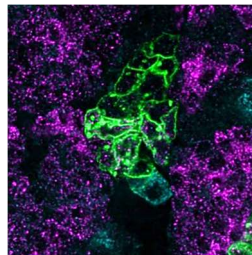
If you find any of these questions or technologies interesting, please do not hesitate to contact us!



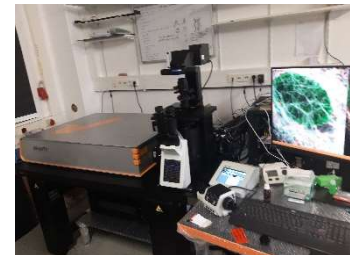
Single cell Seq



Flywalker



smFISH/spatial transcriptomic



STED microscopy

3-5 recent publications :

1. Mathilde Bouchet, Séverine Urdy, Wenyue Guan, Chérif Kabir, Steve Garvis and Jonathan Enriquez. **A simple smFISH pipeline to quantify mRNA at the single cell level in 3D**. STAR protocols. In press
2. Guan, W., Bellemin, S., Bouchet, M., Venkatasubramanian, L., Guillermin, C., Laurençon, A., Kabir, C., Darnas, A., Godin, C., Urdy, S., Mann, R.S., and Enriquez, J. (2022). **Post-transcriptional regulation of transcription factor codes in immature neurons drives neuronal diversity**. Cell Rep. 39.
3. Guan, W., Bouchet, M., Darnas, A., and Enriquez, J. (2021a). **Shaping the size of a neuronal lineage: the role of Imp and Syp RBPs in the precise elimination of neurons by apoptosis**. BioRxiv 2021.11.06.467542.
4. Guan, W., Venkatasubramanian, L., Baek, M., Mann, R.S., and Enriquez, J. (2018). **Visualize Drosophila Leg Motor Neuron Axons Through the Adult Cuticle**. corresponding author. J. Vis. Exp. JoVE.
5. Enriquez¹, J., Rio, L.Q., Blazeski, R., Bellemin, S., Godement, P., Mason, C., and Mann, R.S.¹. (2018). **Differing Strategies Despite Shared Lineages of Motor Neurons and Glia to Achieve Robust Development of an Adult Neuropil in Drosophila**. 1: Co-corresponding author. Neuron 97, 538–554.e5. Cover article.

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