MASTER 2 Fundamental and Clinical Neurosciences

Internship proposal 2026-2027

(internship from January to June 2027)

Host laboratory: *MeLis, CNRS UMR 5284-INSERM U1314-Université Claude Bernard Lyon 1*

Host team : *NEST – Embryogénèse du Système Nerveux et étude des Tumeurs pédiatriques. Director V. Castellani*

Internship supervisors : *Falk Julien, chargé de recherche CNRS, julien.falk@univ-lyon1.fr*

Project title : Deciphering the spatial landmarks that orchestrate the wiring of the enteric circuit architecture and their disruptions in pediatric gastrointestinal motility disorders

Project summary : *approx 10 lines*

Correct circuit formation is crucial to enable normal function of our nervous system. Our lab has started to explore these questions in the enteric nervous system (ENS) using the chick embryo. ENS derives from specialized neural crest cells (NCCs) that colonize the developing gut. Abnormal NCCs migration but also enteric axon development causes pediatric gastrointestinal dysmotility. However, the mechanisms directing the specific morphologies and axon patterns of the different neuron subtypes are poorly understood. The project aims to decipher the molecular signaling controlling the spatial position, morphologies and stereotypical axon patterns underlying the ENS geometry.
It is grounded in our previous characterization of the morphology and single-cell transcriptomes of neurons at different stages of development (André et al., in revision). We will use the cluster-specific markers we identified, to analyze the morphological differentiation of neuronal subtypes and assay the contribution of candidate transmembrane proteins to their axon development.

3-5 recent publications :

An early version of the paper in revision can be found in the PhD manuscript of Maelys André : **André, M.** (2024). Développement des circuits nerveux entériques: imagerie et dynamique transcriptomique des programmes de guidage axonal. *Thèse*.

André, M., Dinvaut, S., Castellani, V. and Falk, J. (2024). 3D exploration of gene expression in chicken embryos through combined RNA fluorescence in situ hybridization, immunofluorescence, and clearing. *BMC Biol* **22**, 131.

Dinvaut, S., Calvet, S., Comte, J.-C., Gury, R., Pascual, O., André, M., Ferrigno, R., Honnorat, J., Moret, F., Marcy, G., et al. (2024). Contribution of the neuron-specific ATP1A3 to embryonic spinal circuit emergence.

Pignata, A., Ducuing, H., Boubakar, L., Gardette, T., Kindbeiter, K., Bozon, M., Tauszig-Delamasure, S., Falk, J., Thoumine, O. and Castellani, V. (2019). A Spatiotemporal Sequence of Sensitization to Slits and Semaphorins Orchestrates Commissural Axon Navigation. *Cell Reports* **29**, 347-362.e5.

Boubakar, L., Falk, J., Ducuing, H., Thoinet, K., Reynaud, F., Derrington, E. and Castellani, V. (2017). Molecular Memory of Morphologies by Septins during Neuron Generation Allows Early Polarity Inheritance. *Neuron* **95**, 834-851.e5.