Master Biologie Moléculaire et Cellulaire 'BMC',
Université Paris Cité - *UFR Sciences du Vivant*

Parcours : **Biologie et Développement Cellulaires 'BDC'**
https://master2bdc.ijm.fr/
Fiche de Projet de Stage de M2, 2025-2026

Unité INSERM ou CNRS ou Université : **CNRS** **Intitulé Equipe :** **Regulation of microtubule nucleation** **ED d'appartenance :** **BioSPC** **Responsable de l'Equipe :** **Paul Conduit**	**Responsable du Stage : Chithran Vineethakumari (postdoc)** **Contacts** Adresse : Institut Jacques Monod, CNRS - Université de Paris, 15 rue Hélène Brion, 75013 Paris Email : paul.conduit@ijm.fr Tel : 01 57 27 80 95

Titre du projet : Shaping the neuron: how is microtubule nucleation regulated during neuronal regrowth?
Keywords: Neurons, microtubules, Drosophila

Résumé du Projet de Stage

Background. Peripheral neurons, like the sensory neurons in our Dorsal Root Ganglia (DRG) that reach from the spinal cord to our hands and feet, possess a remarkable innate ability to regrow after injury. Despite this, neuronal regeneration in humans is often inefficient, leading to disappointing clinical outcomes. A deeper understanding of how neurons extend their neurites is crucial for developing strategies to stimulate robust regrowth and improve patient recovery. Neuronal growth fundamentally depends on microtubules, a key component of the cytoskeleton, yet the precise mechanisms by which new microtubules are generated during this growth remain poorly understood.

Project overview. This Master 2 (M2) project will utilize regrowing *Drosophila* dendrites as a powerful model to investigate the regulation of microtubule nucleation during neurite regrowth. *Drosophila* neurons undergo a fascinating process during the larval-to-pupal transition: their neurites are pruned back, only to completely regrow and establish the precise neuronal structures required for adulthood. The student will establish live-cell imaging assays, combined with cutting-edge genetic manipulation, to directly visualize and characterize these growing neurons. Our working hypothesis, based on prior research, is that a novel Microtubule Organizing Centre (MTOC) exists at the growing distal tip of the neurite. We believe this MTOC is essential for providing the new microtubules required for neurite extension. The student's primary objective will be to identify the composition of this novel MTOC and uncover the key molecular players involved in generating these new microtubules.

Skills acquired. The student will gain invaluable practical experience and training in:

- Fly husbandry and *Drosophila* genetics
- Molecular biology techniques
- Advanced fluorescent imaging, including spinning disk confocal and super-resolution microscopy

We actively encourage our students to be proactive, innovative, and take initiative in their research. This Master's project also offers strong potential for continuation into a PhD program.

Our team. You'll be joining an eclectic and international team that operates primarily in English. We are well-resourced, supported by prestigious Impulscience and ANR grants, and have access to our own state-of-the-art multi-modal imaging system. Team webpage: https://www.ijm.fr/research-topics/conduit-lab-va/?lang=en

Publications de l'équipe relatives au projet de stage (max 5)

Yagoubat A and **Conduit PT***. Asymmetric microtubule nucleation from Golgi stacks promotes opposite microtubule polarity in axons and dendrites. **Current Biology**. PMID: 40037351

Mukherjee A, Jeske YA, Becam I, Taïeb A, Brooks P, Aouad J, Monguillon C, **Conduit PT***. γ-TuRCs and Augmin are required for the development of highly branched dendritic arbors in Drosophila.. **Journal of Cell Science**. PMID: 38606636.

Mukherjee A, Brooks P, Bernard F, Guichet A, Conduit PT*. (2020). Microtubules originate asymmetrically at the somatic Golgi and are guided via Kinesin2 to maintain polarity in neurons. eLife. DOI: 10.7554/eLife.58943