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, 2026-2027

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 : Léa Mammri (CNRS Engineer)** **Contacts** Adresse : Institut Jacques Monod, CNRS - Université de Paris, 15 rue Hélène Brion, 75013 Paris Email : paul.conduit@ijm.fr; lea.mammri@ijm.fr Tel : 01 57 27 80 95

Titre du projet : Controlling microtubule nucleation to avoid major mitotic defects

Keywords: Microtubules, Drosophila, Biochemistry, Protein purification, Imaging, Genetics,

Résumé du Projet de Stage

Background. Spatially controlling microtubule formation during mitosis is essential for the fidelity of spindle formation and cell division. Located at the spindle poles, centrosomes recruit **γ-tubulin ring complexes (γ-TuRCs)** that template microtubule nucleation. These multi-protein complexes are built in a semi-open low-activity conformation in the cytosol and must then adopt a closed high-activity conformation at centrosomes. A highly conserved **Centrosomin motif 1 (CM1) domain** found within specific centrosome proteins binds and activates γ-TuRCs by altering their conformation. Given this potency, CM1 binding is tightly regulated and we showed that an upstream **CM1 auto-inhibition (CAI) domain** prevents CM1 binding in the cytosol (Tovey et al., 2021, JCB; Elfarkouchi et al., 2026, under review). Preliminary experiments suggest that phosphorylation at the centrosome releases this auto-inhibition, but the molecular mechanism remains unknown.

Project overview. The aim of this M2 project is to identify potential phosphorylation sites that relieve auto-inhibition. This will involve using a previously established co-immunoprecipitation assay to test the interaction between γ-TuRCs and CAI-CM1 protein fragments containing specific phosphomimetic mutations. The student will also perform in vitro kinase assays and phospho-peptide mass spectrometry on phosphorylated protein fragments and on centrosomes purified from Drosophila embryos. Any putative sites identified will be tested in vivo by using CRISPR to generate mutant fly lines and phospho-specific antibodies to immunostain Drosophila tissue.

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

- Molecular biology techniques
- Protein purification and biochemical assays
- Fly husbandry and *Drosophila* genetics
- Cell imaging (confocal)

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 AKTA pure HPLC machines and 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)

Elfarkouchi, Vitard, Mammri, Brier, Tanneur, Hu, Thureau, Joly, Ochsenbein and **Conduit PT***. A structural model for the autoinhibition of the γ-TuRC-activating CM1 domain. **Journal of Cell Biology, in revision**.

Zhu Z, Becam I, Tovey CA, Elfarkouchi A, Yen EC, Bernard F, Guichet A, **Conduit PT***. Multifaceted modes of γ-tubulin complex recruitment and microtubule nucleation at mitotic centrosomes. **Journal of Cell Biology.** PMID: 37698931

Tovey CA, Tsuji C, Egerton A, Bernard F, Guichet A, de la Roche M, **Conduit PT***. (2021). Auto-inhibition of Cnn binding to γ-TuRCs prevents ectopic microtubule nucleation and cell division defects. **Journal of Cell Biology**. PMID: 34042945