

**Master 2 internship project  
Year 2023-2024**

**Laboratory/Institute:** Grenoble Institut Neurosciences - GIN    **Director:** E. Barbier  
**Team:** Neurocytoskeleton Dynamics and Structure    **Head of the team:** I. Arnal / A. Andrieux

**Name and status of the scientist in charge of the project:** V. Stoppin-Mellet (MCF)

**HDR:** yes  no

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**Program of the Master's degree in Biology:**

- Microbiology, Infectious Diseases and Immunology     Structural Biology of Pathogens  
 Physiology, Epigenetics, Differentiation, Cancer     Neurosciences and Neurobiology

**Title of the project: Role of tau in cytoskeleton-dependent focal adhesion dynamics**

**Objectives (up to 3 lines):**

The main objective is to explore how the remodeling of microtubule and actin networks induced by the neuronal protein tau affect the turnover of focal adhesion structures.

**Abstract (up to 10 lines):**

Tau is a neuronal microtubule (MT) stabilizer that also interacts with actin and regulates MT-actin interplay. Tau dysfunctions induce neurodegenerative diseases such as Alzheimer's disease. A milestone in the elucidation of tau toxicity is the understanding of the molecular mechanism by which abnormal tau proteins alter the cytoskeleton. Another major related question is to identify cellular processes impacted by these altered cytoskeleton networks. It has recently been proposed that components of focal adhesions are modulators of tau toxicity in Alzheimer's disease. Furthermore, MTs emerged as an additional player, together with actin, of focal adhesions, whose dysregulation has been linked to neurodegenerative diseases. The aim of this internship is to determine how pathological forms of tau affect cytoskeleton organizations which in turns impact focal adhesions, a mechanism that might trigger synapse alteration in neurons.

**Methods (up to 3 lines):**

Immunocytochemistry (confocal imaging), cell culture and patterning, in vitro reconstitution of cytoskeleton network, image analysis (ImageJ)

**Up to 3 relevant publications of the team:**

- \* Elie E *et al.* (2015) Tau co-organizes dynamic microtubule and actin networks. *Sci Rep* 5:9964
- \* Prezel et al (2018) Tau can switch MT network organizations: from random networks to dynamic and stable bundles. *Mol Biol Cell* 29, 154-165
- \* Fourest-Lieuvain et al. (2023) Controlled Tau Cleavage in Cells Reveals Abnormal Localizations of Tau Fragments. *Neuroscience* 518:162-177.

**Requested domains of expertise (up to 5 keywords): Cell biology, Protein biochemistry, Photonic microscopy, Data analysis, Ability to follow protocols**