

## MASTER 2 BMC PARCOURS GENOPATH ANNEE 2021-2022

**Titre du sujet de stage :**

Axon branching, mitochondrial metabolism and mRNA biology

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MÉTABOLISME ÉNERGÉTIQUE ET DÉVELOPPEMENT NEURONAL

**Nom, tel, adresse e-mail de l'encadrant de stage :**

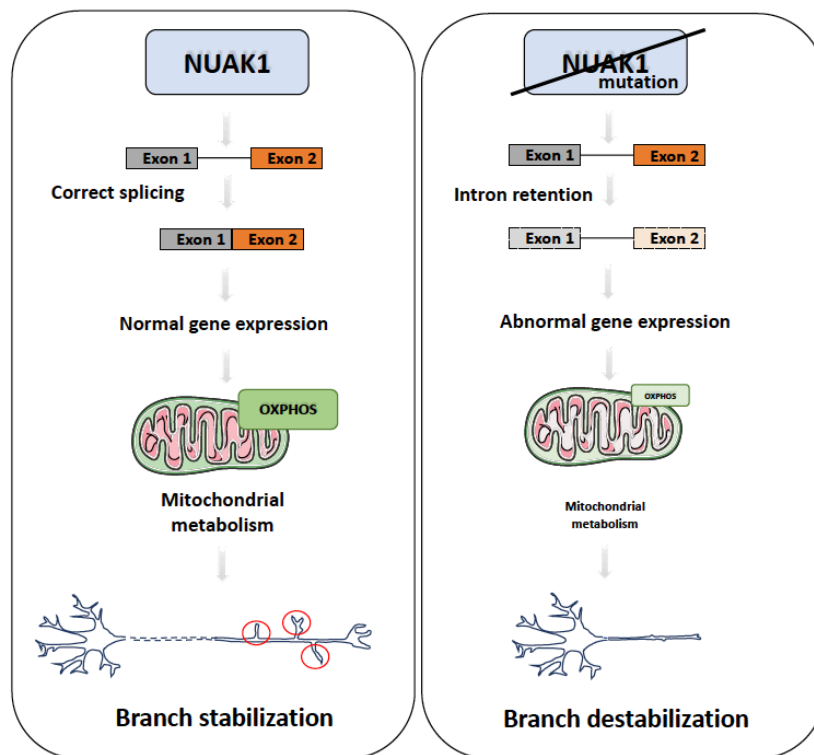
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**Sujet de stage:**

Axon branching, mitochondrial metabolism and mRNA biology

The formation of cortical circuits relies on a cascade of tightly regulated cellular processes whose disruption can lead to life-altering neurodevelopmental disorders such as autism. Recent evidence uncovered critical roles for mitochondria to support the development of cortical connectivity. Yet the molecular mechanisms regulating mitochondrial activity in developing neurons remain partially understood. In our laboratory, we study NUAK1, an autism-associated protein kinase that controls cortical axon branching through the regulation of mitochondria trafficking and metabolic activity at axonal branchpoints. We identified novel interactors of NUAK1 involved in the regulation of mRNA processing, providing an unexpected link between gene expression regulation and metabolic homeostasis. Our goal overall (as depicted in the figure below) is to understand how mRNA biology, and specifically mRNA splicing, underlie a dynamic regulation of mitochondria and metabolic activity in axon outgrowth/branching during the development of cortical circuits.



### Technologies utilisées :

Primary neuron culture and electroporation  
 Protein biochemistry (WB Immunoprecipitation and kinase assay)  
 RT-PCR and cloning  
 Immunofluorescence (fluorescent metabolic reporters)

### Mots clés:

Axon morphogenesis  
 RNA biology  
 Mitochondria metabolism

### Publications d'intérêt :

#### Lab publications

1. Meyer-Dilhet, G. & Courchet, J. STAR protocols 1, 10027 (2020).
2. Lanfranchi, M. et al. bioRxiv 2020.05.18.102582 (2020).
3. Rangaraju, V. et al. J neurosci 39, 8200–8208 (2019).
4. Courchet, V. et al. Nature communications 9, 4289 (2018).
5. Courchet, J. et al. Cell 153, 1510–1525 (2013).