

MASTER 2 BMC PARCOURS GENOPATH ANNEE 2023-2024

Titre du sujet de stage :

Cost and benefits of gene expression regulation in dynamic environments

Nom, adresse de l'Unité d'accueil / Nom du responsable de l'unité :

Laboratoire de Biologie et Modélisation de la Cellule (LBMC), UMR5239.
ENS de Lyon, 46 allée d'Italie, 69007 Lyon. Directeur : Didier Auboeuf.

Nom, adresse de l'Equipe d'accueil / Nom du responsable d'équipe :

Equipe génétique des variations intra-espèces (LBMC).
ENS de Lyon, 46 allée d'Italie, 69007 Lyon. Responsable : Gaël Yvert.
<http://www.ens-lyon.fr/LBMC/gisv/index.php/en/>

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

Fabien Duveau (Chargé de Recherche CNRS), tél : 04 72 72 80 67, e-mail : fabien.duveau@ens-lyon.fr

Sujet de stage :

One of the most fascinating and singular properties of life is its capacity to adapt to dynamically changing environments. Understanding the mechanisms that contribute to such adaptation is a fundamental challenge for evolutionary biology and also for biomedical research. Yet, the cost and benefits of regulating the expression of particular genes in fluctuating and steady environments remain largely unknown. To fill this knowledge gap, we recently implemented in yeast cells a genetic system allowing us to control the temporal dynamics of expression of a target gene. The student will harness this tool to determine how the expression dynamics of genes involved in osmoregulation (*GPD1*, *FPS1*) or histone methylation (*BRE2*) contribute to growth when cells are exposed to diverse regimes of periodic and steady hyperosmotic stress. By performing competition experiments under diverse regimes of gene expression and environmental fluctuations, we aim to understand when and how the regulation of gene expression can be shaped by selection. This project will offer the opportunity to learn basic molecular biology techniques, CRISPR/Cas9 genome editing, flow cytometry, quantification of growth rates and computational analyses while addressing a fundamental biological question.

Technologies utilisées : Molecular biology, CRISPR/Cas9 genome editing, flow cytometry, growth assays, data analysis with R.

Mots clés : Inducible expression, environmental changes, periodic stress, adaptation, *S. cerevisiae*.

Publications d'intérêt :

Barrere *et al.* 2023 <https://www.sciencedirect.com/science/article/abs/pii/S0960982223003196>
Yesbolatova *et al.* 2020 <https://www.nature.com/articles/s41467-020-19532-z>
Keren *et al.* 2016 <https://www.sciencedirect.com/science/article/pii/S009286741630931X?via%3Dihub>
Bleuven and Landry 2016 <https://royalsocietypublishing.org/doi/10.1098/rspb.2016.1458>
Duveau *et al.* 2018 <https://elifesciences.org/articles/37272>