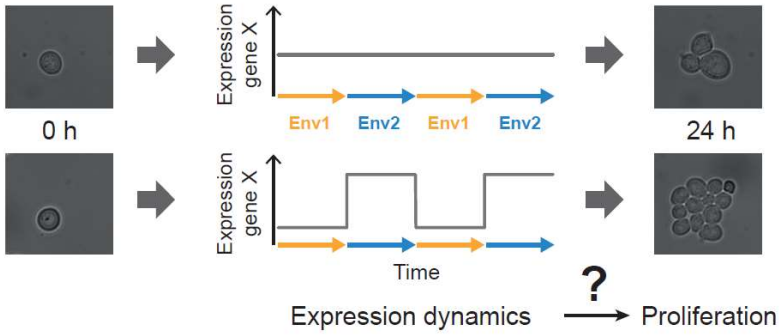
ÉCOLE NORMALE SUPÉRIEURE DE LYON

Offre de stage de Master / Master Internship offer



Date of the offer: Anytime from October 2022 to July 2023

Tuteur du stage et Laboratoire d'accueil / Internship supervisor and Host laboratory:

Laboratoire / Lab : Laboratoire de Biologie et Modélisation de la Cellule (LBMC)

Chef d'équipe / Team leader (name, function, e-mail and telephone):
Gaël Yvert, Directeur de Recherche CNRS, gael.yvert@ens-lyon.fr, 04 72 72 87 17

Encadrant du stage / Supervisor for the internship (if different):
Fabien Duveau, Chargé de Recherche CNRS, 04 72 72 80 67

Personne à contacter / Contact e-mail: fabien.duveau@ens-lyon.fr

Adresse du stage / Address of the internship:
Laboratoire de Biologie et Modélisation de la Cellule (LBMC), UMR5239.
ENS de Lyon, 46 allée d'Italie, 69007 Lyon.

Site internet de l'équipe / Team Website :
http://www.ens-lyon.fr/LBMC/gisv/index.php/en/

Langues parlées dans l'équipe / Languages spoken in the lab: French, English

Titre du projet de recherche / Research project title:

Adaptation of a living system to environmental changes

Mots clés / Keywords :
Inducible expression, dynamic control, periodic stress, fitness, yeast

Techniques: Molecular biology, CRISPR/Cas9 bioengineering, flow cytometry, growth assays, data analysis with R

UNIVERSITÉ DE LYON

ENS DE LYON

Description du projet / Project description (subject and technics):

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. In particular, gene expression regulation can be important for the adaptation of living organisms to changes in their environment. Yet, the cost and benefits of regulating the expression of particular genes remain largely unknown. To fill this knowledge gap, we will quantify how changes in gene expression affect the proliferation of yeast cells exposed to periodic stress. To this end, the student will use genetic tools to artificially control the expression dynamics of stress response genes in yeast cells. She/he will adapt a system allowing for inducible degradation of a protein of interest in yeast. Critical properties of the inducible system will be characterized and optimized including its efficiency, its specificity, its kinetics and its toxicity. 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. In the longer term, the tools developed in this project will be used to determine how the expression dynamics of genes involved in the osmotic stress response affects cell growth under periodic fluctuations of osmotic stress.

Publications du laboratoire ou revue recommandée sur le sujet / Lab publications or recommended review on the subject (5 max):

Yesbolatova *et al.* The auxin-inducible degron 2 technology provides sharp degradation control in yeast, mammalian cells, and mice. *Nat Commun*. 2020
https://www.nature.com/articles/s41467-020-19532-z

Keren *et al.* Massively Parallel Interrogation of the Effects of Gene Expression Levels on Fitness. *Cell*. 2016
https://www.sciencedirect.com/science/article/pii/S009286741630931X?via%3Dihub

Bleuven and Landry. Molecular and cellular bases of adaptation to a changing environment in microorganisms. *Proc Biol Sci*. 2016
https://royalsocietypublishing.org/doi/10.1098/rspb.2016.1458

Duveau *et al.* Fitness effects of altering gene expression noise in *Saccharomyces cerevisiae*. *Elife*. 2018
https://elifesciences.org/articles/37272