



Research Internship (M2)

Opto-genetic manipulation of individual cells in living animals

Where: Quantitative regulatory genomics team, LBMC

<http://www.ens-lyon.fr/LBMC/equipes/quantitative-regulatory-genomics>

ENS de Lyon, 46, allée d'Italie, 69364 LYON CEDEX 07, France

When: Beginning of 2025 (flexible)

Duration: 6 months (M2)

Teams:

Quantitative regulatory genomics, team leader: Mirko Francesconi.

Epigenetic regulation of cell identity and environmental stress response, team leader: Francesca Palladino.

Genetic complexity of living systems, team leader: Gael Yvert.

Scientific Tutors:

Valérie Robert (Mail: valerie.robert@ens-lyon.fr)

Mirko Francesconi (Phone: +33 4 72 72 85 08, mail: mirko.francesconi@ens-lyon.fr)

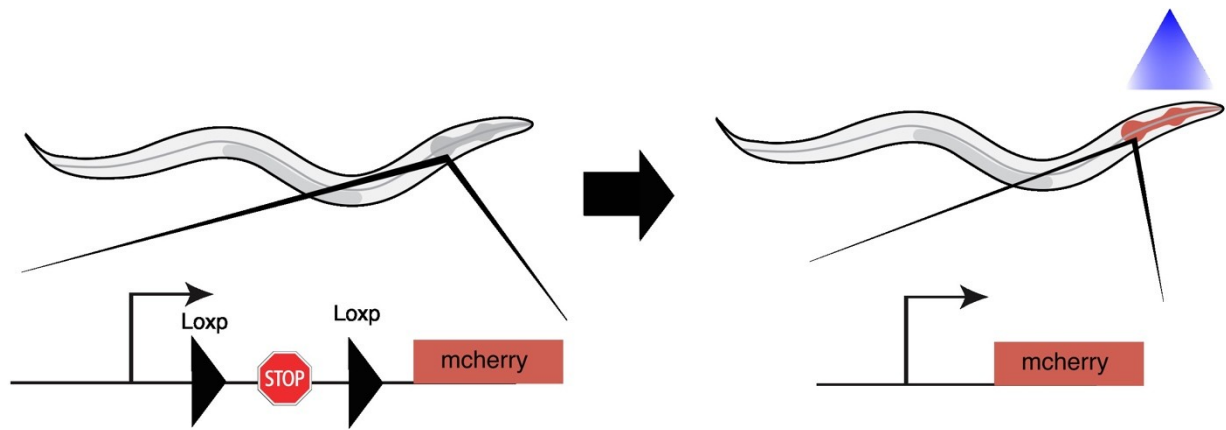
Keywords: optogenetics, *C. elegans*, biotechnology.

Background and description of the project:

Molecular genetics allows to discover causal links between mutations/genes and biological processes, such as molecular regulations, development, cellular adaptation and disease. Model organisms are powerful for this, but available procedures remain limited because we lack the possibility to introduce genetic changes with high temporal and spatial precision. Gael Yvert team has developed a light activated Cre/Lox recombination system to induce specific genetic perturbations using light¹. This system has been tested in yeast and human cells. We have now introduced it the *C. elegans* nematode model system and have established that LiCre can recombine 2 LoxP sites in this model when induced by blue light. The objective is now to characterize and optimize the system (illumination conditions/use of a laser beam, temperature, etc...) to systematically study time- and cell- specific genetics in a whole animal. Moreover, we want to use this system in combination with a transgene to rescue RNA interference in a mutant, to be able knock down genes in a cell and time specific manner using light. You will be trained to molecular biology, genetics, and microscopy under the supervision by Mirko Francesconi and Valérie Robert. We expect the work to open a variety of novel and exciting routes of investigations.

Techniques: Molecular biology, nematode genetics, microscopy, optogenetics.

For further information and to apply contact mirko.francesconi@ens-lyon.fr or Valérie Robert valerie.robert@ens-lyon.fr



References

1. Duplus-Bottin, H. *et al.* A single-chain and fast-responding light-inducible Cre recombinase as a novel optogenetic switch. *eLife*
<https://elifesciences.org/articles/61268> (2021) doi:10.7554/eLife.61268.