

ÉCOLE DOCTORALE E2M2

THESE FINANCEE DANS LE CADRE DE L'IPL COSY

Intitulé du sujet : Development, characterization and control of *E. coli* communities on an automated experimental platform (thesis funded by the IPL project CoSy)

Couleurs : *Ecologie des communautés, fonctionnement des écosystèmes, écotoxicologie et Biomath-Bioinfo-Génomique évolutive*

Directeur/trice (NOM Prénom) : GEISELMANN Johannes	Co-directeur/trice (NOM Prénom) : CINQUEMANI Eugenio
Unité de recherche : Laboratoire Interdisciplinaire de Physique, Université Grenoble-Alpes/CNRS	Unité de recherche : Inria Grenoble – Rhône-Alpes
E-mail : hans.geiselman@univ-grenoble-alpes.fr	E-mail : eugenio.cinquemani@inria.fr
HDR : OUI	HDR : NON

Résumé :

Different species in natural bacterial communities generally communicate in complicated ways. Here, we construct precisely defined bacterial communities consisting of engineered strains of *Escherichia coli*. Using this synthetic system, we can analyze and control the interactions between different subpopulations. In particular, we engineer bacteria that communicate by metabolites that are released in the medium and control the temporal expression profile of particular genes in the two populations by optogenetics.

The PhD project consists in constructing some of the strains, analyzing their behavior by measuring gene expression and growth parameters, and controlling their temporal dynamics using an advanced platform of mini-bioreactors coupled to a cytometer. By this setup, our aim is to achieve feedback control not only of mean behavior, but also of variability of growth and gene expression between and within subpopulations.

The project will be carried out at Inria Grenoble – Rhône-Alpes for the data analysis and modeling parts and the Laboratoire Interdisciplinaire de Physique (LIPhy) for the experimental part. Our interdisciplinary group, composed of biologists, computer scientists, mathematicians and physicists, studies bacteria, in particular *Escherichia coli*, at the level of the population and at the level of single cells. Our main focus is fundamental research, but we also aim at applications in biotechnology and synthetic biology.

Applicants may come from different disciplinary backgrounds – physics, biology, computer science, or mathematics. We expect them to be strongly motivated by interdisciplinary work combining experimental work in the lab with the mathematical modeling of biological systems and data analysis. Basic knowledge in microbiology and previous experience with some of the above-mentioned techniques would be appreciated. Good relational skills are important for the project, as it will be carried out in an interdisciplinary and international environment.

For more information, see <https://team.inria.fr/ibis/phd-thesis-development-characterization-and-control-of-e-coli-communities-on-an-automated-experimental-platform/>