

# Neutral models in microbial ecology - Undergraduate research project -

## Supervisor

Stilianos Louca, PhD; Assistant Professor, Biology

## Project breadth

Full independent research project, with the ultimate goal of publishing a scientific paper.

## Project background

Understanding the mechanisms that shape microbial community composition remains a core endeavor of modern ecological research. The widely used *Sloan neutral model* of microbial ecology assumes that local species composition is driven by two neutral (i.e., species- and trait-independent) mechanisms, namely random dispersal from a common pool and ecological drift due to stochastic birth/death events. A comparison of the model's predictions to real communities is often used to claim that community assembly is indeed neutral, or to quantify the extent to which communities assemble neutrally, or to identify individual species subject to non-neutral processes (e.g., selection). However, the validity and informative ability of these approaches, especially when neutrality is violated, has never been rigorously evaluated.

## Project objectives

Evaluate the inference power of the Sloan neutral model using computer simulations of hypothetical microbial communities. Test whether existing approaches are able to correctly identify species subject to selection.

## Potential benefits to student

- Experience in conducting supervised serious research from A to Z
- Opportunity to author or co-author a scientific publication (depending on progress)
- Research credit

## Prerequisites and commitments

- Experience in programming (e.g., R, C++ or python)
- Experience in statistics and/or mathematical modeling
- Student in biology, bioinformatics, statistics, physics, math or related discipline
- Interest in microbial ecology
- Strong motivation to learn independently and solve complex problems
- Scientific writing skills
- Professionalism and scientific integrity
- Willing to devote 150-300 hours of work, over the course of 1-2 years

## Application procedure

Contact Stilianos Louca by email (contact details at [www.loucalab.com](http://www.loucalab.com)). Please include CV and an explanation of why you think you are a good candidate for the project.