



## PhD position in *Modeling and Experimental Microbial Ecology*

### **Deciphering formation mechanisms of oxygenic photogranules**

#### Context and objectives

Effective sanitation of wastewater is a milestone in the development of mankind. However, the operation of centralized wastewater treatment plant in Western Europe accounts for 2% of the total electricity consumption. About 60% of the energy is required for gas-liquid oxygen transfer in a process called activated sludge.

As part of a project funded by the French National Research Agency (ANR) and an international collaboration with the University of Massachusetts Amherst (USA), we explore the biotechnological potential of an alternative process to activated sludge using oxygenic photogranules (OPG).

OPG are microbial aggregates that combine photosynthetic cyanobacteria releasing oxygen, and oxygen-consuming bacteria that degrade pollutants. OPG have an enormous potential in biotechnology. Research in this promising process may advance wastewater treatment and environmental biotechnology on a global scale.

The objective of this PhD thesis is to decipher formation mechanisms of these granules using approaches in mathematical and experimental microbial ecology.

#### Methods and program of the work

Through the tight coupling of laboratory experiments in microbial ecology, multi-omics approaches and modeling (1D dynamic multi-species model and individual-based modeling), the PhD student working on this subject will decipher granulation mechanisms. Key to this approach is the ability to separate potential factors governing granulation in a mathematical model.

Photogranulation will be performed in our recently developed high-throughput set-up using multiwall-plates for the production of OPGs. Routine image acquisition using time-lapse scanning, white-light and fluorescence microscopy will be used to follow granulation on various spatial scales. The images will serve as reference data for the comparison with the output of models. The physico-chemical characterization of granules will be done in collaboration with both national and international partners. Models of the microbial community will be implemented in COMSOL Multiphysics®. The PhD student will have the opportunity to participate in research exchanges with international partners.

#### Candidate

We are looking for a (microbial) ecologist or biophysicist by training, with a special interest in microbial engineering or biotechnological processes. The applicant will work in an interdisciplinary team.

Experience in programming and mathematical modeling is advantageous. Good English skills are required. Knowledge of French is not immediately necessary for life in the lab and can be acquired during the stay.

## Laboratory

The PhD student will be based at INRA Laboratoire de Biotechnologie de l'Environnement (LBE) in Narbonne (<http://www.montpellier.inra.fr/narbonne>). The LBE is staffed with 16 tenured researchers, 20 technicians and support staff, 8 postdocs and 19 PhD students. Scientists from LBE cover a wide range of disciplines: microbiology, microbial ecology, microbial engineering, process engineering, modelling, control, life cycle assessment and technology transfer. Research at LBE focuses on the development of new solutions for pollution removal and the generation of value-added products from waste, in the framework of the Environmental Biorefinery concept.

## Timeline and review of application

A complete application consists of a cover letter and a CV. The cover letter should include contact information for a possible (personal, phone or skype) interview. The cover letter should be seen as opportunity to concisely introduce oneself and highlight the key reasons and qualifications for the PhD position. The CV should include among others the names and contact information of two referees, including (if possible) a senior scientist closely associated with your current work.

Review of applications will start immediately until the position is filled. The start time of the thesis will be in Spring 2017 but could be later if necessary

## **Please send your application by email to:**

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