# Post-doctoral position : multiphase flow with OpenFOAM applied to bioreactor design

*Fixed term – 10 months, with possible extension*

**CONTEXT:**

The Chair of Biotechnology of CentraleSupélec aims to develop biotechnological approaches to address major societal challenges such as improving food quality, using bio-based materials, and developing resource-efficient processes, all with the goal of reducing society's carbon footprint and improving citizens' quality of life. To achieve these ambitious objectives, the Chair deploys experimental and digital approaches in partnership with industrial stakeholders.

This recruitment is taking place within the framework of a contract with a company (a large group) cultivating microalgae. The project aims to improve biomass through better culture vessel design. This ambitious project is supported by BPI France under its "Food for Tomorrow" call and will run for about 2 more years. During this project, you will support the design and development of the solution, from detailed laboratory characterization to deployment on-site (6000 L).

**ACTIONS:**

In collaboration with the laboratory teams, you will be in charge of the digital (numerical) aspect of the project. Your work will cover: the calculation of flows within the bioreactors, the monitoring of "digital" microalgae throughout their development, and the reconstruction of the conditions they have perceived. We will first validate the tools and methods at the laboratory scale before designing production bioreactors (6000 L).

From a practical point of view, your actions will mainly be simulation with the open source CFD framework OpenFOAM. Expertise in OpenFOAM, in the context of multiphase flow, is required and should be testified with several publications. The topic is irrelevant, so long the technical skills are demonstrated. For example, two-phase flows studies with OpenFOAM in the context of metallurgy are admissible. Still, the validation part of the project (5-liter reactor, already in place) will require some technical knowledge. So, having performed some experiments alike in the past is a plus.

**SUPERVISION AND MEANS:**

In addition to support from the team, you will be accompanied throughout the project by the senior researcher in charge of the project. You will be required to provide regular written reports, which will enable effective communication between partners and facilitate the process of publishing your results in scientific journals.

To successfully carry out your tasks, you will have access to a high-quality HPC infrastructure. Our laboratory has access to a supercomputer (RUCHE at ENS & CentraleSupélec) and also has its own workstations.

**SKILLS:**

Holding a PhD, the candidate should:

- Have practical expertise in CFD with OpenFOAM
- Be capable of building a numerical workflow chaining together various codes,
- Have good collaborative working skills,
- Be familiar with (not necessarily proficient in) the Linux environment,
- Ideally, have a personal interest in the project's topic.

The following experiences would be considered an asset:

- Statistical methods (broadly defined, from ANOVA to machine learning),

- Some experimental know-how for CFD prediction validation,
- A hands-on, resourceful mindset (to assist colleagues when needed).

**TEAMS:**

The position is open within a dynamic and growing laboratory. The team brings together individuals with true diversity and complementarity of expertise (microbiology, analytical chemistry, numerical methods, etc.). The recruited candidate will be surrounded by a strong team (PhDs, engineers, and doctoral students, all working with microalgae in both numerical and experimental approaches) who will share their expertise while also benefiting from the candidate's knowledge. Finally, the Biotechnology Chair is composed of a young, multicultural team that offers numerous scientific and personal development opportunities.

**ENVIRONNEMENT:**

The Chair of Biotechnology of CentraleSupélec, established in 2011 and located within the Bazancourt-Pomacle biorefinery (Marne, France), is structured around three thematic areas: lignocellulosics, biotransformation, and separation techniques, all supported by a cross-disciplinary foundation of modeling, instrumentation, and visualization. It is one of the four groups hosted by the European Center for Biotechnology and Bioeconomy (CEBB).

**PRACTICAL ASPECTS:**

The position is open within the European Center for Biotechnology and Bioeconomy (CEBB). The work will be conducted on-site. The salary will be 2900€/month gross. Ideally, the position will start on September 1, 2025.

**DOCUMENTS TO PROVIDE:**

Application letters, accompanied by a curriculum vitae and, at the candidate's discretion, letters of recommendation, should be sent by email to the contact below.

**CONTACT :**

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