INTERNSHIP PROGRAM FOR INTERNATIONAL STUDENTS

INTERNSHIP SUBJECT FORM

Name of the Host Laboratory	LadHyX
Website of the Host Laboratory	https://www.ladhyx.polytechnique.fr/en/
Research Group	
Internship Supervisor	Blaise Delmotte and Gabriel Amselem
Internship Subject	Particle transport and mixing by microswimmers in liquid films
Student's level	☐ Advanced Undergraduate Students (3rd or 4th year) ☒ Master's students (1st or 2nd year) ☒ PhD students
Proposed Duration	☐ 3 months ☐ 4 months ☒ 5 months ☒ 6 months
Prerequisites	Low Reynolds number Hydrodynamics, Computational Fluid Dynamics, Programming
Internship description (max. 15 lines)	In addition to enabling movement towards environments with favourable living conditions, swimming by microorganisms has also been linked to enhanced mixing and improved nutrient uptake by their populations. Mixing and transport of microscopic, inert particles by motile microorganisms have been a topic of recent interest as such suspensions are a prime example of out-of-equilibrium systems. Recent experimental results have shown that microorganisms transport microparticles more efficiently under confinement than in the bulk. However the physical origin of these results has not been explained and remains to be understood. The goal of this internship is to combine numerical simulations and experiments to study the effect of confinement on particle transport in active suspensions. The numerical method to be used is called the Force Coupling Method. It has been shown that this method can simulate experiments of particle transport by microswimmers in the absence confinment with excellent quantative agreement. The intern will first learn how to use the numerical tool to model suspensions of microswimmers. Then she/he will study the effect on confinment on the transport of inert particles in microswimmer suspensions and compare the simulation results with the experiments. Experiments will be carried out in parallel by another student in the lab next door under the supervision of Gabriel Amselem. This work will be *highly collaborative* as it requires strong interactions between simulations and experiments.