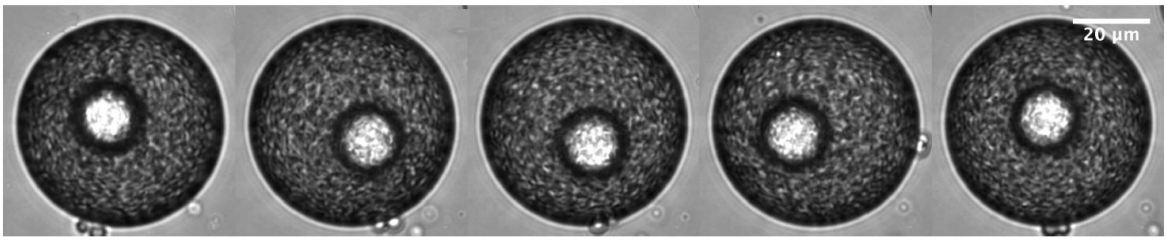
Post-doctoral position at ESPCI Paris

"Confined bacteria in a drop: a model of active thermal bath"

In a bath of active particles, or active thermal bath, a passive object will undergo agitation, resembling Brownian motion. However, the diffusive properties, the collective mixing behaviour, and the possibility of self-organization bestow on the driven passive objects novel emergent properties, far beyond the classical Brownian motion.



Motion of an inner droplet immersed in a thermal bath of E-coli bacteria contained in a larger droplet. Pictures are shown every 5s. Curtesy Cristian Villalobos Concha, collaboration Univ.Chile, PMMH and Gulliver, ESPCI

This project aims at exploring these new properties using a population of swimming bacteria confined into droplets. The specific goal of this postdoctoral position is:

1. To study the fluctuating motion of an inner droplet encapsulated inside a larger one that contains bacteria when systematically changing the radii of the two droplets.
2. To characterize the motion of solid passive objects of different shapes dispersed in a droplet containing bacteria. We expect to observe interesting and novel self-organization phenomena when several of these objects are dispersed inside the droplet.

The outcome of the experimental measurements will be compared with several propositions recently developed to describe active thermal baths in the framework of out-of-equilibrium stochastic thermodynamics, in particular in collaboration with a Chilean team (Profs. R.Soto and Maria-Luisa Cordero, Universitad de Chile). This project is also a part of a larger collaborative project: *Bacteria in droplet self-assemblies: from hybrid materials to new assays strategies*, involving the ESPCI-PSL and New-York University (Prof. Jasna Brujic, Center for Soft Matter Research, Physics Department).

The project is funded by the Institut des sciences de l'Ingénierie et des Systèmes (INSIS) of the CNRS and has a duration of 12 months. Preferred starting date autumn 2020. It will be carried out at ESPCI Paris, in the PMMH and Gulliver labs. The candidate will use different experimental techniques, such as confocal microscopy, a 3D Lagrangian tracking set-up built at PMMH and a 3D nano-printer to create solid objects of customized shapes.

We are looking for a motivated candidate with expertise in optical microscopy and image analysis and a background in physics. Working knowledge of microfluidics and active matter is also an asset.

Contact info

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