Master 2 internship proposal

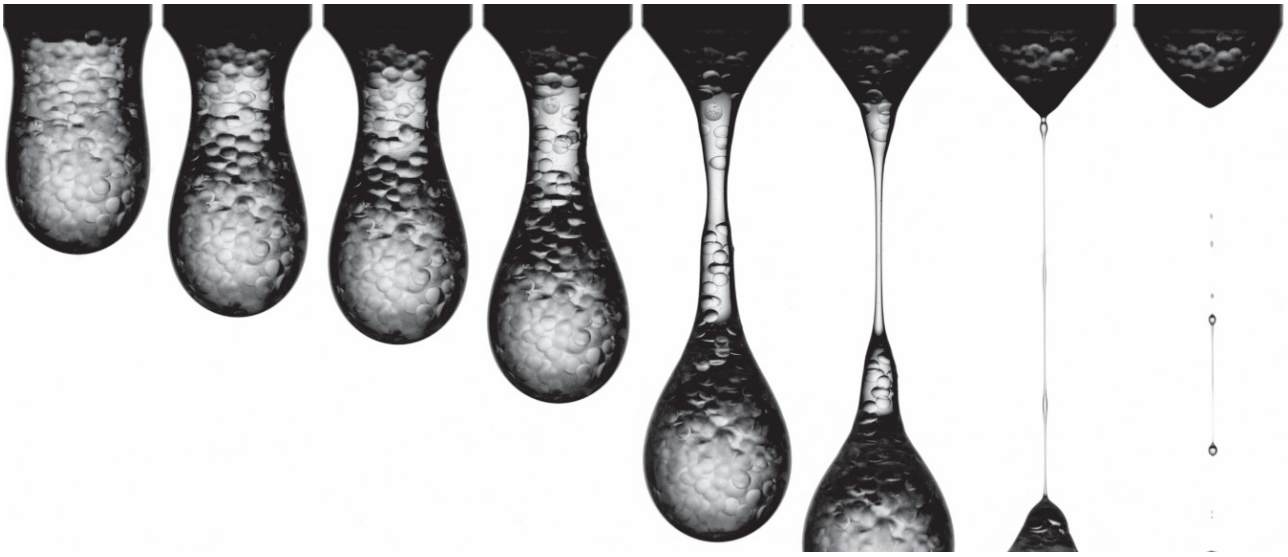
Physique et Mécanique des Milieux Hétérogènes

Contact: Virgile Thiévenaz/ @: virgile.thievenaz@espci.fr / Web: **https://www.vthievenaz.fr**
Internship location: barre Cassan A, campus Jussieu, 7 Quai Saint Bernard, 75005 Paris

Drops of granular suspensions

Many fluids of everyday life, industry, or nature are actually suspensions of solid grains. Mud, paint or blood are common examples. When the particles are in the size range 1µm-1mm, one speaks of granular suspensions [1], because they are too big to feel thermal agitation from the suspending liquid. Modeling the flow of such suspensions is challenging because of their heterogeneity – they are not continuous media – and because of the many-body interactions between the grains. An emerging cooperative length scale appears, larger than the grain size and smaller than the whole system, and leads to specific flows [2]. This process typically depends on the size distribution of the grains [3], and most likely on the kind of boundary conditions.

This internship aims at investigating this collective motion inside drops of granular suspensions, for which surface tension produces a specific boundary condition. The intern will principally conduct experimental work using high-speed imaging and rheology. This internship could be prolonged into a **PhD** provided that the intern obtain funding from the École Doctorale.



Detachement of a drop of a granular suspensions of polystyrene beads (250 µm-big) in silicone oil. The nozzle is 2.75 mm-wide. As the drop falls, the neck thins down following different dynamics depending on how its size relates to the cooperative length.

References

[1] E. Guazzelli & O. Pouliquen, Journal of Fluid Mechanics 852 (2018)
[2] V. Thiévenaz & A. Sauret, PNAS 119:e2120893119 (2022)
[3] V. Thiévenaz, S. Rajesh & A. Sauret, Soft Matter 17 pp.6202-6211 (2021)

Expected skills: The applicant should have interest in physics, fluid mechanics and experimental work.