



*Post-doctoral position*  
**Numerical modelling of particle suspensions in crowded environments.**

*Supervisor: Blaise Delmotte*

CNRS Research Scientist at LadHyX / Professeur Chargé de Cours at Ecole Polytechnique  
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Duration: 24 months

Starting date: between October 2021 and February 2022

Monthly gross salary: between 2800€ and 3700€ depending on experience

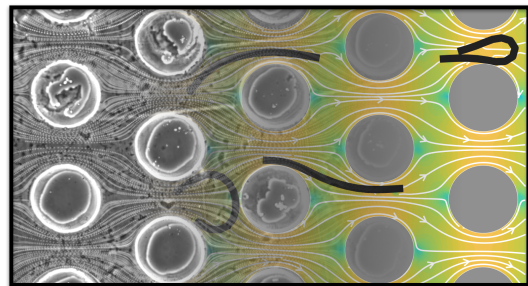
Lab: LadHyX (<https://www.ladhyx.polytechnique.fr/en/>), Ecole Polytechnique, France

**Context:** the motion of suspended particles at the micron-scale often happens in complex media that are structured by obstacles whose size is similar to the size of the moving particles. In this regime, which covers a broad range of applications, the dynamics of flexible or active particles result from the complex interplay between the external flow, locomotion mechanisms, internal elastic stresses, contact forces and hydrodynamic interactions with the surrounding interfaces and the embedded obstacles. Examples of physical systems of interest include suspensions of pulp fibers in the papermaking process, parasites in mucus, particles in microfluidic sorting devices, or micro-swimmers in densely populated environments. Understanding how such suspensions navigate in a flow embedded with obstacles is essential to study the physics of biological and industrial systems, but also to deal with major sanitary issues, such as the prevention and treatment of infections.

**Description:** the postdoctoral researcher will work in the group of Blaise Delmotte at LadHyX (Ecole Polytechnique) which develops numerical methods to study fluid-structure interactions and the dynamics of active and passive suspensions in Stokes flow. The candidate will help implement and apply computational techniques in an existing numerical framework [1,2,3] to address physical problems of scientific importance with a broad range of applications. Current collaborations with experimentalists at LadHyX (Profs. C. Duprat and G. Amselem) include the dynamics of fiber and micro-swimmer suspensions in idealized porous media. Depending on her/his taste and profile, the candidate will have the possibility to study other related topics.

**Experiments**

**Simulations**



*Flexible fibers moving through a lattice of rigid posts.*

**Environment:** LadHyX is a worldwide famous lab in fluid mechanics and interdisciplinary research at Ecole Polytechnique, near Paris. The candidate will join the ANR-funded project [TransClog](#), coordinated by B. Delmotte, which includes experimentalists as well as a PhD student working on numerical simulations of fiber-obstacle interactions.

**Profile:** candidates should hold a PhD degree and have experience with numerical modelling and scientific computing, with a solid background in fluid mechanics or soft matter. No prior knowledge on Stokes flows or particle suspensions is required. Participation in various international scientific events (conferences, workshops, etc.) are expected. Proficiency in English and oral scientific communication are therefore mandatory. Opportunities also exist to gain mentoring and/or teaching experience.

**Contact:** please send a CV, cover letter, list of publications, and the names and email addresses of at least two references to [blaise.delmotte@ladhyx.polytechnique.fr](mailto:blaise.delmotte@ladhyx.polytechnique.fr).

### **Selected publications**

[1] [B. Delmotte](#), F. Plouraboué and E. Climent. (2015). *Journal of Computational Physics*

[2] F. Balboa-Usabiaga, B. Kallelov, [B. Delmotte](#), A. Pal Singh Balla, B. Griffith, A. Donev, (2017). *Communications in Applied Mathematics and Computational Sciences*

[3] F. Balboa-Usabiaga, [B. Delmotte](#). (2021). *Submitted to Journal of Computational Physics*