Internship - PhD proposal:
Clogging in fluidic channels covered with elastic fibers

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Profile: Soft matter physicist or mechanical engineer
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Context: From hairs on our skin to the microscopic cilia inside our respiratory tract, large aggregates of thin deformable elastic structures in contact with fluids are ubiquitous. When these elastic fibers are tightly packed, they form a porous media which can act as a particle filter (Fig. 1a). However, here the pores are deformable. The elastic fibers can bend in response to the flow (Fig. 1b), altering the pore size and geometry, as well as the overall porous media dimensions. Understanding this flexibility based poroelastic material and its potential for filtration is the goal of the ANR JCJC Filthair funding this position.

Goal: Within the ANR project, the PhD student will focus on a macroscale approach and investigate how a whole porous medium made of these fibers can capture particles (Fig. 1a). Using experiments, he/she will inject a suspension of large particles (~ 500 µm) into a channel fully filled with fibers and measure its filtration properties as a function of the fiber arrangement, rigidity, and flowrate. Then, he/she will explore whether particle loaded fiber beds can be washed with pure fluid, thus paving the way for the development of bioinspired flow tunable filters.

Profile: The expected candidate should have a strong academic background in fluid mechanics and/or soft matter. Experience in fast prototyping, image analysis and particle tracking are particularly welcome. A strong interest for modelling and theoretical analysis is also appreciated. The position (internship/PhD) is fully funded by the ANR JCJC Filthair.

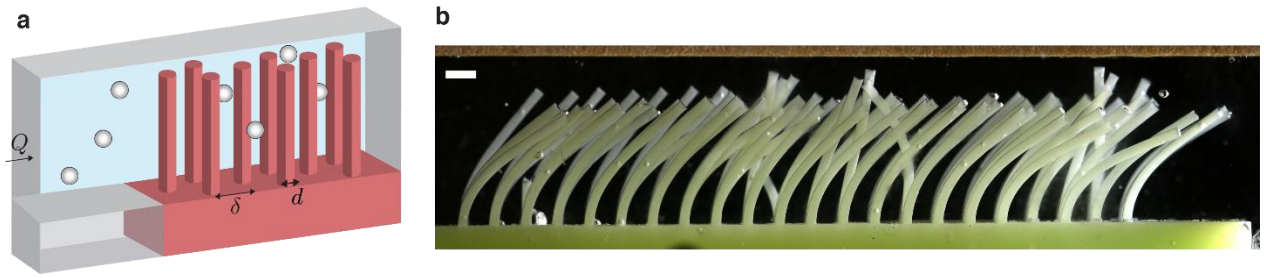

*Figure 1: **a**. Schematic of an array of elastic hairs acting as particle filter. **b.** Preliminary experiment showing flow induced hair deformation. Scale bar 1 mm.*