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Capillary effects in suspension flows: from break-up to contamination

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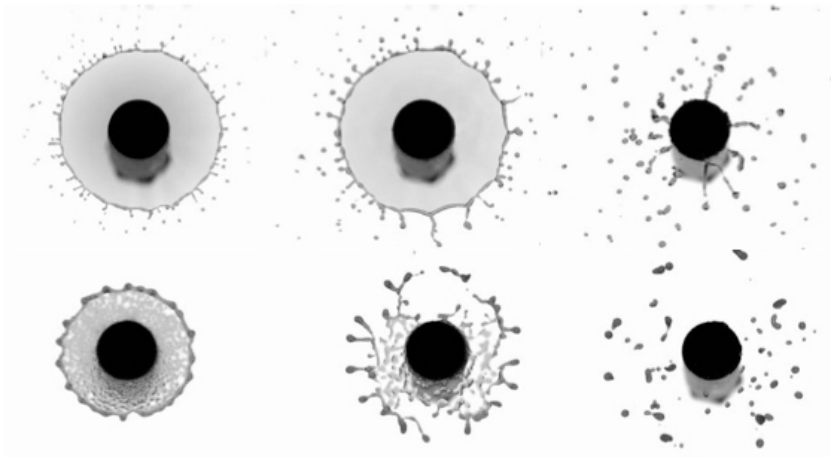
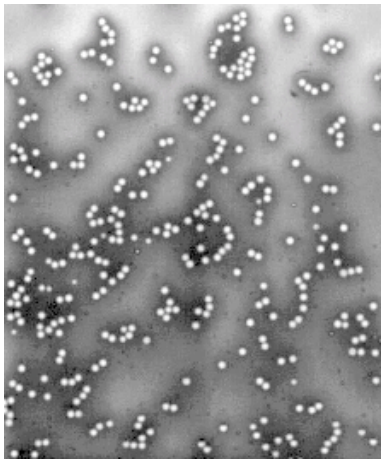
Suspension flows are encountered in various industrial and biological systems. In confined environments, such as thin liquid films or threads, the thickness of the liquid layer becomes comparable to the particle size. As a result, the **particles deform the liquid interface, which leads to capillary effects**, modifying the transport of particles [Fig. 1(a)] and the stability of the liquid films [Fig. 1(b)]. The capillary force contribute to the deposition of non-Brownian particles leading to the **contamination of the surface** and the loss of transported material, but the interplay between particles and interfaces remains poorly described.



(a)



(b)

Figure 1: (a) Particles entrained during the withdrawal of a substrate from a liquid contaminated with particles. The dye indicates the thickness of the liquid film. (b) Expansion and atomization of a liquid sheet for a pure liquid (top) and a suspension of solid particles (bottom).

We propose to investigate different physical situations in which **capillary effects induced by the particles contribute to the liquid film and thread dynamics**. The experimental results will be rationalized by taking into account the influence of the liquid, and the capillary forces and the drag force exerted on the particles. This knowledge will contribute to a better optimization of industrial processes and prevention of substrate contamination by suspensions.

The internship will be carried out in the Mechanical Engineering department at the University of California at Santa Barbara (USA). The ideal applicant will have a strong taste for experimental studies.