LadHyX Seminar – September 23, 11:00, Amphi Painlevé

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Trapping microswimmers in a foam

A massive formation of stable foam is regularly observed in various waterbodies such as watercourses, lakes and oceans. These foams, of natural origin, can cover kilometres of coastlines, and remain stable for several days. Inspired by the consequences of such foam formation for ecosystems, one of which is the loss of phytoplankton biodiversity, we studied the sedimentation of microswimmers in a liquid foam.

I will present experiments performed in the laboratory on a model system: the unicellular bi-flagellate alga Chlamydomonas reinhardtii (CR) was incorporated into a liquid foam stabilized with biocompatible proteins. Over time, the liquid contained in the foam flows downward by gravity drainage, advecting the solid particles suspended in the liquid, which then escape from the foam and reach the underlying liquid. We measured the dynamics of escape of CR cells from the foam, and compared the case of living and of dead cells. While the dead cells are totally advected by the liquid flow, as expected for passive solid particles of this size (10 microns), the living cells sediment much more slowly, and a significant proportion remains trapped in the foam at long times.

The liquid phase of a foam consists of interconnected micro-channels through which the liquid flows. Microscopic observation of living CR cells in micro-wells mimicking the cross-section of one of these microchannels has revealed that microswimmers accumulate near the corners of the channels. This microscopic trapping increases the retention of the microswimmers in the foam.