Marine foams described using a model system: trapping bi-flagellated algae in a foam.

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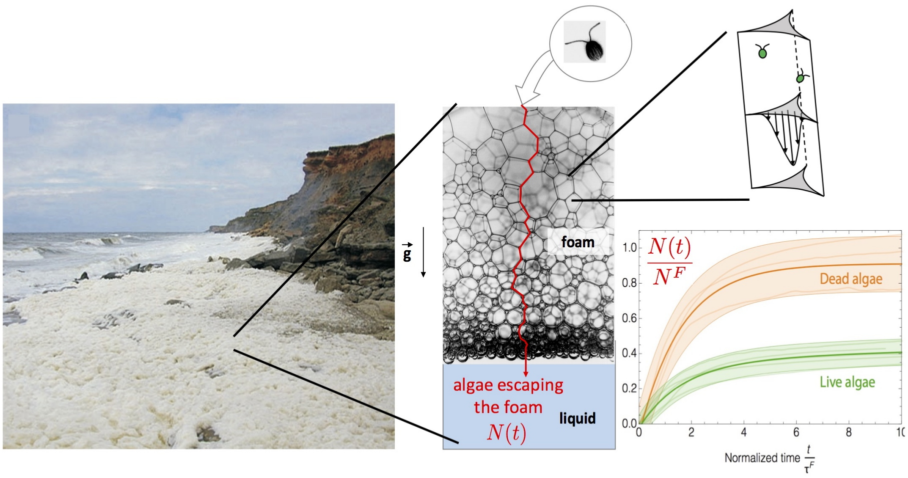

A massive formation of stable sea foam is regularly observed on certain shores. These foams, of natural origin, are concomitant with a loss of phytoplankton biomass and biodiversity. Besides, liquid foams are known to act as filters for solid particles, due to the complex network of internal channels through which the liquid flows. We therefore hypothesise that a relevant part of the phytoplankton, advected in the foam during the foam formation, could be trapped in the foam.

Among phytoplanktonic organisms, many are flagellated and therefore motile. In this talk, I will present experiments performed in the laboratory on a model system to investigate the sedimentation of microswimmers in a liquid foam: 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 similar size, the living cells sediment much more slowly, and a significant amount remains trapped in the foam at long times. I will ultimately discuss the microscopic mechanisms that can lead to this trapping.