Active trapping of micro-swimmers in a foam

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ABSTRACT

Inspired by the consequences of sea foams on planktonic ecosystems, we have studied the sedimentation of a microswimmer in a liquid foam. The model unicellular bi-flagellated *Chlamydomonas reinhardtii* (CR) algae was incorporated in a foam stabilized with biocompatible proteins, and the dynamics of cell sedimentation out of the foam was measured. By comparing the escape dynamics of living and dead CR cells in a draining foam, we found that dead cells were totally advected by the liquid flow, as expected for passive solid particles of this size (10 μm). On the other hand, living motile CRs sedimented much more slowly. Microscopic observation of the swimming CR cells in a chamber mimicking the cross-section of a Plateau border revealed that the microswimmers accumulate near channels corners. This trapping on a microscopic scale should increase the microswimmer retention in the foam.

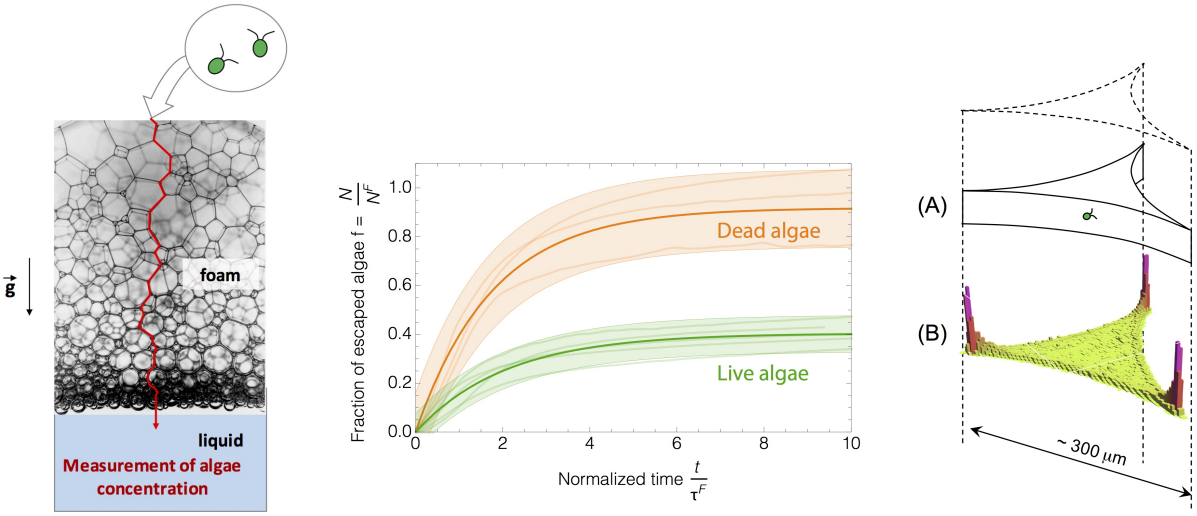

Figure 1: Sedimentation of motile micro-algae in a foam. Left: principle of the experiment; center: time-evolution of the number of CR cells escaping from the foam; right: scheme of a micro-chamber mimicking the section of a Plateau border (A), and probability distribution of a microswimmer (B).

[1] Q. Roveillo, J. Dervaux, Y. Wang, F. Rouyer, D. Zanchi, L. Seuront & F. Elias, Unexpected trapping of swimming microalgae in foam, *preprint*, https://hal.archives-ouvertes.fr/hal-02446242 (2020)