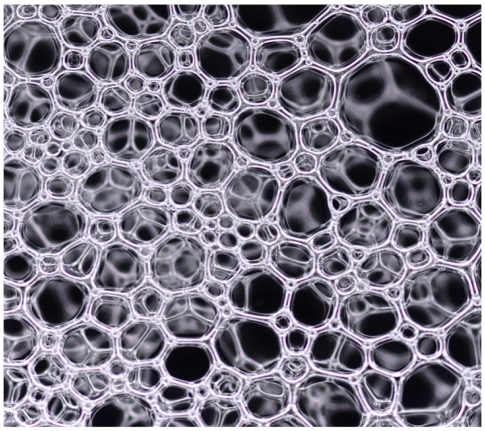
Stability and dissipative properties of liquid foam

Key words: Fluid mechanics, rheology, diphasic fluids, soft matter, surfactants.
Funding: ERC grant.

A 2 years postdoctoral position is currently open at Institut de Physique de Rennes (France). The project is experimental and is part of the ERC project DISFILM (A. Saint-Jalmes, I. Cantat). Start in sommer 2022 (adjustable if needed).

Context
Liquid foams are complex fluids that absorb energy particularly well. However, the link between the effective visco-elasticity observed at the foam sample scale and the flows measured at the film scale has not yet been identified. A better understanding of this multiscale problem is crucial to be able to predict the foam stability and dissipative properties as a function of the bubble size, liquid fraction and chemical formulation.

Experiments
The candidate will make the link between the macroscopic rheological properties of a liquid foam and the local flow recently described at the film scale [1,2]. Rheometric measurements will be coupled to *in situ* measurements of the liquid fraction and film thickness (using acoustic techniques [3]) while spanning a wide range of bubble sizes, so that overlap and quantitative comparisons with the local measurements will be possible. The local dissipative processes will be identified, allowing the construction of a multi scale model for foam viscosity.



Required skills
Excellent formation in fluid mechanics at low Reynolds and/or surfactant physical chemistry. Interest for both experiments and models, in the field of Soft Condensed Matter.

[1] Dynamical coupling between connected foam films: interface transfer across the menisci. A. Bussonnière, E. Shabalina, X. Ah-Thon, M. Le Fur and I. Cantat. Phys. Rev. Lett. 124 p.018001 (2020)
[2] Local origin of the visco-elasticity of a millimetric elementary foam. A. Bussonnière and I. Cantat. J. Fluid Mech. (2021)
[3] The acoustics of liquid foams. F. Elias, J. Crassous, C. Derec, B. Dollet, W. Drenckhan, C. Gay, V. Leroy, C. Nous, J. Pierre, A. Saint-Jalmes. Current Opinion in Colloid & Interface Science, Elsevier, 2020, pp.101391.

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