Topic A: Structure and Modelling

“Predicting the bubble-scale structure and rheology of aqueous foams”

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I will survey various numerical models of the structure and flow of foams, and indicate where they have been, or could be, successfully applied e.g. in the limits of dry or wet, 2D or 3D, slow or fast dynamics etc.
I will address the question of how much we can determine about the rheology of a foam given precise knowledge of its structure. Combining the Laplace-Young Law and Plateau's rules leads to a quasi-static algorithm for film motion in dry foams in which bubble pressure differences are available. I will describe new results for bounded flows of two-dimensional foams, including (i) Couette (boundary-driven) shear, and the prediction of localised regions of topological changes; (ii) discrete microfluidics, and the transition between different structures in narrow channels; and (iii) interaction between particles sedimenting under gravity. Finally, I will describe models for foam rheology that include different modes of dissipation.