Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Foam morphology, frustration and topological defects in a Negatively curved Hele-Shaw geometry ADIL MUGHAL, GERD SCHROEDER-TURK, MYFANWY EVANS, Institut fuer Theoretische Physik (LS Klaus Mecke) Friedrich-Alexander Universitaet Erlangen-Nuernberg Staudtraße 7, D-91058 Erlangen, Germany — We present preliminary simulations of foams and single bubbles confined in a narrow gap between parallel surfaces. Unlike previous work, in which the bounding surfaces are flat (the so called Hele-Shaw geometry), we consider surfaces with non-vanishing Gaussian curvature. We demonstrate that the curvature of the bounding surfaces induce a geometric frustration in the preferred order of the foam. This frustration can be relieved by the introduction of topological defects (disclinations, dislocations and complex scar arrangements). We give a detailed analysis of these defects for foams confined in curved Hele-Shaw cells and compare our results with exotic honeycombs, built by bees on surfaces of varying Gaussian curvature. Our simulations, while encompassing surfaces of constant Gaussian curvature (such as the sphere and the cylinder), focus on surfaces with negative Gaussian curvature and in particular triply periodic minimal surfaces (such as the Schwarz P-surface and the Schoen's Gyroid surface). We use the results from a sphere-packing algorithm to generate a Voronoi partition that forms the basis of a Surface Evolver simulation, which yields a realistic foam morphology.

Adil Mughal
Institut fuer Theoretische Physik (LS Klaus Mecke)
Friedrich-Alexander Universitaet Erlangen-Nuernberg Staudtraße 7,
D-91058 Erlangen, Germany

Date submitted: 12 Nov 2013 Electronic form version 1.4