Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Scaffold-independent Patterning of Cells using Magnetic Nanoparticles SUVOJIT GHOSH, Department of Engineering Science and Mechanics, Virginia Tech, MOANARO BISWAS, SUBBIAH ELANKUMARAN, Department of Biomedical Sciences and Pathobiology, Virginia-Maryland Regional College of Veterinary Medicine, ISHWAR PURI, Department of Engineering Science and Mechanics, Virginia Tech — Spatial patterning of cells in vitro relies on direct contact of cells on to solid surfaces. Scaffold independent patterning of cells has never been achieved so far. Patterning of cells has wide applications including stem cell biology, tissue architecture and regenerative medicine besides fundamental biology. Magnetized cells in a suspension can be manipulated using an externally applied magnetic field enabling directed patterning. We magnetized mammalian cells by internalization of superparamagnetic nanoparticles coated with bovine serum albumin (BSA). A magnetic field is then used to arrange cells in a desired pattern on a substrate or in suspension. The control strategy is derived from the self-assembly of magnetic colloids in a liquid considering magnetostatic interactions. The range of achievable structural features promise novel experimental methods investigating the influence of tissue shape and size on cell population dynamics wherein Fickian diffusion of autocrine growth signals are known to play a significant role. By eliminating the need for a scaffold, intercellular adhesion mechanics and the effects of temporally regulated signals can be investigated. The findings can be applied to novel tissue engineering methods.

Suvojit Ghosh
Department of Engineering Science and Mechanics, Virginia Tech

Date submitted: 07 Nov 2012 Electronic form version 1.4