Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Cell Structure Assembly with Magnetic Nanowires E. J. FELTON, A. HULTGREN, M. TANASE, D. H. REICH, Department of Physics and Astronomy, Johns Hopkins University, C. S. CHEN — The ability to precisely position and organize mammalian cells plays a significant role in numerous biological applications, including the assembly of multi-dimensional cell structures. Ferromagnetic nanowires, used in conjunction with patterned micromagnets, are shown to provide a highly effective tool for cell manipulation. The nanowires are fabricated by electrodeposition, allowing for precise control of their dimensions and magnetic properties. Their high aspect ratio and large remanent magnetization allow suspensions of cells bound to nanowires to be controlled with low magnetic fields through the alignment of the wires' moments. We have shown that these characteristics enable self-assembly and patterning of 3T3 mouse fibroblast cells with Ni nanowires in one and two dimensions in the presence of an applied horizontal field. Vertical orientation of the applied field promotes the creation of vertical cell columns which can be organized to form more complex structures. The geometry of these structures is controlled through selection of different micromagnet patterns, and the resulting three-dimensional structures can be made permanent by stabilization in hydrogel. These methods are potentially useful in the synthesis of engineered tissues.

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Date submitted: 06 Dec 2004 Electronic form version 1.4