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Directed Cell Assembly with Magnetic Nanowires EDWARD J. FELTON, MARCIE JAFFEE, DANIEL H. REICH, Department of Physics and Astronomy, Johns Hopkins University, CHRISTOPHER S. CHEN, Department of Bioengineering, University of Pennsylvania — Control of the positioning and movement of mammalian cells in culture has a variety of important applications ranging from medical diagnostics to tissue engineering. We have developed cell manipulation techniques that exploit the magnetic properties of high aspect ratio nanoparticles such as ferromagnetic nanowires. The large remanent magnetization of these nanoparticles permits delivery of cells bound to them to precise locations on biochips through the nanoparticles' interactions with the magnetic fields of micropatterned magnetic structures. Together with chemical functionalization of the surfaces to direct cell adhesion, a wide range of multicellular patterns can be achieved. These approaches have been used to produce directed assemblies of cells. Results of these experiments include localized heterotypic cell pairs and the extension of these techniques to cell localization in three dimensions.

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