Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Electron Transport in Quasi-1D, DNA-Templated Nanoparticle Arrays M. S. FAIRBANKS, Department of Physics, University of Oregon, G. J. KEARNS, Department of Chemistry, University of Oregon, B. C. SCANNELL, Department of Physics, University of Oregon, A. LOFTUS, Department of Chemistry, University of Oregon, R. P. TAYLOR, Department of Physics, University of Oregon, J. E. HUTCHISON, Department of Chemistry, University of Oregon — Devices based on self-assembled metal nanoparticle arrays are good model systems for investigating the physics of the nanoscale regime, where size quantization effects and the Coulomb charging energy can dominate transport even at high temperatures. We apply a novel, highly parallel fabrication technique [1] that creates quasi-1D (200 nm x $\sim$20 nm) arrays of Au nanoparticles (r = 1.8 nm) bonded to DNA between predefined electrodes. These devices are found to exhibit Coulomb blockade over a wide range of operating temperatures (0.24 K to >80 K). We present an analysis of our results in comparison to recent theoretical predictions for 1- and 2D tunnel junction arrays and highlight some effects that arise from our devices' particular geometry. [1] M. G. Warner, J. E. Hutchison. Nature Materials 2, 272 (2003).; G. J. Kearns, et al. to be published.

Matthew Fairbanks
Department of Physics, University of Oregon

Date submitted: 21 Nov 2008 Electronic form version 1.4