Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

A Biotransistor: Modulating the Current of a Nanodevice with a Living Cell JENNIFER KANE, JASON ONG, RAVI SARAF, University of Nebraska-Lincoln — Isolated single nanoparticles and array of nanoparticles act as switching devices sensitive to charging by a single electron. For a typical 5 nm Au particle, the switching barrier energy due to Coulomb blockade from a single electron charging is approximately 100 meV, making room temperature switching difficult and very noisy. In an array, the switching energy can be a few eV (at cryogenic temperatures), but unlike a single nanoparticle, the energy barrier reduces linearly and vanishes at room temperature. We have developed a "reactive self-assembly" method to make a network of one-dimensional necklaces of nanoparticles that behaves as a single-electron device at room temperature. Furthermore, upon cementing the particles with an inorganic semiconductor, the switching behavior at room temperature is significantly improved. To demonstrate an interesting application of room temperature single-electron switching, we couple the network to a living microorganism to modulate the device current by regulating the cell's metabolic activity. In the talk we will describe fabrication of the necklace and biotransistor device.

Jennifer Kane
University of Nebraska-Lincoln

Date submitted: 21 Nov 2008 Electronic form version 1.4