Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Transport studies of individual crystalline nanowires contacted by superconducting electrodes[1] JIAN WANG, The Pennsylvania State University, MEENAKSHI SINGH, MINGLIANG TIAN, NITESH KUMAR, BANGZHI LIU, CHUNTAI SHI, J.K. JAIN, NITIN SAMARTH, T.E. MALLOUK, M.H.W. CHAN — When a crystalline Au nanowire of 70 nm diameter is contacted by superconducting electrodes, the wire acquires superconductivity via the proximity effect. Instead of a single sharp drop to zero resistance as seen in a shorter wire, a two step superconducting transition was found for a wire of 1.2 microns in length. The normal and fully superconducting regions are separated by what we call the "minigap" phase. In addition, clear periodic differential magnetoresistance oscillations in the superconducting to normal transition region were observed. Our systematic study of individual single crystal ferromagnetic Co nanowires, contacted by superconducting electrodes found the surprising result that a wire of 600 nm is completely superconducting with zero resistance. For longer wires, there is a large and sharp resistance peak at the onset of superconductivity that "anticipates" the incomplete superconductivity at low temperatures.

[1]This work was supported by the Penn State MRSEC under NSF grant DMR-0820404.

Jian Wang
The Pennsylvania State University

Date submitted: 18 Nov 2009 Electronic form version 1.4