Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

**Spin-dependent resonant tunneling through quantum-well states in magnetic metallic thin films** ZHONG-YI LU, XIAO-GUANG ZHANG, Computer Science and Mathematics Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831, SOKRATES T. PANTELIDES, Dept. of Physics and Astronomy, Vanderbilt University, Nashville, TN 37235 and Oak Ridge National Laboratory, Oak Ridge, TN 37831 — Quantum-well states in nonmagnetic metal films between magnetic layers are known to be important in spin-dependent transport, but quantum well states in magnetic films remains elusive. We report first-principles transport calculations for the junctions Fe/MgO/FeO/Fe/Cr and Co/MgO/Fe/Cr and identify the conditions for resonant tunneling through quantum well states in magnetic films. We show that, at resonance, the current increases by one to two orders of magnitude. The tunneling magnetoresistance ratio is much larger than in simple spin tunnel junctions and is positive (negative) for majority- (minority-) spin resonances, with a large asymmetry between positive and negative biases. The results can serve as basis for novel spintronic devices.

Zhong-Yi Lu
Computer Science and Mathematics Division, Oak Ridge National Laboratory
Oak Ridge, TN 37831

Date submitted: 02 Dec 2004 Electronic form version 1.4