Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

**Cryogenic optical nano-imaging of phase coexistence in correlated oxides** A. S. MCLEOD, University of California San Diego, E. VAN HEUMEN, University of Amsterdam, J. ZHANG, J. G. RAMIREZ, University of California San Diego, Z. HUANG, University of Science and Technology of China, Hefei, S. WANG, T. SAERBECK, S. GUENON, M. GOLDFLAM, L. ANDEREGG, P. KELLY, A. MUELLER, University of California San Diego, M. K. LIU, Stony Brook University, W. B. WU, University of Science and Technology of China, Hefei, R. D. AVERT, I. K. SCHULLER, D. N. BASOV, University of California San Diego — Correlated transition metal oxides exhibit a bevy of textbook electronic phases characterized by richly interacting lattice, spin, and orbital degrees of freedom. A broad array of accessible thermodynamic phases, ranging from Mott insulator to superconductor, enables abrupt transitions in physical and electronic properties under modest external stimuli, accompanied by spontaneous phase coexistence at the nano-scale. We present a novel near-field optical scanning probe capable of resolving the electronic character of such "switched" phases in the coexistent regime, even insulators, at 10 nm resolution and down to liquid helium temperatures. We demonstrate variable-temperature optical, structural, and magnetic imaging functionalities through studies of the insulator-metal transition in two prototypic correlated oxides under epitaxial strain. Structural and electronic attributes of the Mott transition are distinguished in a $V_2O_3$ thin film, whereas metastable electronic and magnetic phase coexistence is revealed across a 200K range in the strained manganite $La_{0.67}Ca_{0.33}MnO_3$

Alexander McLeod
University of California San Diego

Date submitted: 06 Nov 2015 Electronic form version 1.4