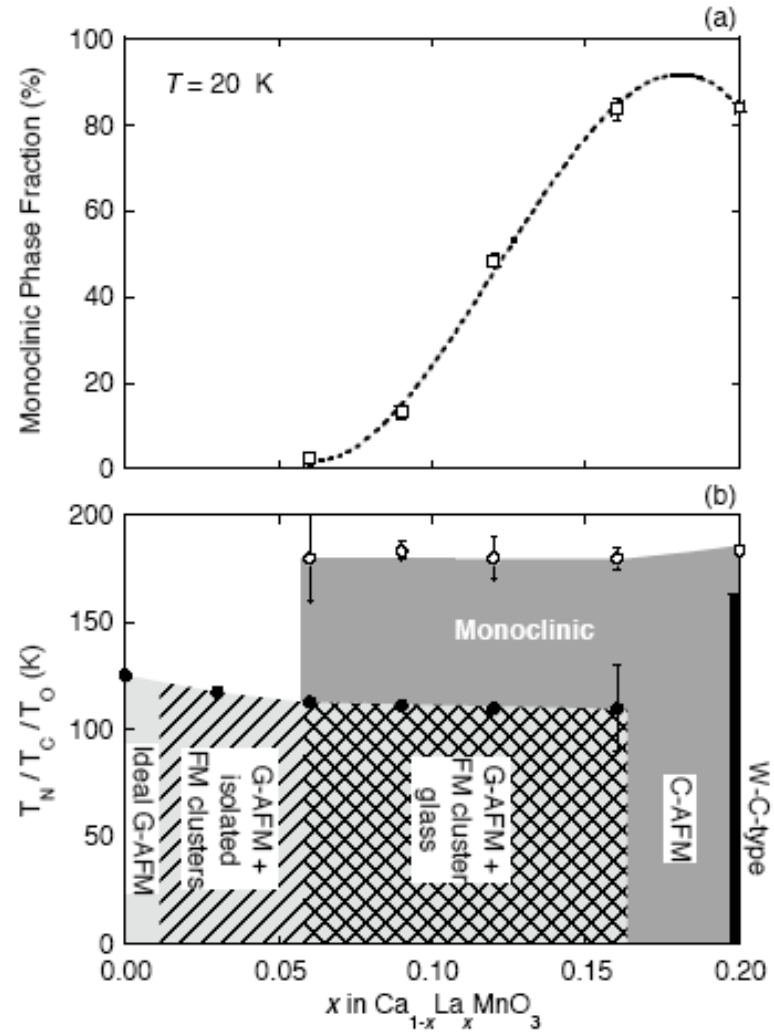
CAREER, Synthesis and investigation of novel condensed matter materials and development of a high-resolution capacitive dilatometer

John J. Neumeier, Montana State University, DMR-0301166

- *A key topic in the study of novel transition metal oxides is electronically-mediated phase segregation.*
- *$CaMnO_3$ was studied because it is not defect prone and forms a simple antiferromagnetic lattice. We doped with electrons (La^{3+} for Ca^{2+}) to provide charge inhomogeneity.*
- *Two crystallographic (orthorhombic and monoclinic) and antiferromagnetic phases (G- and C-Type AFM) coexist over a broad composition range ($0.06 < x < 0.16$); the phase fractions are strongly temperature dependent. Observed with powder neutron diffraction and bulk magnetic measurements.*
- *We observe ferromagnetic clusters of average size 10 Å existing within the G-Type antiferromagnetic lattice for $0.01 < x < 0.07$.*



Granado, Ling, Neumeier, Lynn, and Argyriou, Phys. Rev. B 68 134439 (2003); ibid. 68 134440 (2003).

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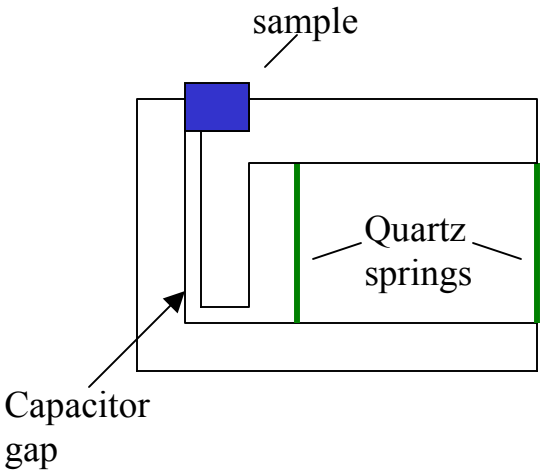
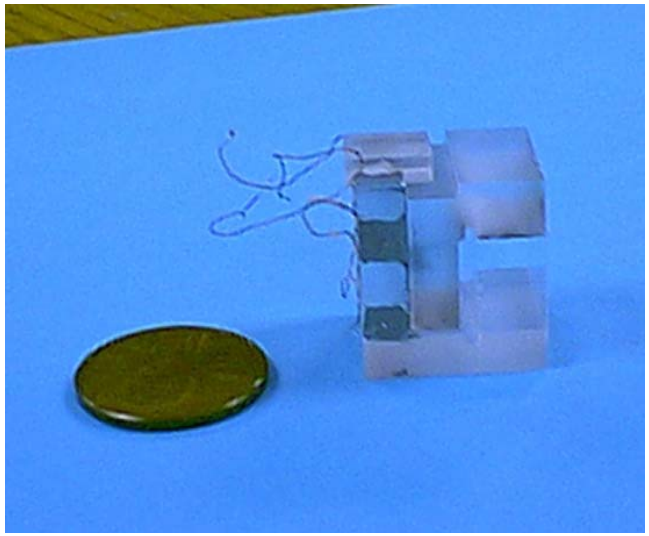
Student activity in our MSU laboratory (in 2003): *One Native American High School Student (Forest Horn), Two graduate students (Hirotoshi Terashita and Richard Bollinger), Two undergraduate students with stipends through our NSF REU program (Joshua Garbe from U. Wisconsin, Stevens Point, and John Macaluso from Stockton State College).*

A new thermal expansion cell for the NHMFL: *Our REU student, John Macaluso, designed, constructed, and calibrated a new quartz thermal expansion cell for use at the high magnetic field laboratory. This project is in collaboration with Luis Balicas at NHMFL in Tallahassee. The cell is currently being tested for use in the 30 tesla magnet down to He^3 temperatures. It will become available to the NHMFL user community.*





The NHMFL quartz dilatometer cell.