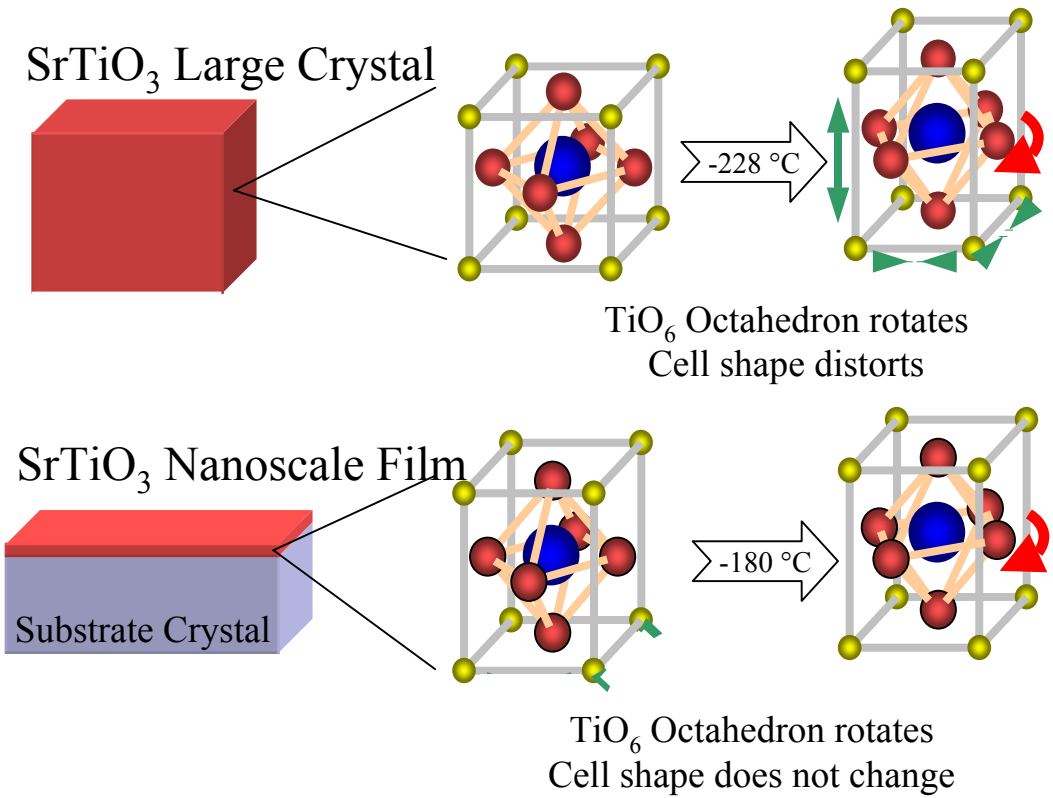
CAREER: Functional Oxide Films for Spectroscopy

Barrett O. Wells, University of Connecticut, DMR-0239667

Materials grown in structures that are very small often have properties quite different from large blocks of the same compound. Two reasons for this are that the small structure has internal stress and is often attached to some larger substrate that constrains it.



$SrTiO_3$ is an excellent model compound for many technologically important oxides. It has a well known structural transition in which the basic crystalline cell stretches and internal atoms rotate. Our studies have found that stress in films of $SrTiO_3$ causes the temperature at which the transition occurs to rise significantly, and can be controlled. In addition, the constraint that the film remains attached to the substrate leads to a suppression of the change in cell shape but does not affect the rotation of atoms – an entirely new type of phase transition and thus new physics.

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Infrastructure:
The funds from this NSF grant are contributing to the construction of a new facility at the University of Connecticut for the production of crystalline films of complex oxides that are important both scientifically and technologically. This is a facility unique in the state and will be available to many affiliated researchers.

Education:
This grant also supports the PI in adapting pedagogical techniques developed by education researchers to advanced classes for physics majors. This is a part of a greater effort to increase the number of physics majors at the University of Connecticut

The film growth chamber at the heart of the new University of Connecticut film growth and analysis facility.