DEPARTMENT OF PHYSICS
COLLEGE OF ARTS & SCIENCES

SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE students

FOR APPLICATION YEAR: 2026

PROJECT TITLE: Quantum paraelectric devices for cryogenic technology

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Project Description

Quantum paraelectric oxide materials SrTiO3 and KTaO3 show unusual behavior in their dielectric constant (as measured through their capacitance). While in most material it is of order 5-10, in SrTiO3 it increases from 350 at room temperature to tens of thousands below 10 Kelvin. This is intriguing for cryogenic applications for quantum information technology, for example in combination with superconductivity. This project will focus on understanding temperature dependence of oxide device capacitance in the 2-300 Kelvin range. Devices of interest are planar capacitors, nanoscale side-gated constrictions, superconducting coplanar resonant meanders, and resonant metal cavities coupled to oxide single crystals. The student will join an experimental physics laboratory focused on low temperature electrical measurement. Experience with python programming and interest in electronic hardware are beneficial for this project.