UHV Systems
in the Edison labs

NBIC Meeting
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Ultra-high vacuum systems

Rough (low) Vacuum
1 – 10^{-3} Torr

Medium Vacuum
10^{-3} – 10^{-5} Torr

High Vacuum
10^{-6} – 10^{-8} Torr

Ultra High Vacuum
<10^{-9} Torr
RHK/Oxford & Omicron UHV systems

Oxford UHV chamber

Omicron VT-STM

Sputtering gun

Manipulator and heater

LEED Auger

paired with RHK controller

University of Pennsylvania

STM and AFM
Scanning tunneling microscopy
# Comparison of our STM systems

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<th>RHK / Oxford</th>
<th>Omicron</th>
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<tr>
<td><strong>Bias</strong></td>
<td>Sample</td>
<td>Tip</td>
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<tr>
<td><strong>Bias Range</strong></td>
<td>±10 V</td>
<td>±10 V</td>
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<tr>
<td><strong>Measurable Tunneling Current</strong></td>
<td>10 pA – 100 nA</td>
<td>100 pA – 10 nA</td>
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<td><strong>Amplifier bandwidth</strong></td>
<td>500 Hz – 150 kHz</td>
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<tr>
<td><strong>Spectroscopy Options</strong></td>
<td>I/V, dI/dV, I/Z</td>
<td>I/V, dI/dV, CITS</td>
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Single molecule charge transport measurements

Sanjini Nanayakkara and Laura Kraya

University of Pennsylvania
High dielectric constant crystalline perovskite oxides

Evolution of the Structure and Thermodynamic Stability of the BaTiO$_3$(001) Surface

AM Kolpak, D Li, R Shao, AM Rappe, DA Bonnell

Low energy electron diffraction

![Diagram of an electron diffraction setup](image)

- **c4x4**: 19.6 eV
- **2x2**: 72.0 eV
- **c2x2**: 89 eV
- **3x1**: 75.9 eV
- **3x2 + streaking**: 22.9 eV
- **√5x√5**: 61.0 eV

University of Pennsylvania
Auger Electron Spectroscopy

John Garra: Auger Spectra of BaTiO₃ recorded at various stages

University of Pennsylvania
Sputtering Gun

University of Pennsylvania
Atomic force microscope

University of Pennsylvania
High resolution characterization of defects in thin film oxides

Matt Brukman, Dawn Bonnell