A postdoc in Academia and Future Prospects

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Overview

What I did

- Bachelor's and Master's in Russia
- 1 year at Fermilab
- PhD at U of IL
- Postdoc at NIST

What I did right

- Research group
- Teaching
- Diverse technical skills
- Soft skills
- Networking

What I did wrong

- Research group
- Teaching
- Organization
- Classes

Research

Research experience

Graduate Research Assistant **2015 – Present**

UIUC, Prof. Madhavan's research group

- growing and characterizing epitaxial thin films of topological materials
- low temperature ultrahigh-vacuum scanning tunneling microscopy of quantum materials
- fabricating nanopatterned topological/superconductor heterostructures
- ultrahigh vacuum system design, troubleshooting, and management
- software development for data analysis

Results published in PRB and npj Quantum Materials.

Graduate Research Assistant **2012-2014**

UIUC, Prof. Nayfeh's research group

- chemical and electrochemical fabrication of 1-3nm Si nanoparticles
- material analysis with electron and force microscopy and X-ray techniques
- Si nanoparticle device fabrication for electronic applications
- polymer encapsulation of Si nanoparticles for biomedical and photovoltaic applications

Results published in J. of Applied Physics, J. of Materials Research, and J. of Instrumentation.

Experimental skills

Ultrahigh vacuum (UHV) techniques:
- scanning tunneling microscopy (STM)
- molecular beam epitaxy (MBE)
- liquid He cryogenics
- UHV system design

Deposition techniques:
- electron beam/thermal evaporation
- magnetron sputtering and ion milling
- PECVD
- atomic layer deposition (ALD)

Probe microscopy:
- atomic force microscopy (AFM)
- probe-enhanced nano-FTIR
- surface profilometry

Device fabrication:
- graphene wet transfer
- semiconductor wet-chemical etching
- electron-beam lithography (EBL)
- UV lithography
- focused ion beam lithography (FIB)
- cleanroom

Electron techniques:
- scanning/transmission electron microscopy
- energy dispersive X-ray spectroscopy (EDX)
- high-energy electron diffraction (RHEED)
- cathodoluminescence

X-ray techniques:
- X-ray diffraction (XRD) & reflectivity (XRR)
- X-ray fluorescence (XRF)
- X-ray photoelectron spectroscopy (XPS)

Optical techniques:
- Fourier transform infrared spectroscopy (FTIR)
- photoluminescence (PL)
- dark/bright field microscopy
- confocal microscopy
- ellipsometry
- laser optics

Other:
- Rutherford backscattering spectrometry (RBS)
- multiprobe transport measurements
- high-vacuum physical properties measurement
- lab safety management

Teaching

Teaching experience

Assistant Lecturer for upper level undergraduate class **SP 2017, SP 2019, SP 2020**
Physics Department, UIUC

Course "Light" (Phys 402) for advanced undergraduate and junior graduate students with Prof. P. Abbamonte

- preparing and delivering lectures
- holding on-demand office hours and answering homework questions

"Electromagnetic Fields II" (Phys 436) for advanced undergraduate and junior graduate students with Prof. P. Abbamonte

- preparing and delivering lectures

Course Material Designer **SP 2020**
Physics Department, UIUC

Condensed Matter (Phys560) for graduate students with Prof. T. Hughes

- developing the studying materials/lecture notes

Teaching Assistant for advanced graduate class **2015, 2016, 2019**
Physics Department, UIUC

Modern Atomic Physics course (Phys 514) for graduate students with Prof. B. DeMarco

- grading homework, designing solutions

Quantum Optics and Information course (Phys 513) for graduate students with Prof. P. Kwiat

- holding weekly office hours, grading homework, designing problems and solutions

James Scholar grader **SP 2018**
Physics Department, UIUC

Classical Mechanics (Phys211)/Quantum Mechanics (Phys213) for engineering undergraduate students with Profs. P. Kwiat/T. Stelzer

- grading advanced extra-credit problems for the James Scholar Honors Program

Course Director (Discussion Coordinator) **FA 2017**
Physics Department, UIUC

Classical Mechanics (Phys 101) for pre-med undergraduate students with Prof. J. Mestre

- supervising discussion teaching assistants on teaching and grading
- designing exam problems and discussion materials
- teaching a discussion section, giving comprehensive pre-exam reviews

Teaching Assistant **2011-2015**
Physics Department, UIUC

Teaching laboratory and discussion sections in university level Electricity and Magnetism (Phys 212, Phys 102), Classical Mechanics (Phys 101), Quantum Mechanics (Phys 214), Statistical Physics and Thermodynamics (Phys 213).

Individual Tutor **2004-Present**

Individual tutoring for high school and undergraduate students in STEM subjects and English.

Teacher and Grader **2005-2007**
Correspondence Physics&Technology School, MIPT, Moscow, Russia

Grading homework and giving feedback to high school students enrolled in the correspondence school for gifted students interested in physics and math.

Mentoring and service

Mentoring experience

Mentor for undergraduate physics students **2015-2019**

Physics Department, UIUC

Mentoring undergraduate students (Mykola Chernyashevskyy, Minhui Zhu, Yufeng Du, Yanting Teng, Lavanya Upadhyaya) as part of the Guidance for Physics Students mentoring program in UIUC Physics Department: advising on career, work-life balance, academics, etc.

Research Mentor **2012-2019**

Prof. Madhavan's research group, UIUC

- Training graduate students on experimental setups, mentoring and guiding their research progress
- Supervising a group of 3 undergraduate students and managing their individual research projects
- Mentoring Xiuting (Amy) Wu, undergraduate student in the physics department, who was awarded ISUR fellowship to work on the research project I designed; admitted to physics PhD program at UC Irvine

Prof. Nayfeh's research group, UIUC

Mentoring undergraduate students in their research.

Mentor in the MUSE program **2016-2017**

College of Engineering, UIUC

Mentoring an undergraduate student (Yanting Teng) as part of the program for Mentoring Undergraduates in Science and Engineering (MUSE) in the UIUC College of Engineering: advising on career and research, work-life balance, academics, etc.

Service/Leadership

Reviewing

Deutsche Forschungsgemeinschaft (DFG)/German Research Foundation, proposal review — *2021-Present*

Journal of BioNanoScience, editors Victor Erokhin, Danilo Demarchi, Wing Cheung Mak, Zhimin Tao — *2016-Present*

Graduate Peer Mentoring program *2016-2017*

Sole organizer of the graduate peer mentoring program for first year graduate students

Physics Department, UIUC, Urbana, IL

Graduate Student Advisory Committee *2016-2019*

Committee member, advising the department on student matters

Physics Department, UIUC, Urbana, IL

+ volunteering…

What I did wrong

- Research group
- Teaching
- Organization
- Classes

Searching for a postdoc

CV, connections, skills,

relating to the particular person/group

National lab vs University

- Schedule
- Community
- Collaborations
- Pay
- Culture

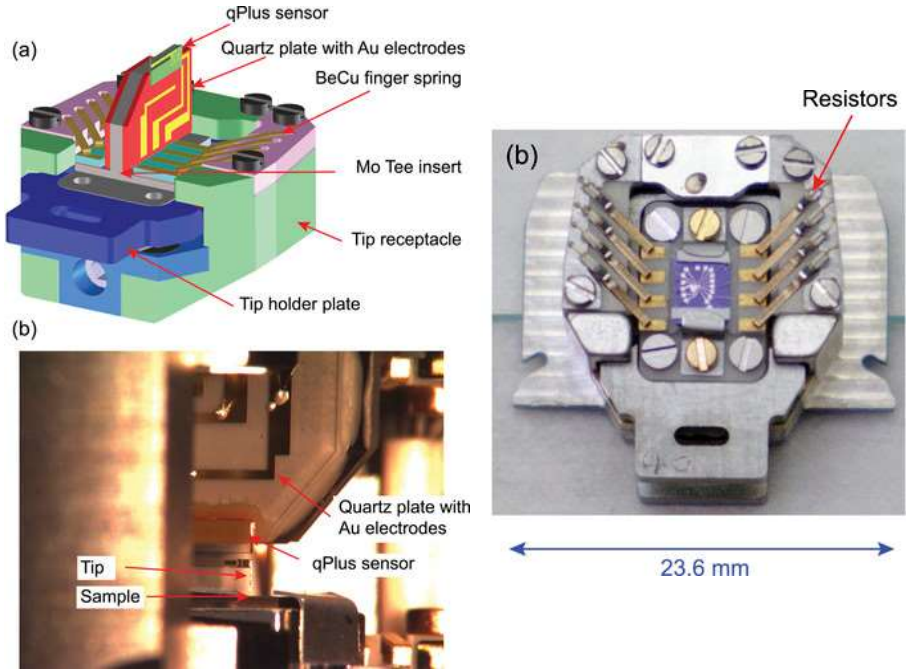
NIST STM

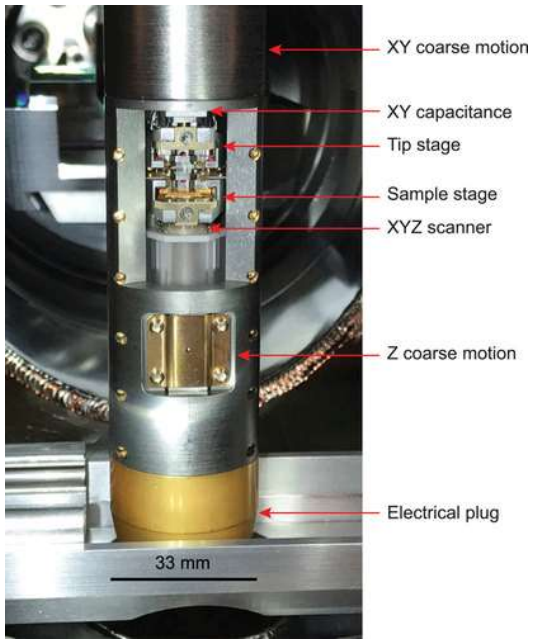
Full . Published Online: 06 July 2020 Accepted: June 2020

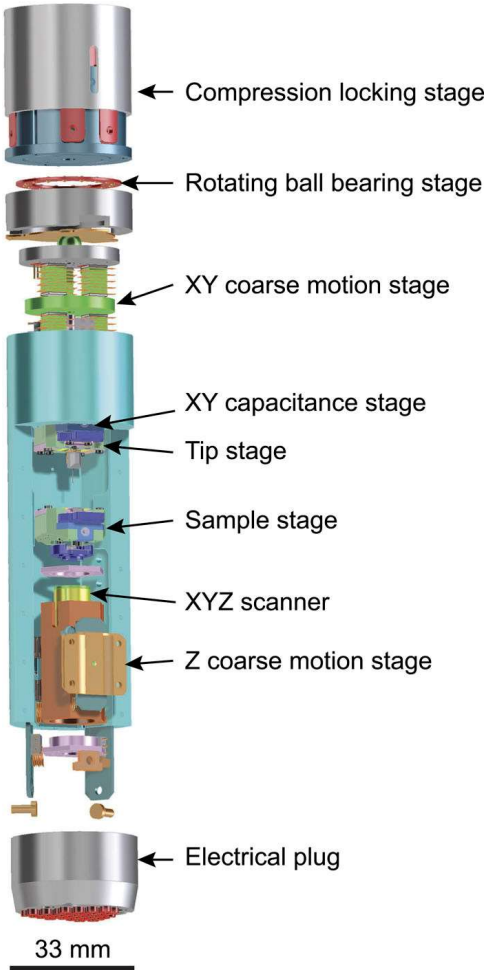
Achieving *μ*eV tunneling resolution in an *in-operando* scanning tunneling microscopy, atomic force microscopy, and magnetotransport system for quantum materials research

Review of Scientific Instruments **91**, 071101 (2020); https://doi.org/10.1063/5.0005320

Johannes Schwenk[1,2], Sungmin Kim[1,2], Julian Berwanger[3], Fereshte Ghahari[1,2], Daniel Walkup[1,2], Marlou R. Slot[1,4], Son T. Le[1,5], William G. Cullen[1], Steven R. Blankenship[1], Sasa Vranjkovic[6], Hans J. Hug[6,7], Young Kuk[8], Franz J. Giessibl[3], *and* Joseph A. Stroscio[1,a)]

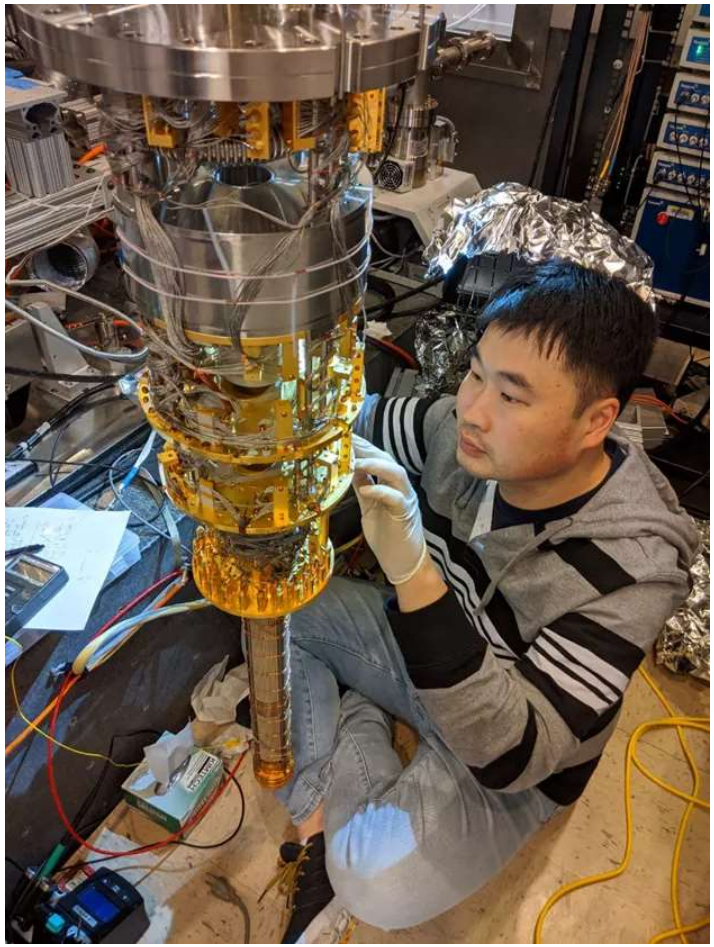






NIST STM

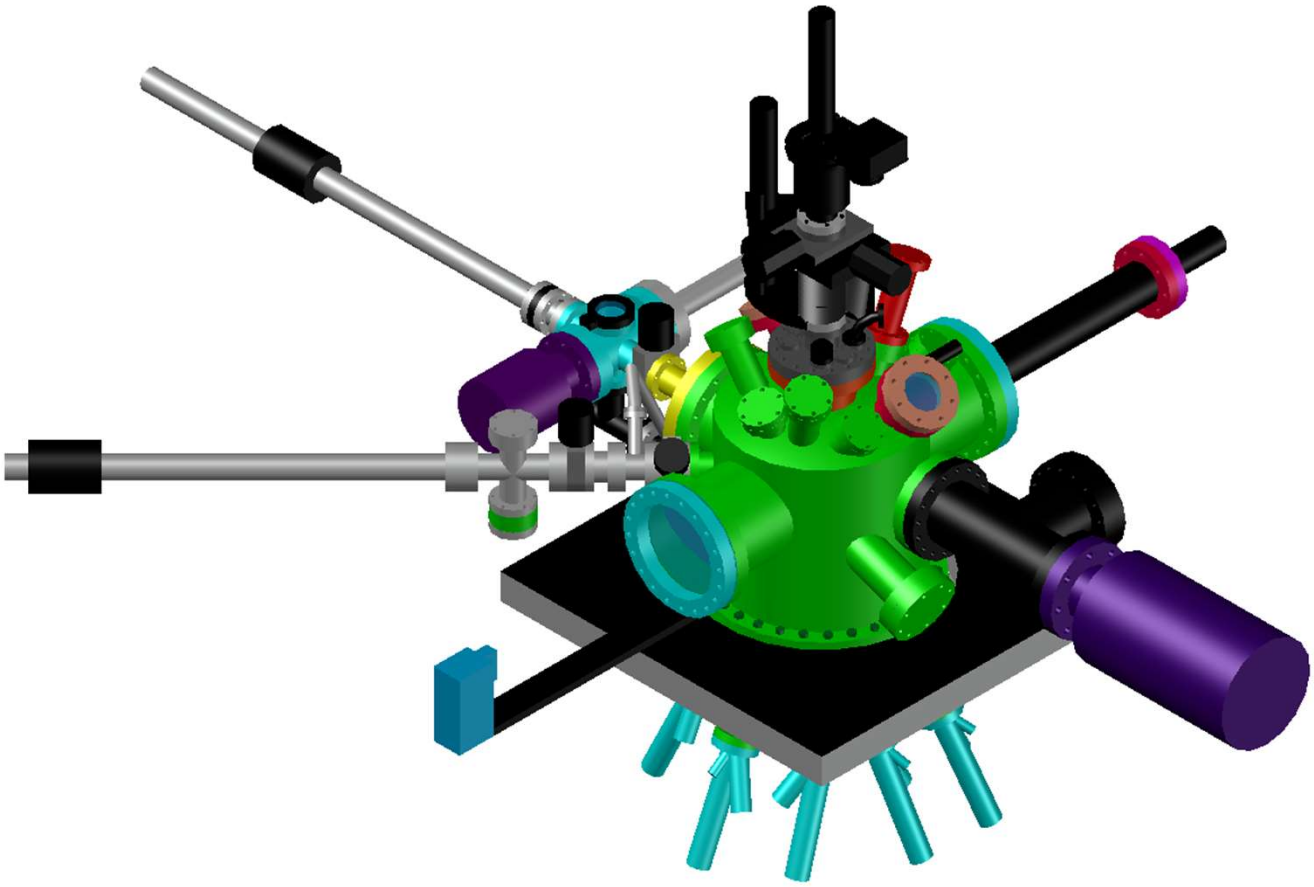
NIST STM



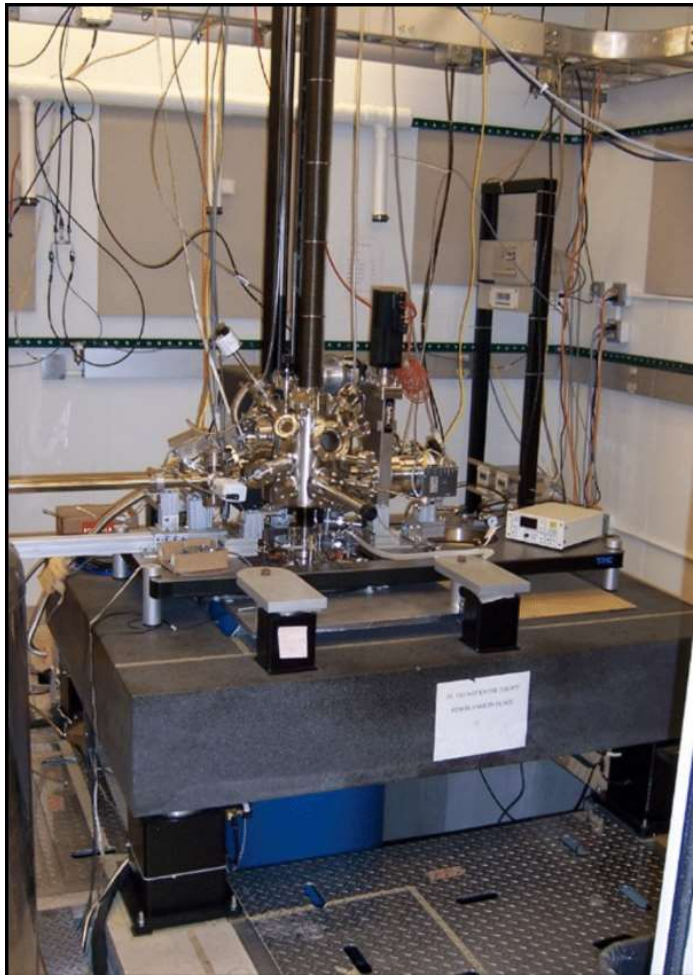
Applying to teaching schools

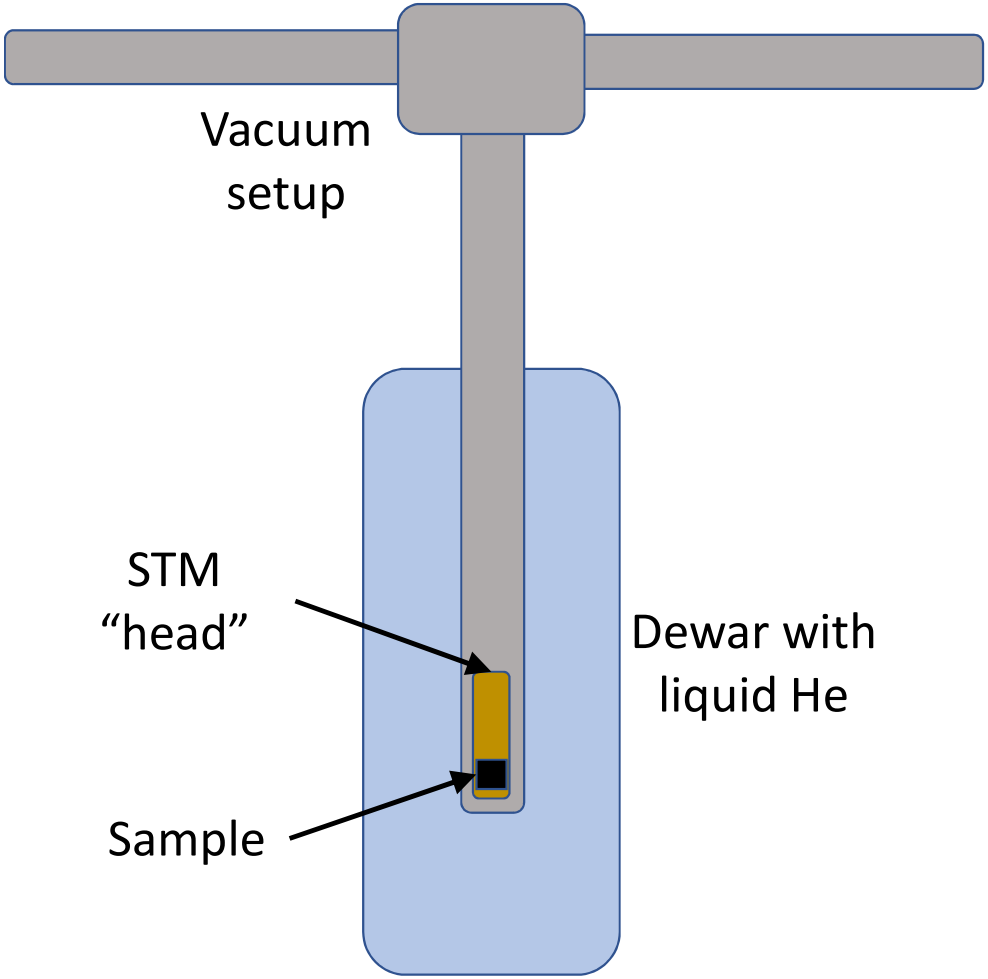
- Application package (CV, statements, recommendations)
- Interviews
- Colloquia

MBE setup

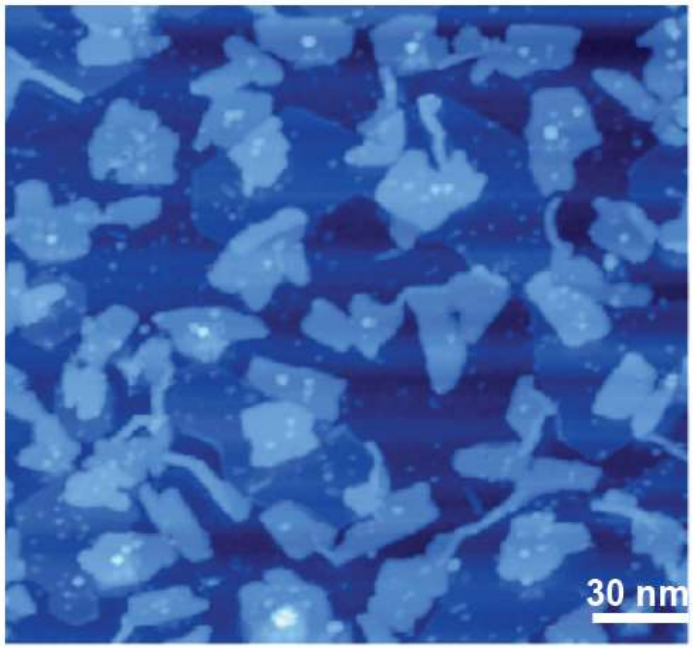


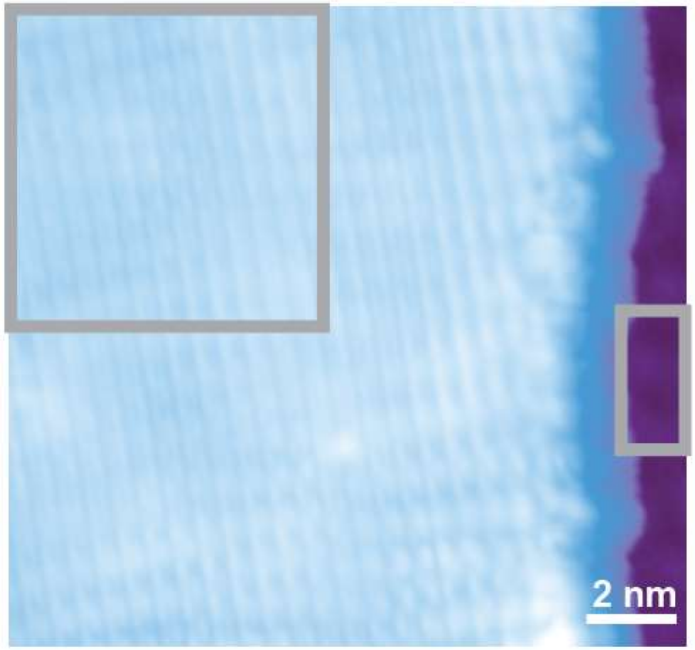
STM ultrahigh vacuum setup

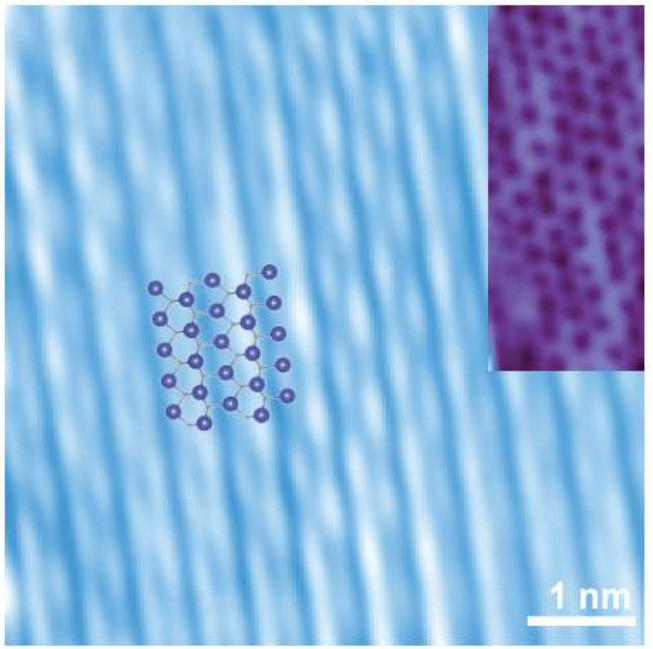


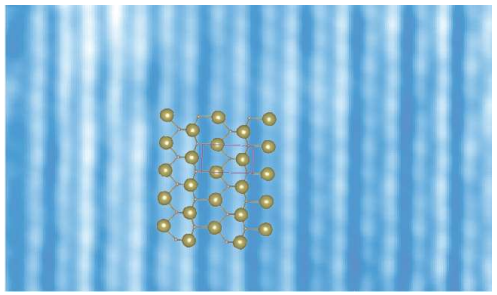


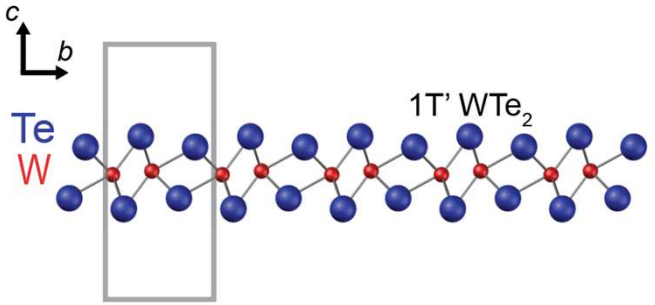
Topographical STM images



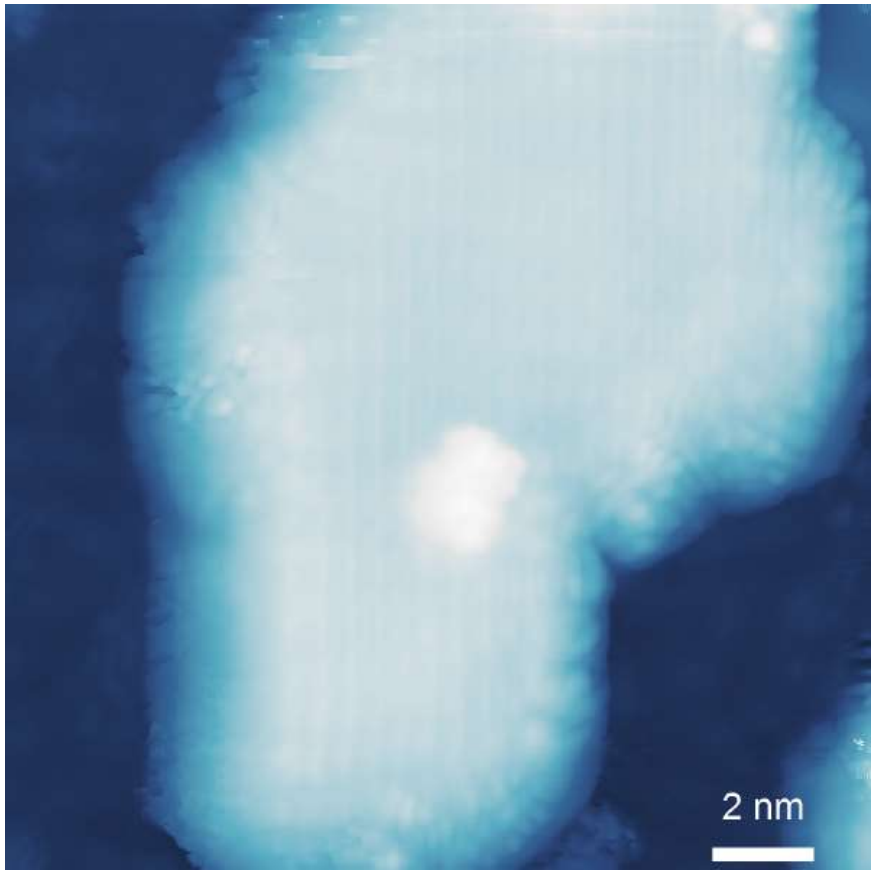


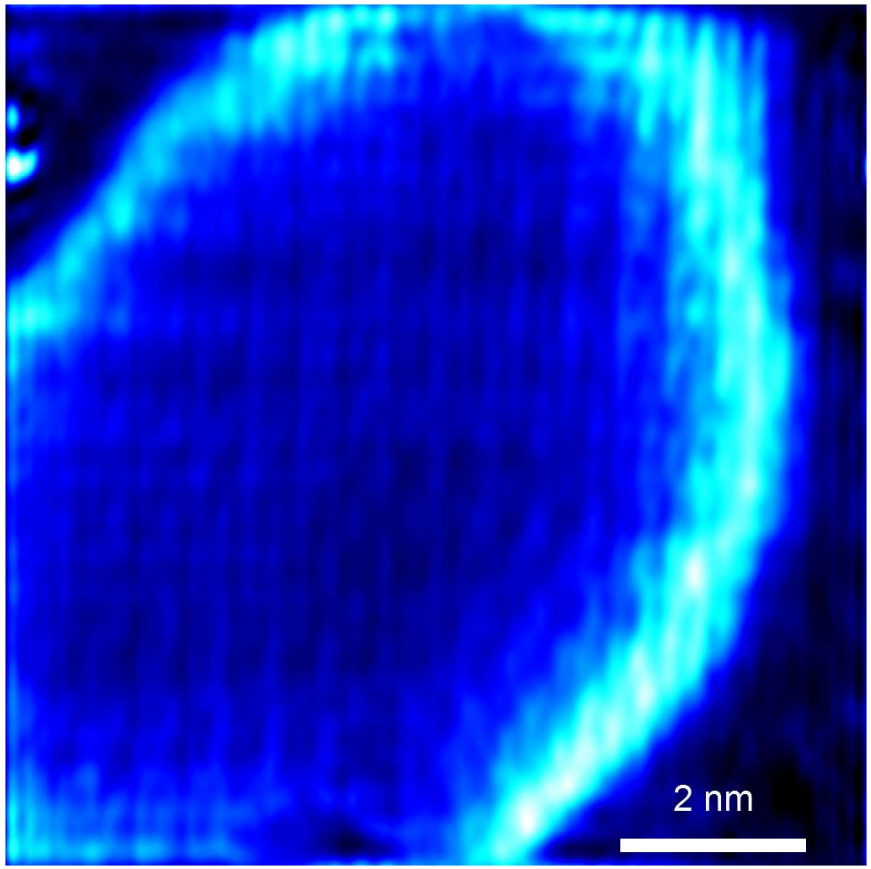






Imaging edge states





dI/dV image

Edge state dispersion