

Atomic Interactions Lab

Exploring the atomic world

Fabian D. Natterer Group

Aleš Cahlik

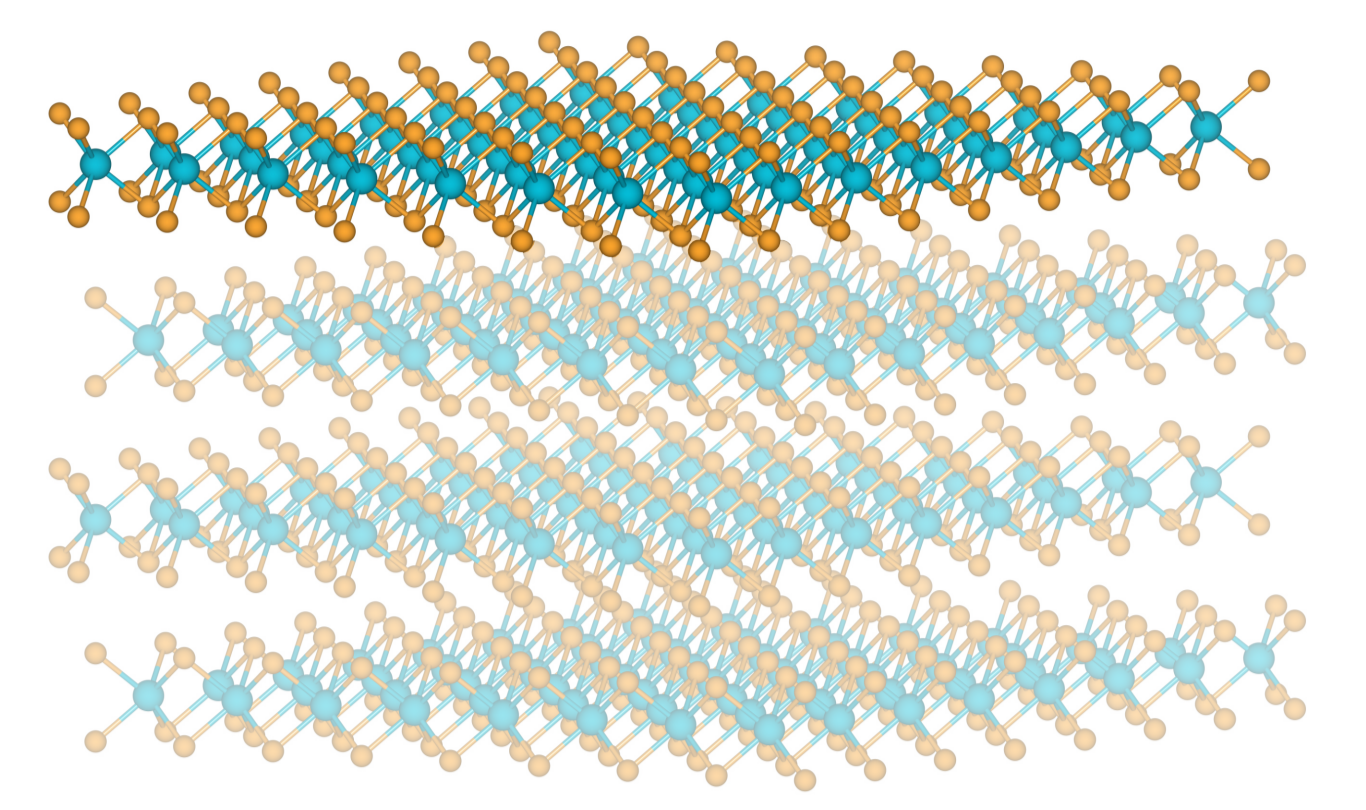
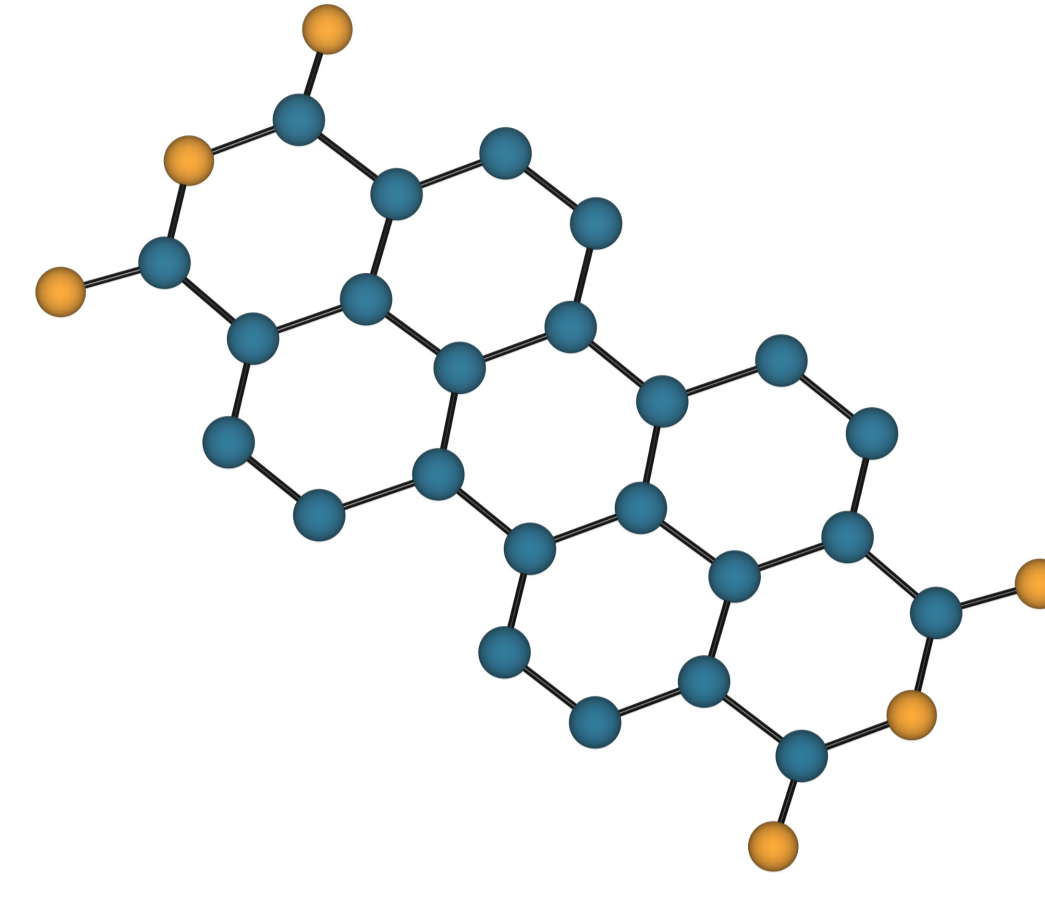
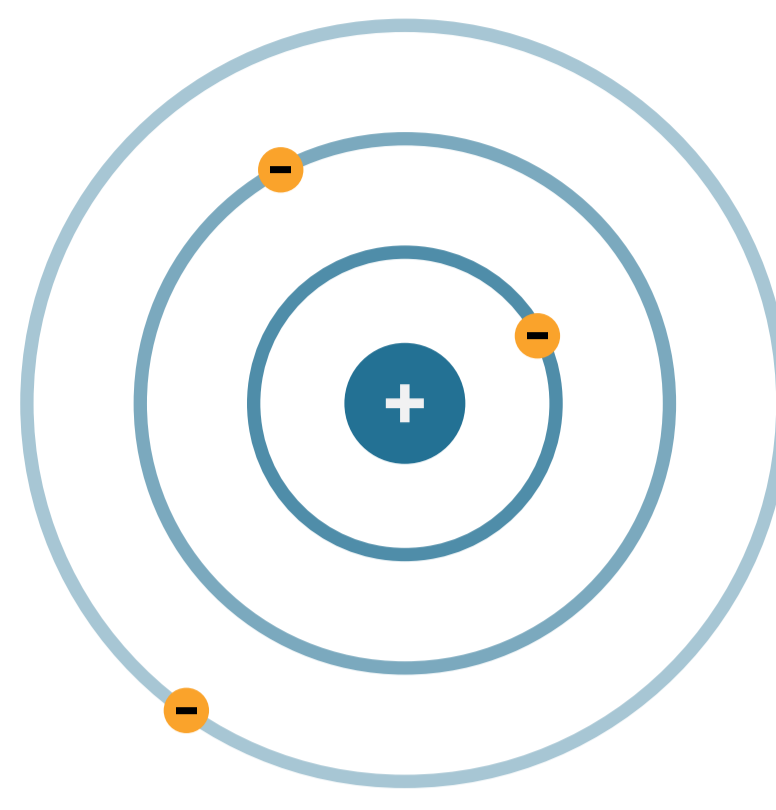
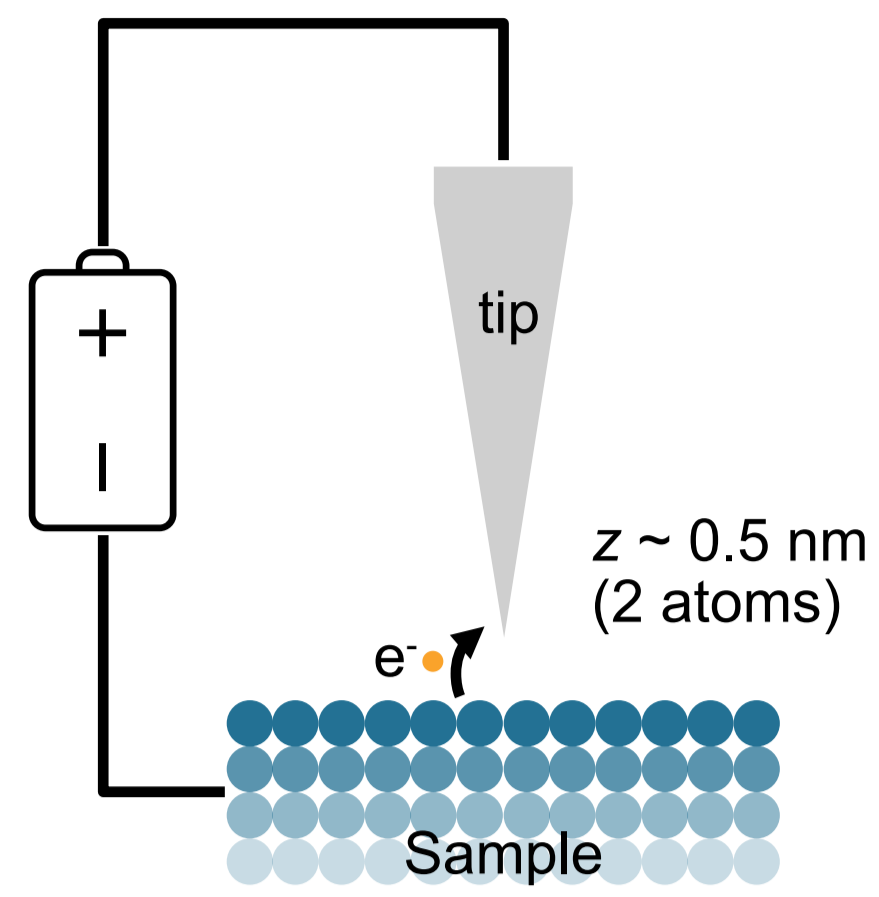
Carolina A. Marques

Scanning tunneling microscopy:

From atoms...

to molecules...

to surfaces!



Atoms and molecular magnets

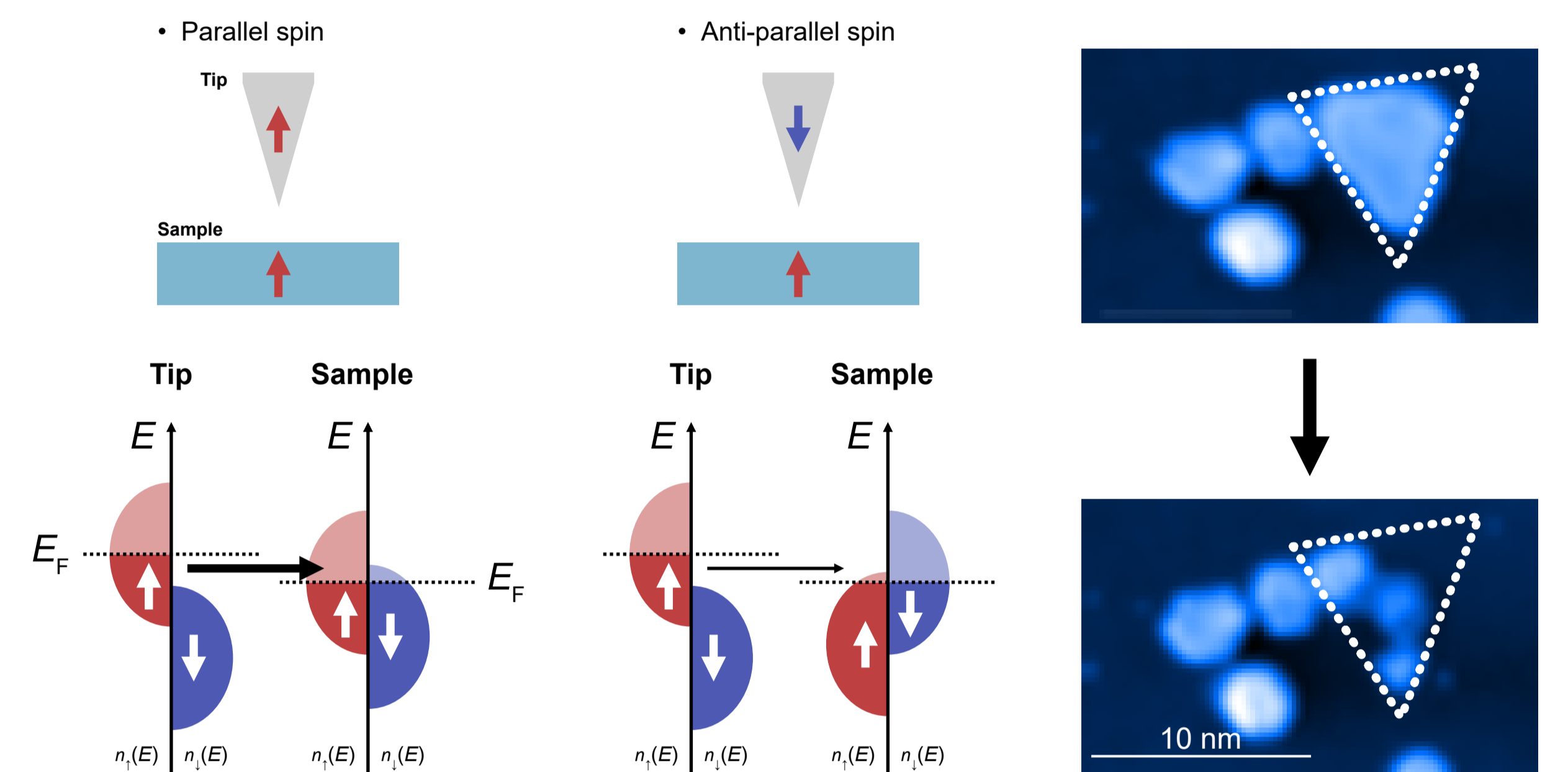
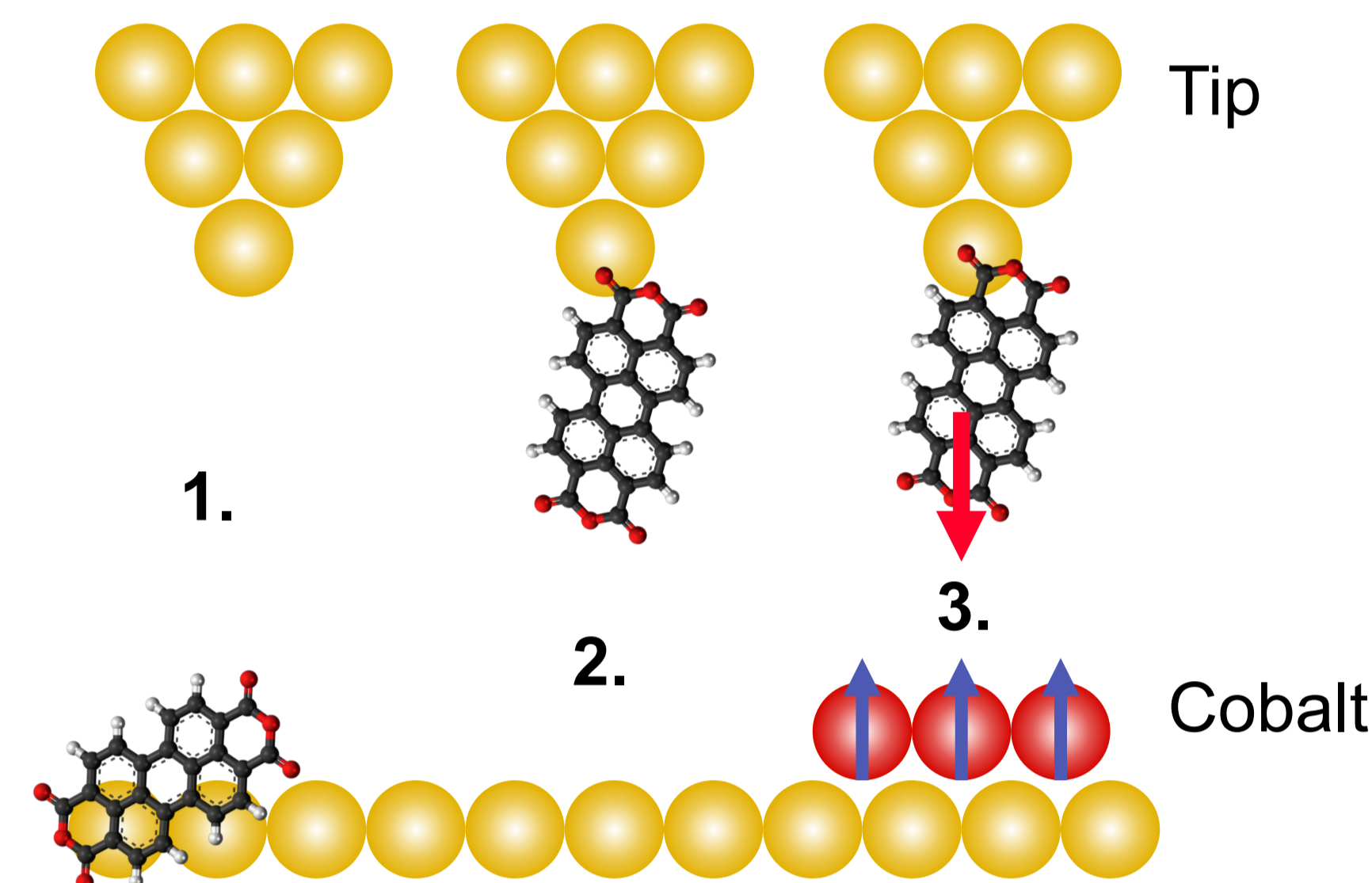
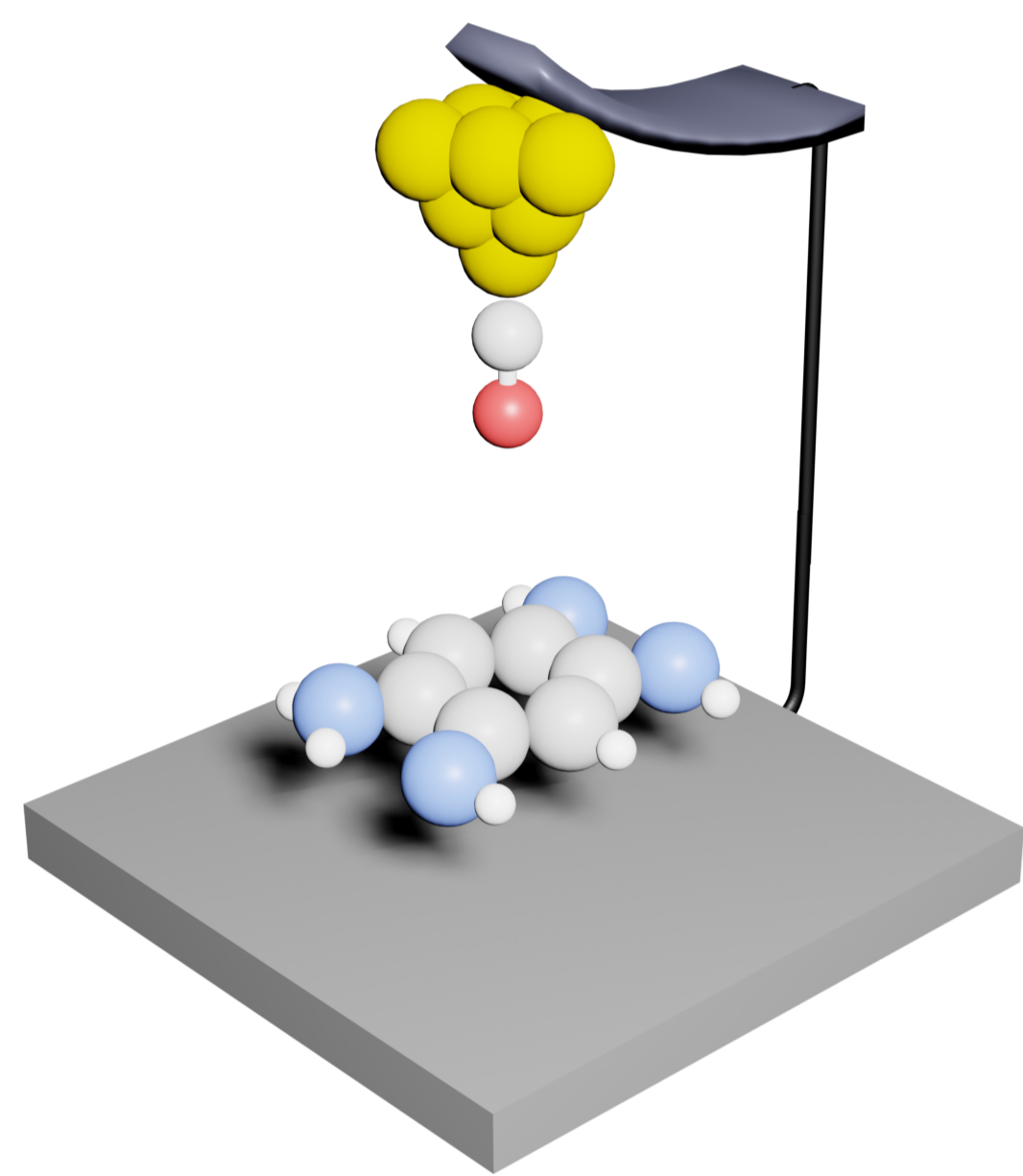
Tip functionalization

High-resolution STM image with CO-tip

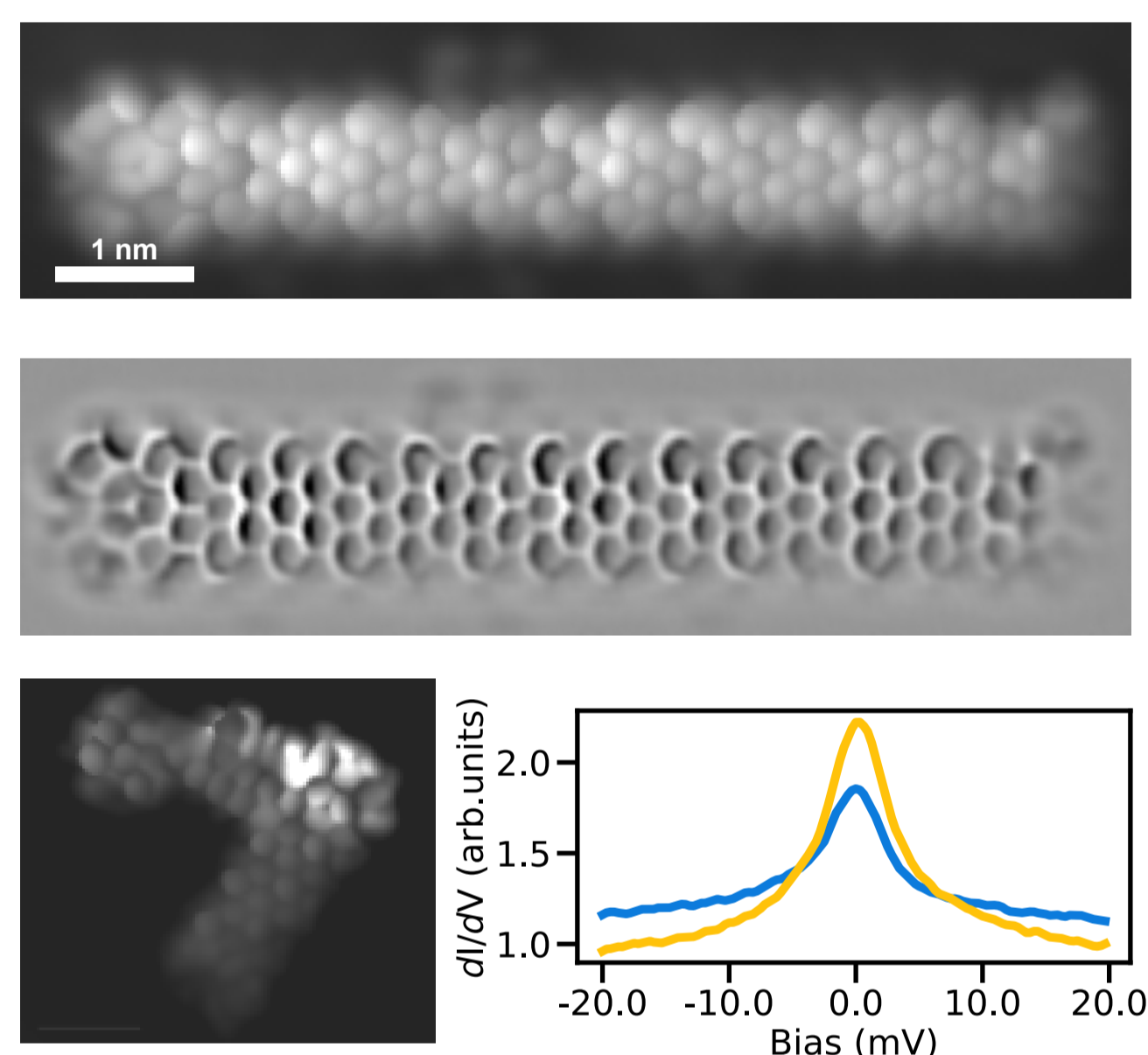
Functionalization with magnetic molecule

Spin polarized tip

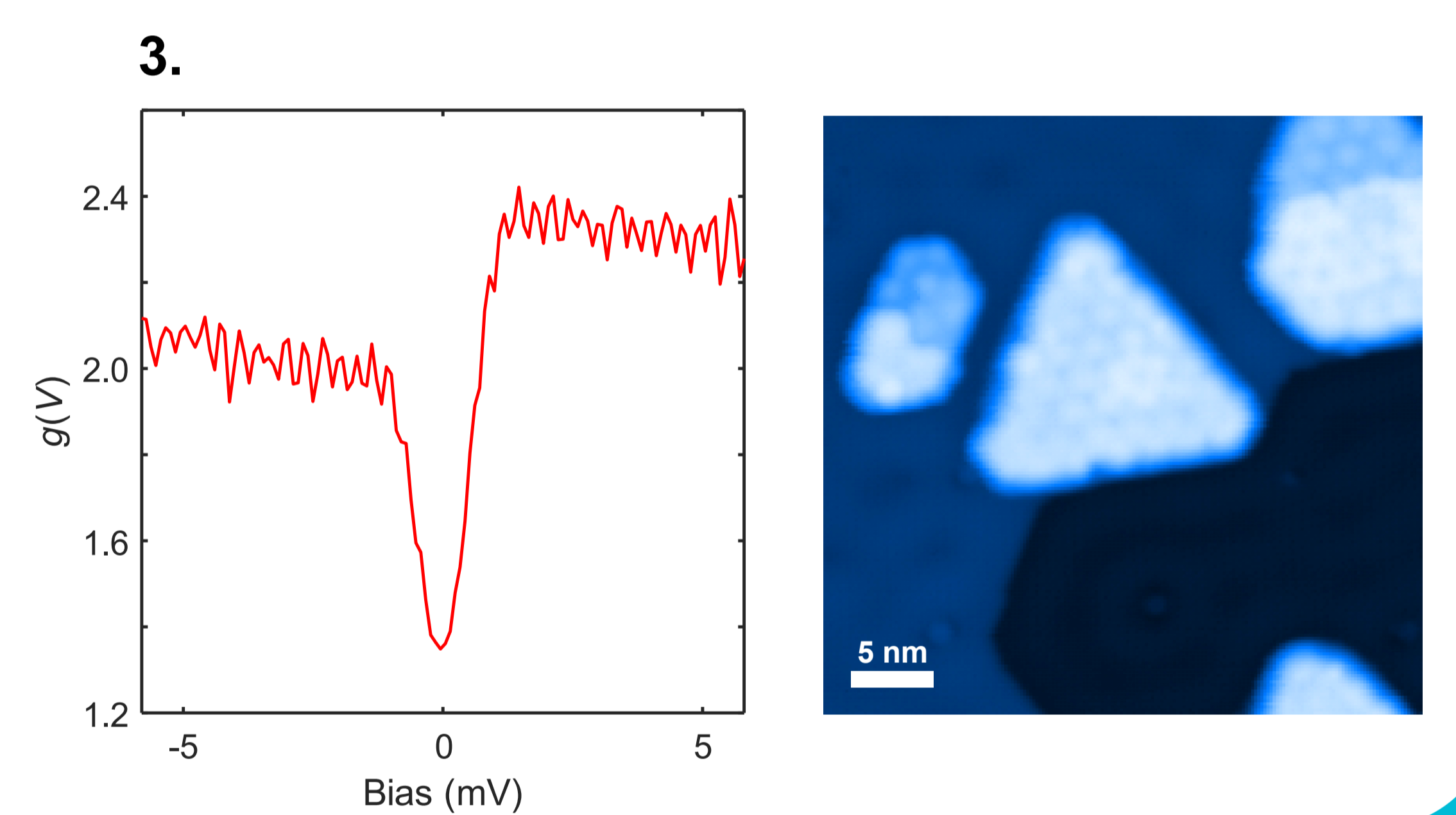
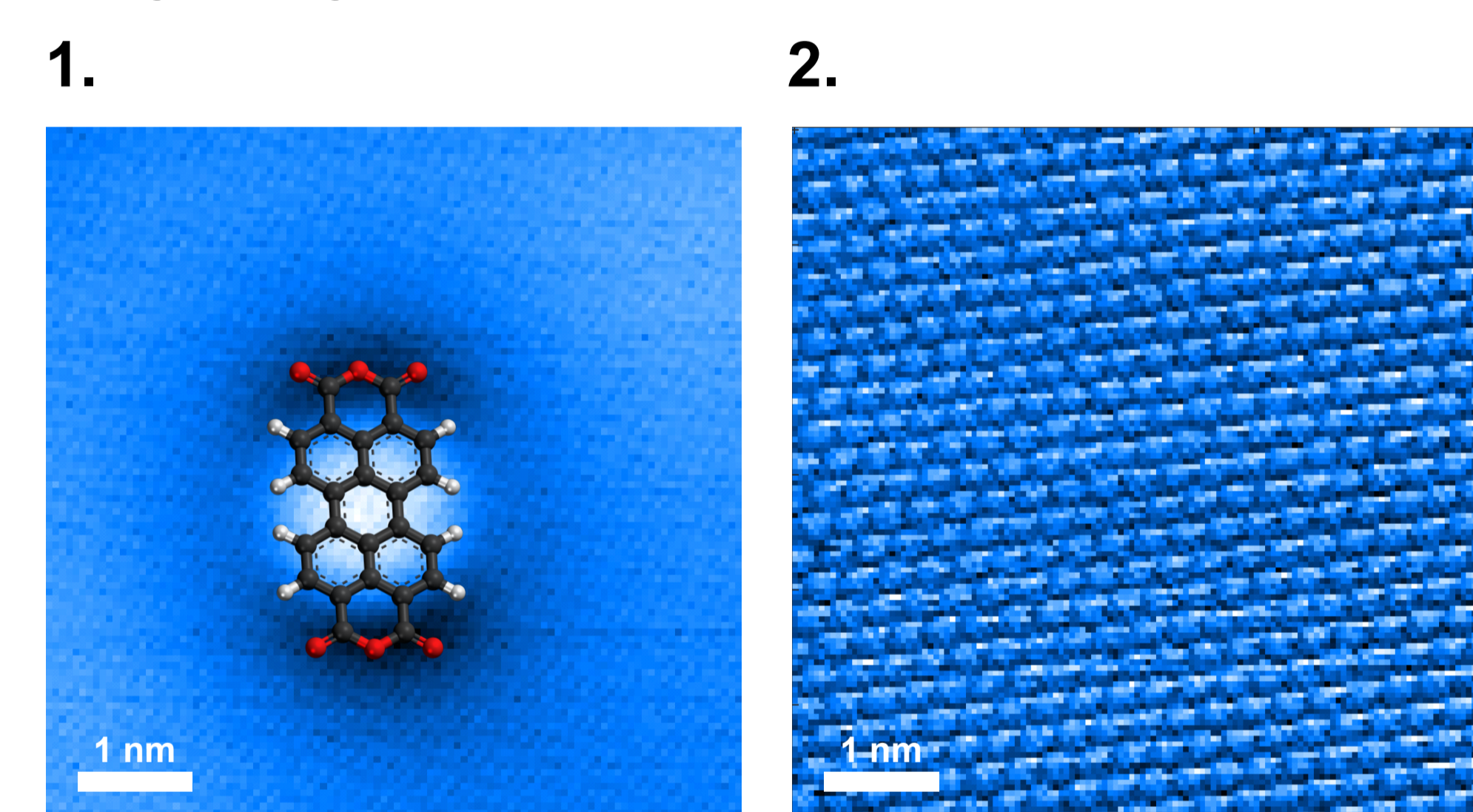
Magnetic sensing



Unpaired electrons in GNR

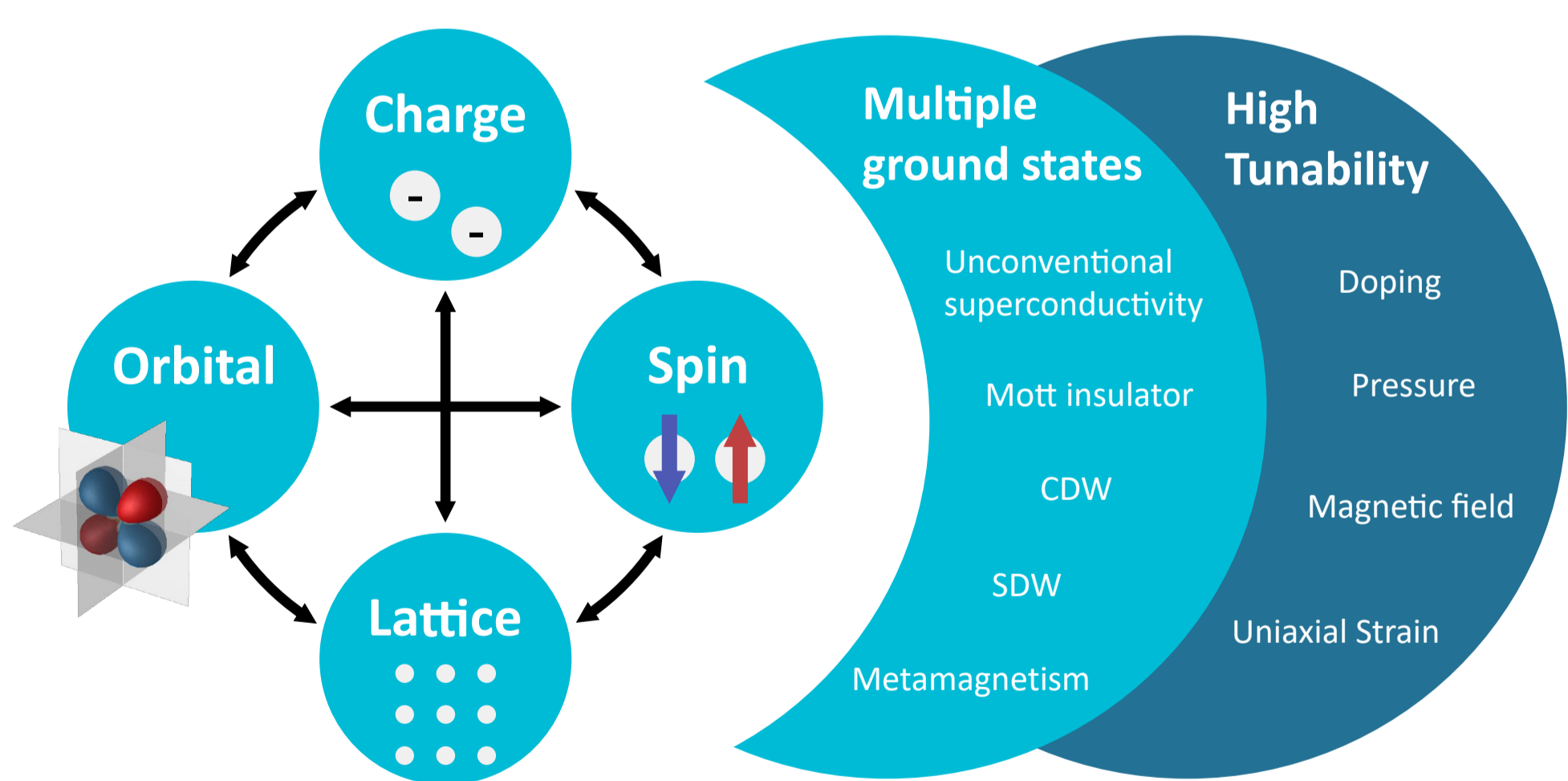


Lifting of single PTCDA molecule - spin sensor



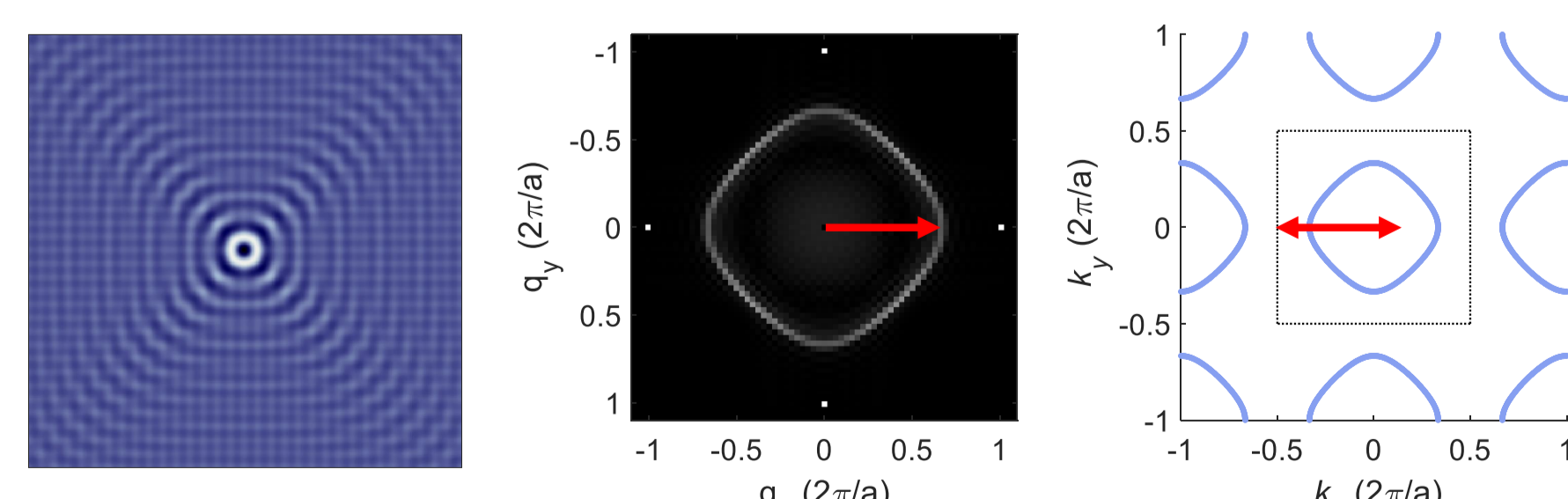
A. Cahlik et al., Nanoscale Advances 5 (6), 1722-1728

Quantum materials

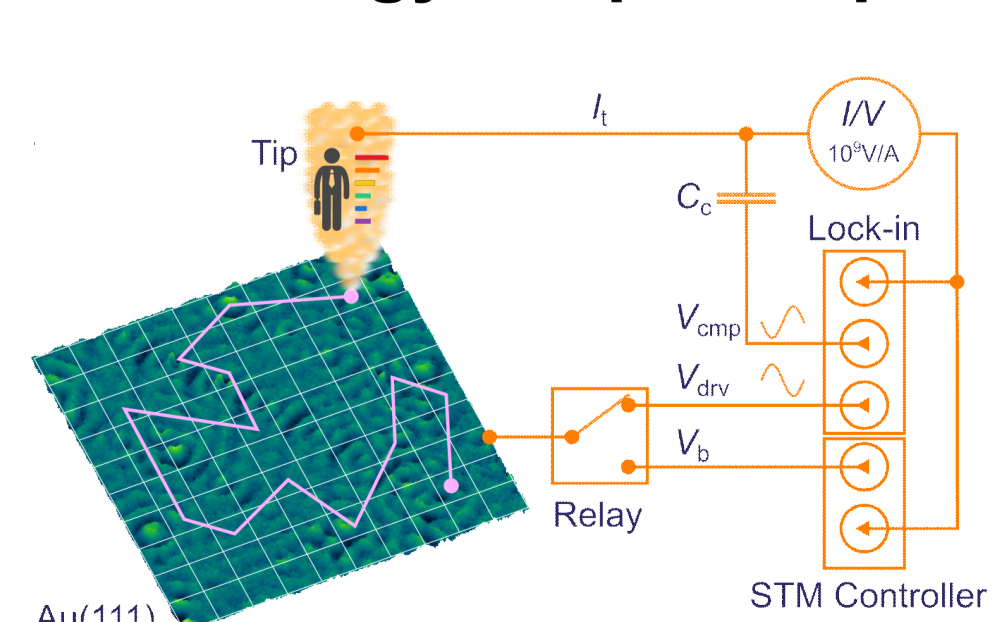


Quasiparticle interference (QPI):

A means to probe the electronic structure



Methodology to speed-up



Sparse sampling:

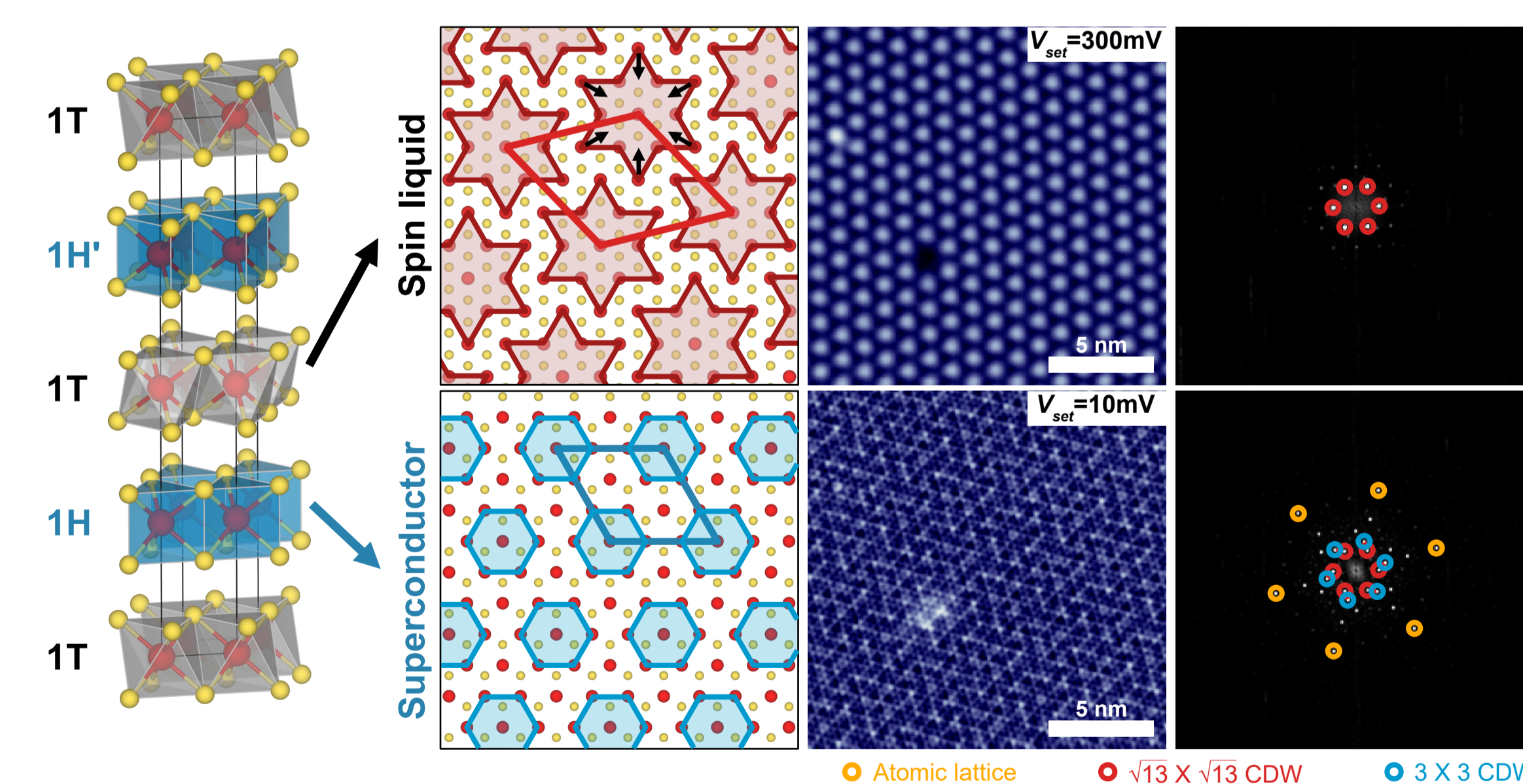
- Measuring less points

Parallel spectroscopy:

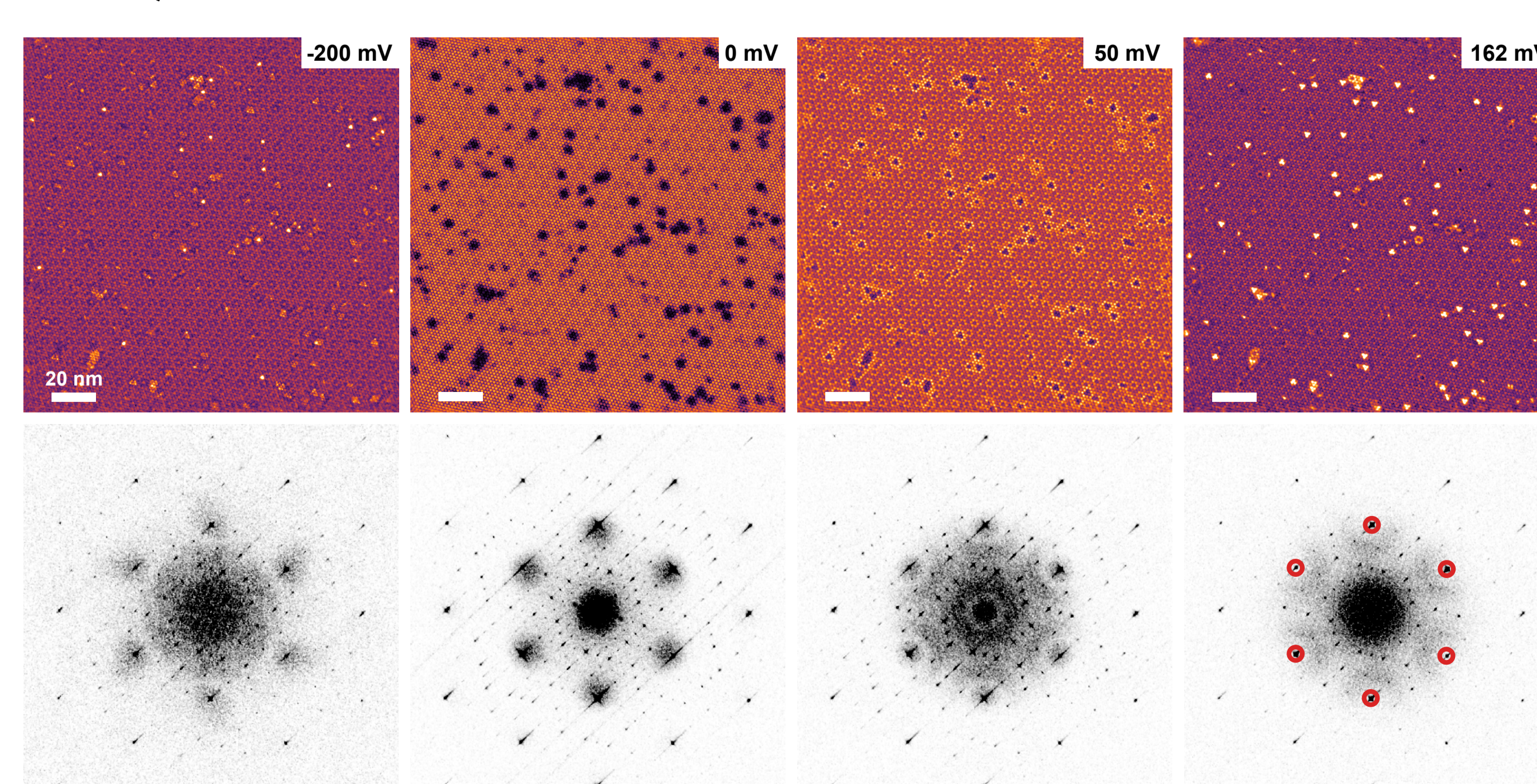
- Measuring spectra faster

Van der Waals materials:

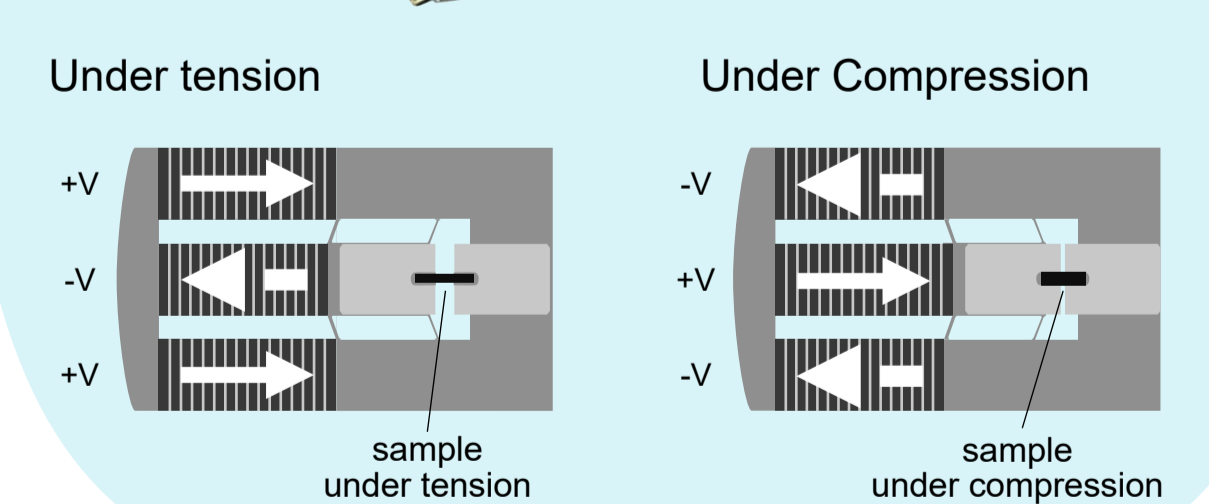
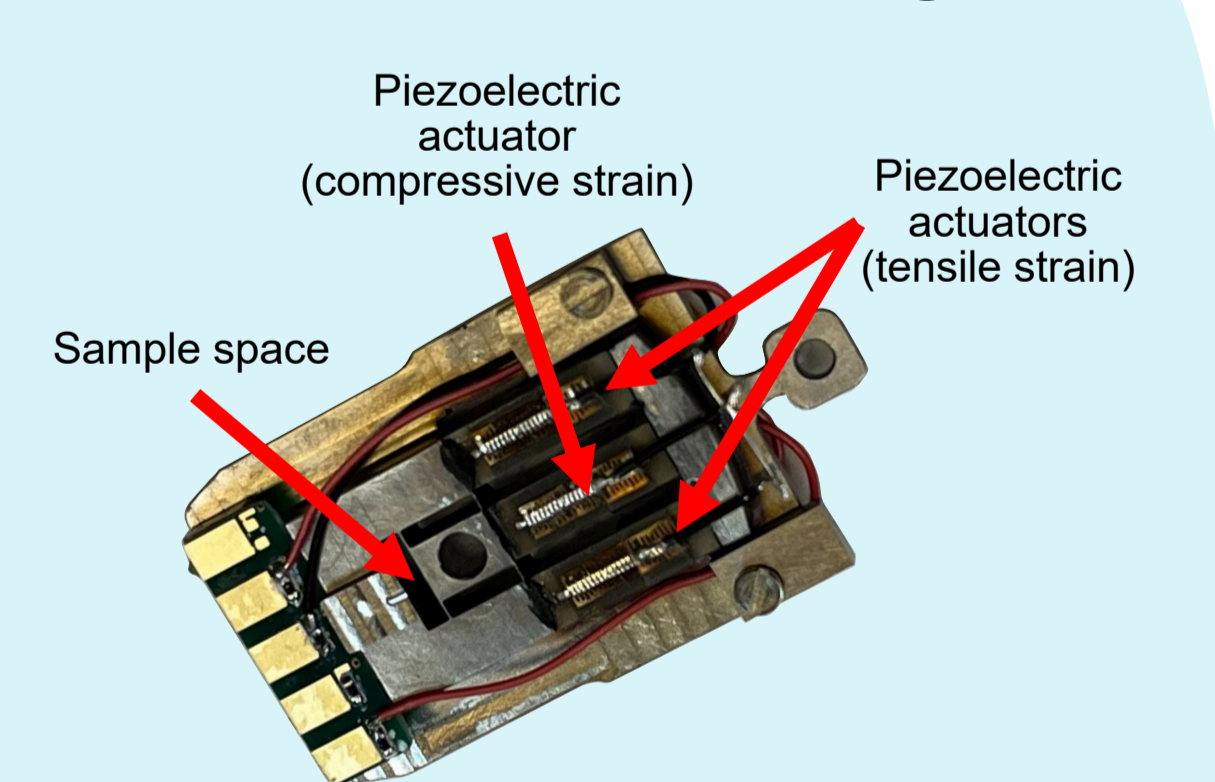
The case of the unconventional $4H_b$ -TaS₂



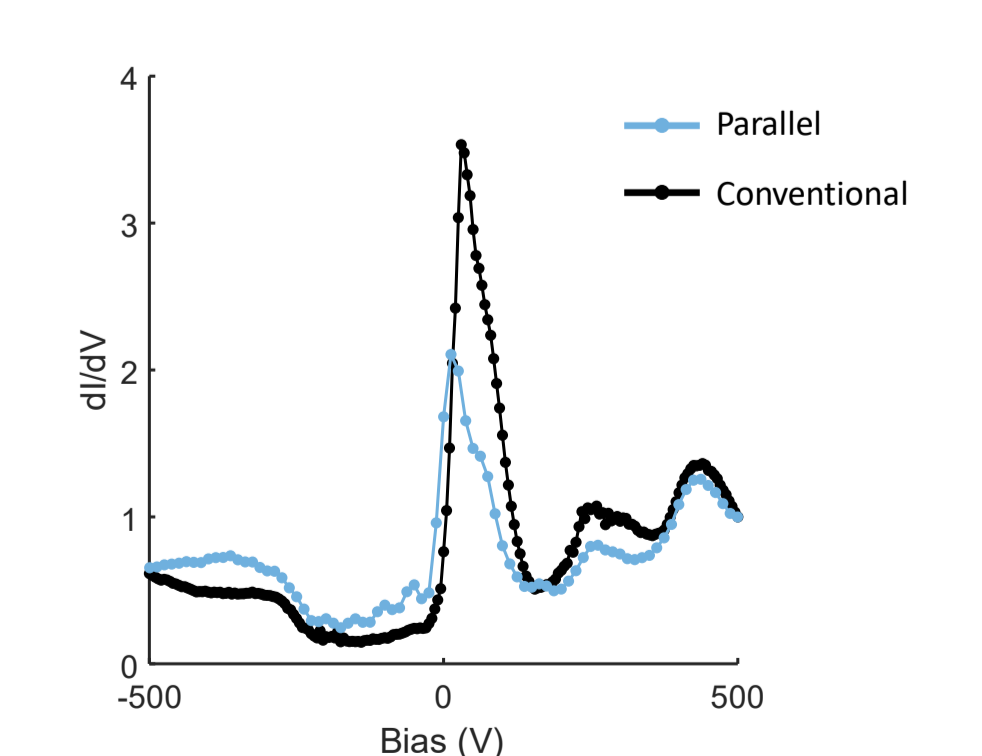
Fast-QPI on 1T-surface



Design and development of devices for *in-situ* tuning



Alexander Steppke and Danyang Liu (2022)



Conventionally:
Total map time 27 days

Fast-approach:
Total map time 2 days