

Nano Optoelectronics Group

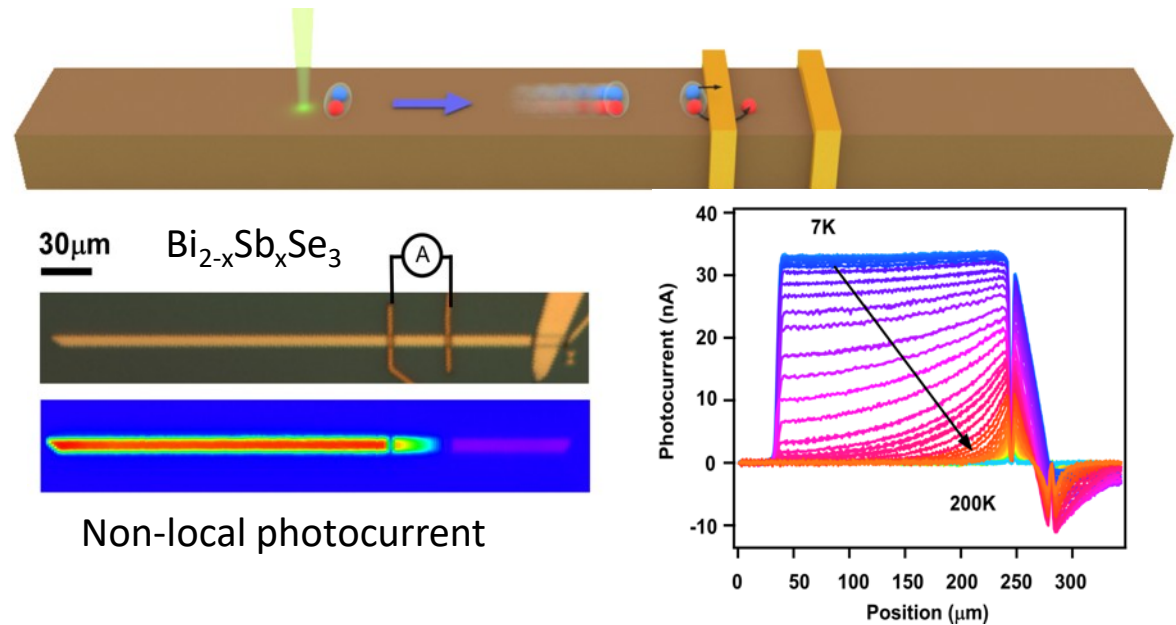
PI: Dong Yu



(1) Topological exciton condensates: can excitons be a superfluid and make quantum computers?



Yasen Hou

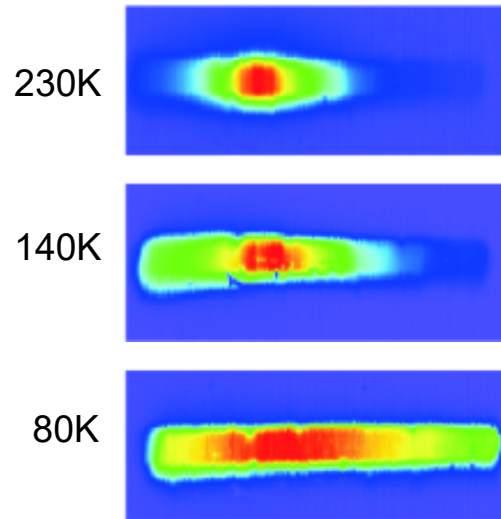


Y. Hou, et al. "Millimetre-long transport of photogenerated carriers in topological insulators," *Nature Communications*, 10, 5723 (2019).

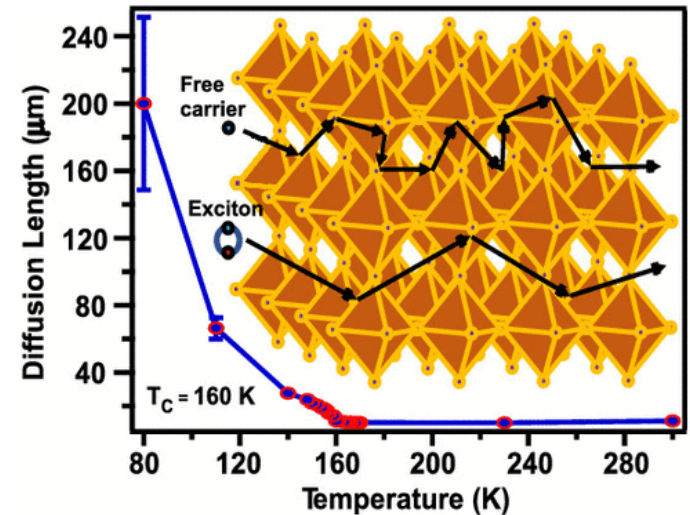
(2) Halide perovskites: can we make a better solar cell by manipulating phase?



Luke McClintock



Photocurrent images

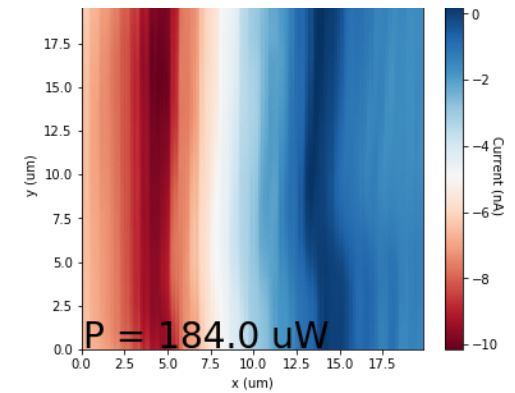
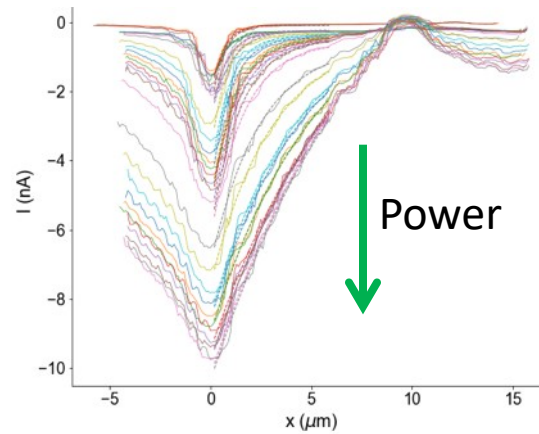
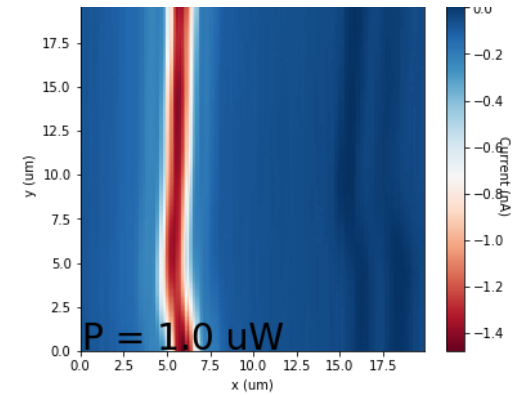
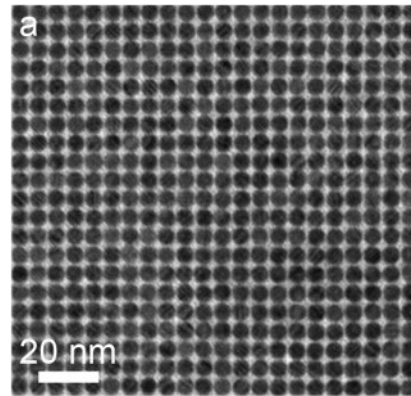


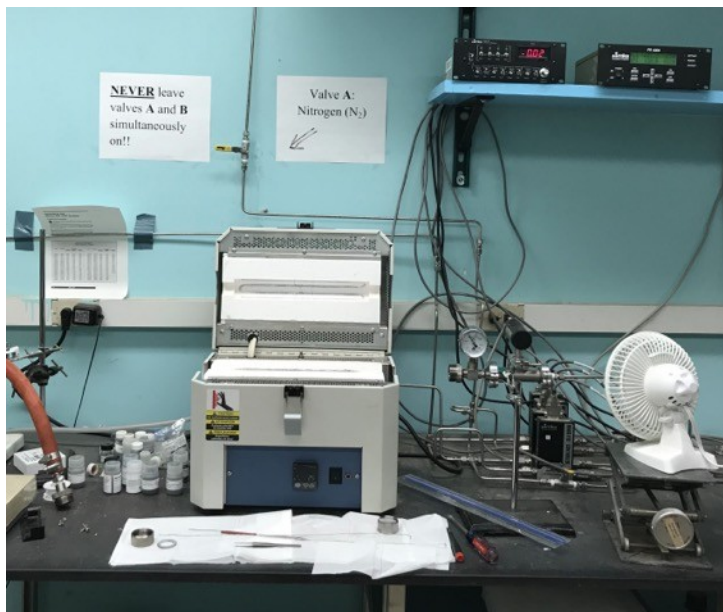
L. McClintock, et al, "Temperature and Gate Dependence of Carrier Diffusion in Single Crystal Methylammonium Lead Iodide Perovskite Microstructures," *Journal of Physical Chemistry Letters*, 11, 1000-1006 (2020).

(3) Quantum dots: can electrons transport coherently in quantum dot superlattices?



Clark Travaglini





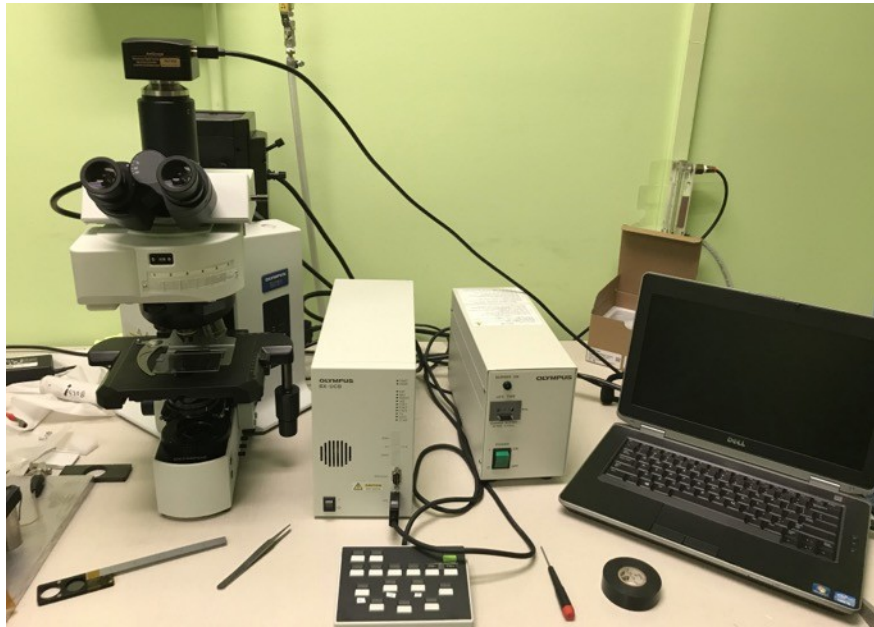
Chemical vapor deposition (CVD)



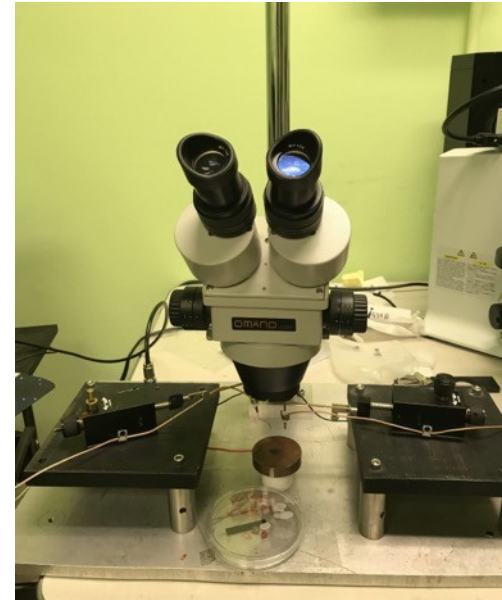
Probe station in glovebox



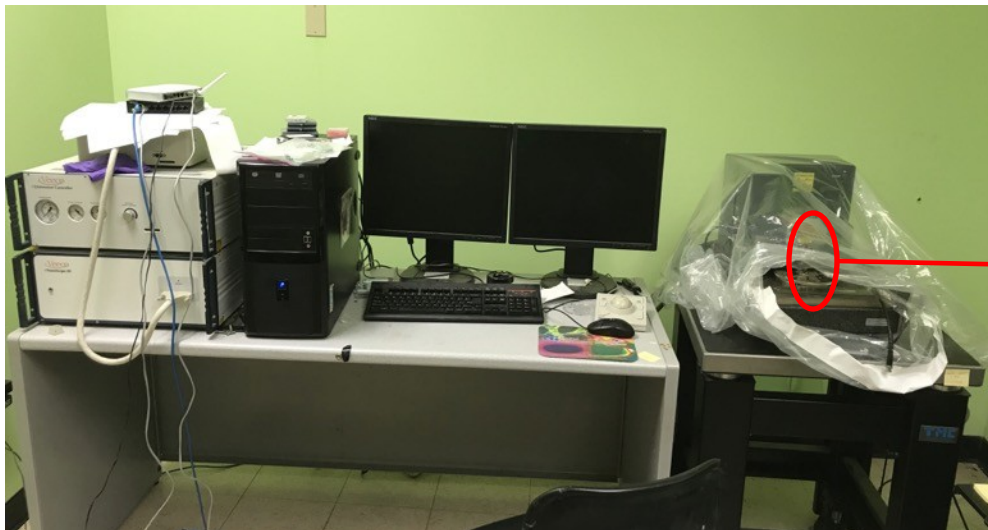
Spin coater in fume hood



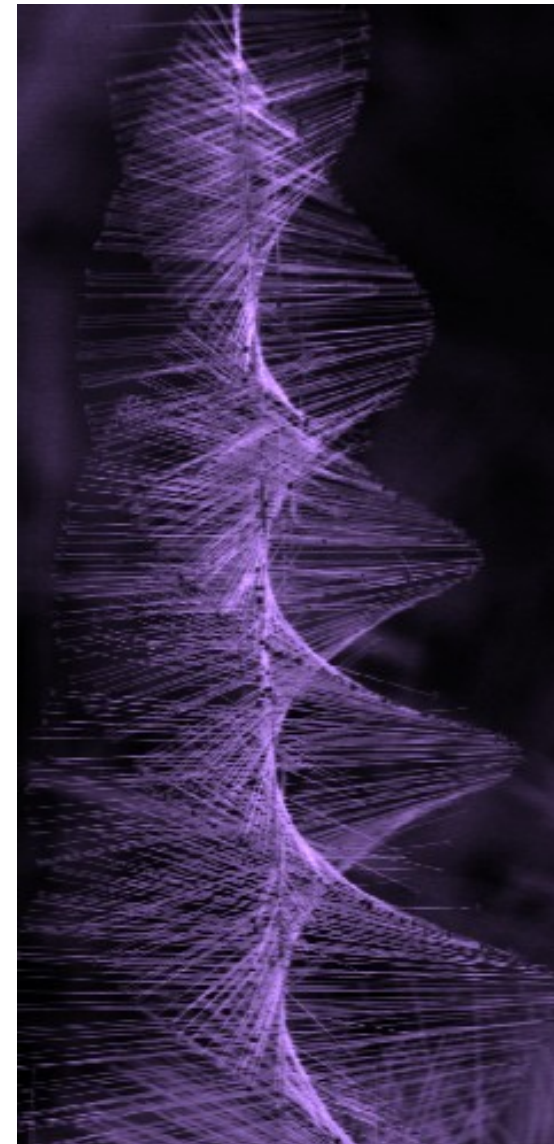
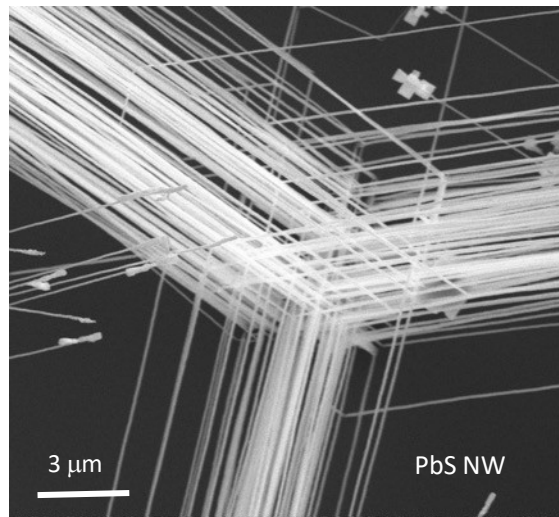
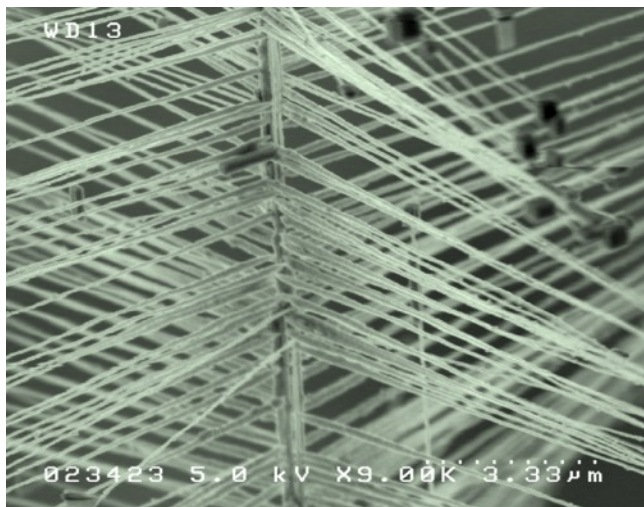
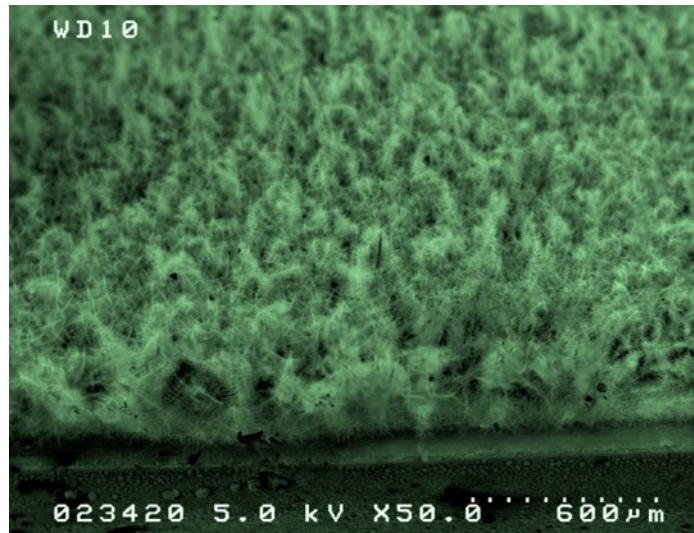
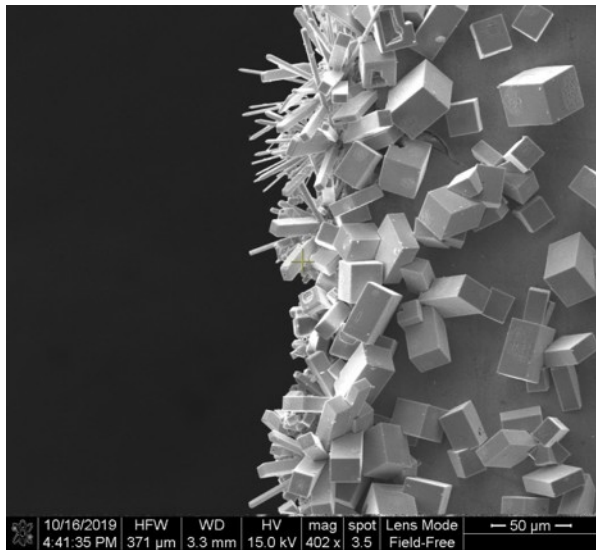
Olympus BX61 microscope



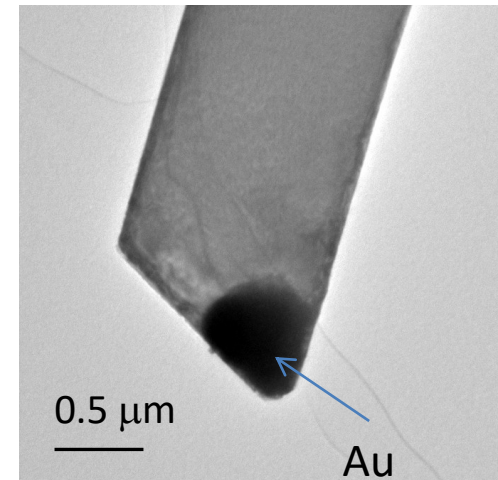
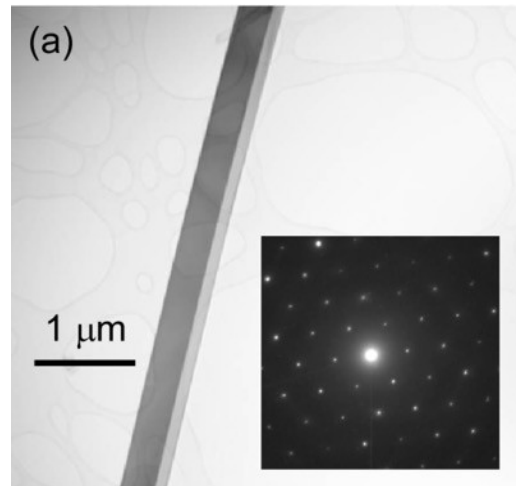
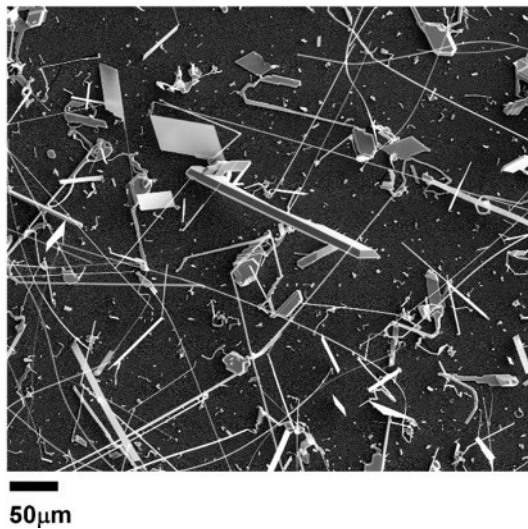
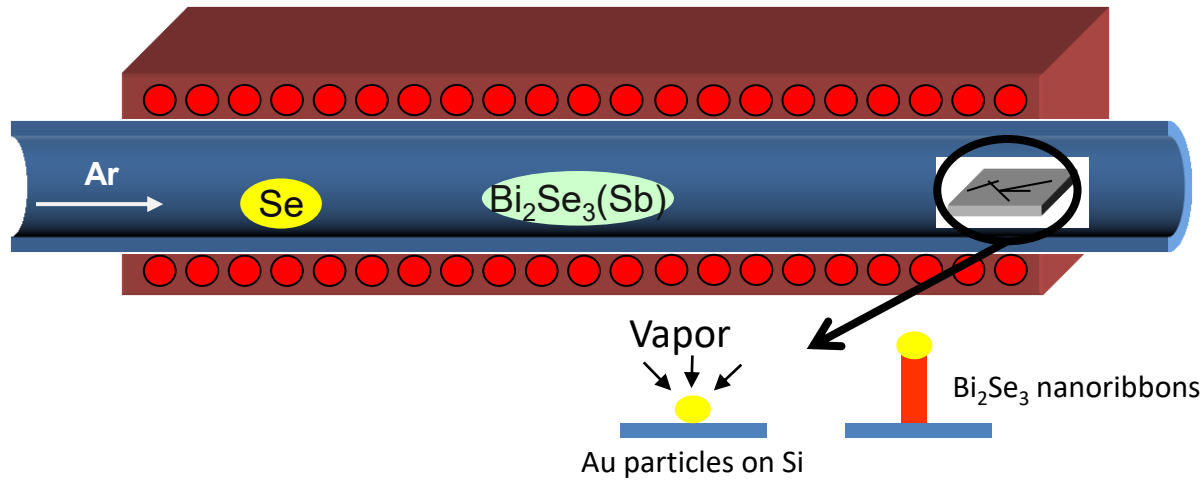
Probe Station

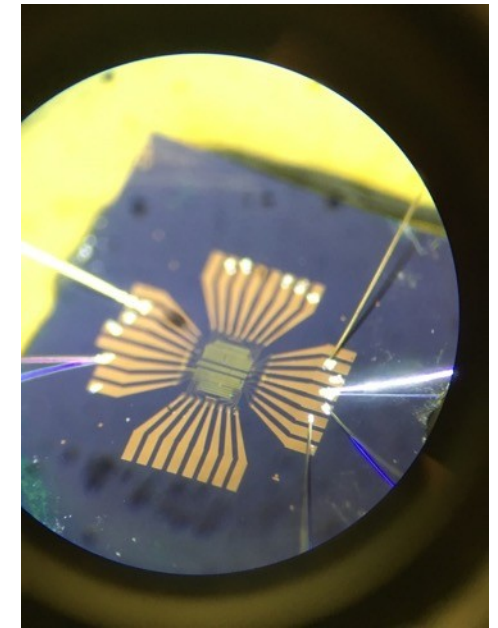


Atomic force microscope (AFM)



Synthesis of Bi_2Se_3 Nanostructures

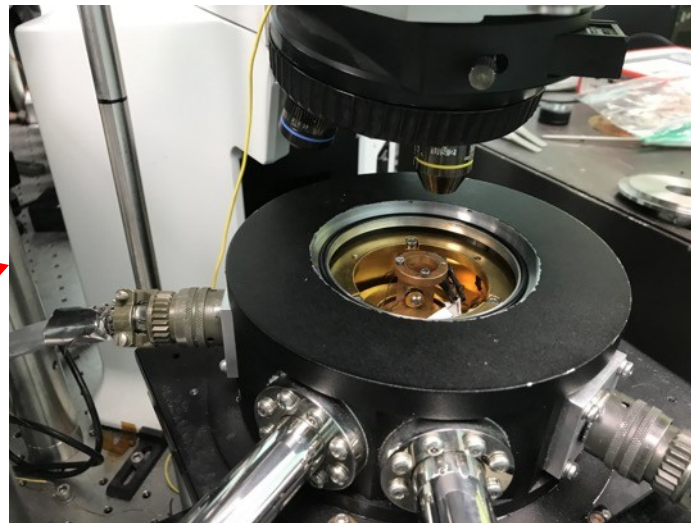
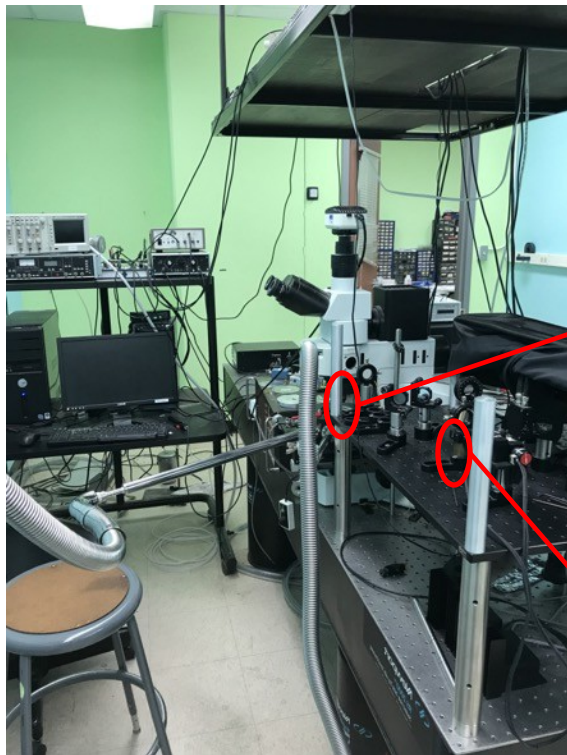




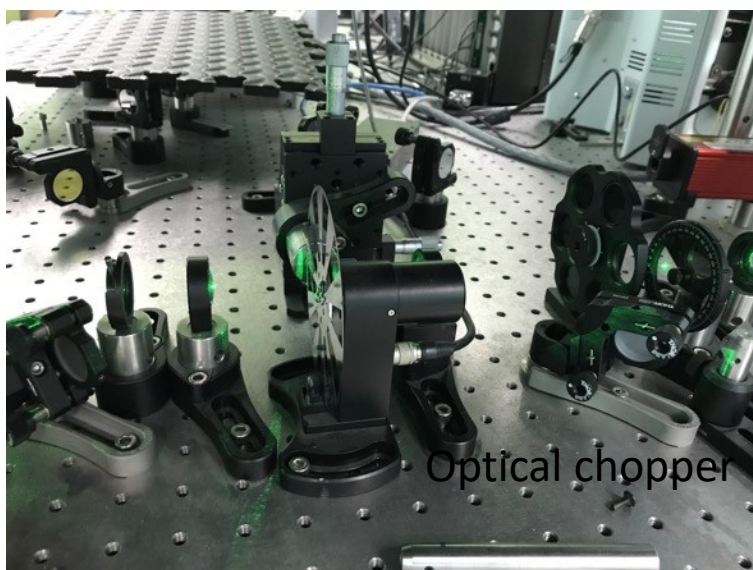
Center for Nano-MicroManufacturing <https://cnm2.ucdavis.edu/>

Fabricated device

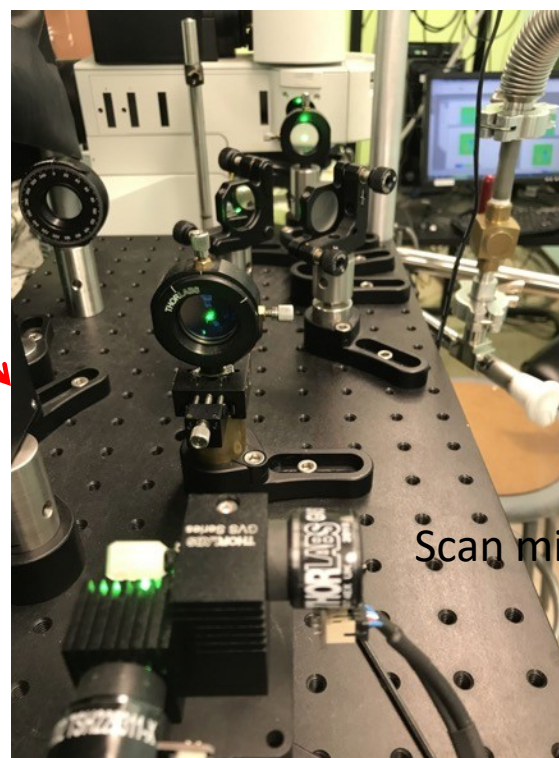




Janis ST-500 Cryostat

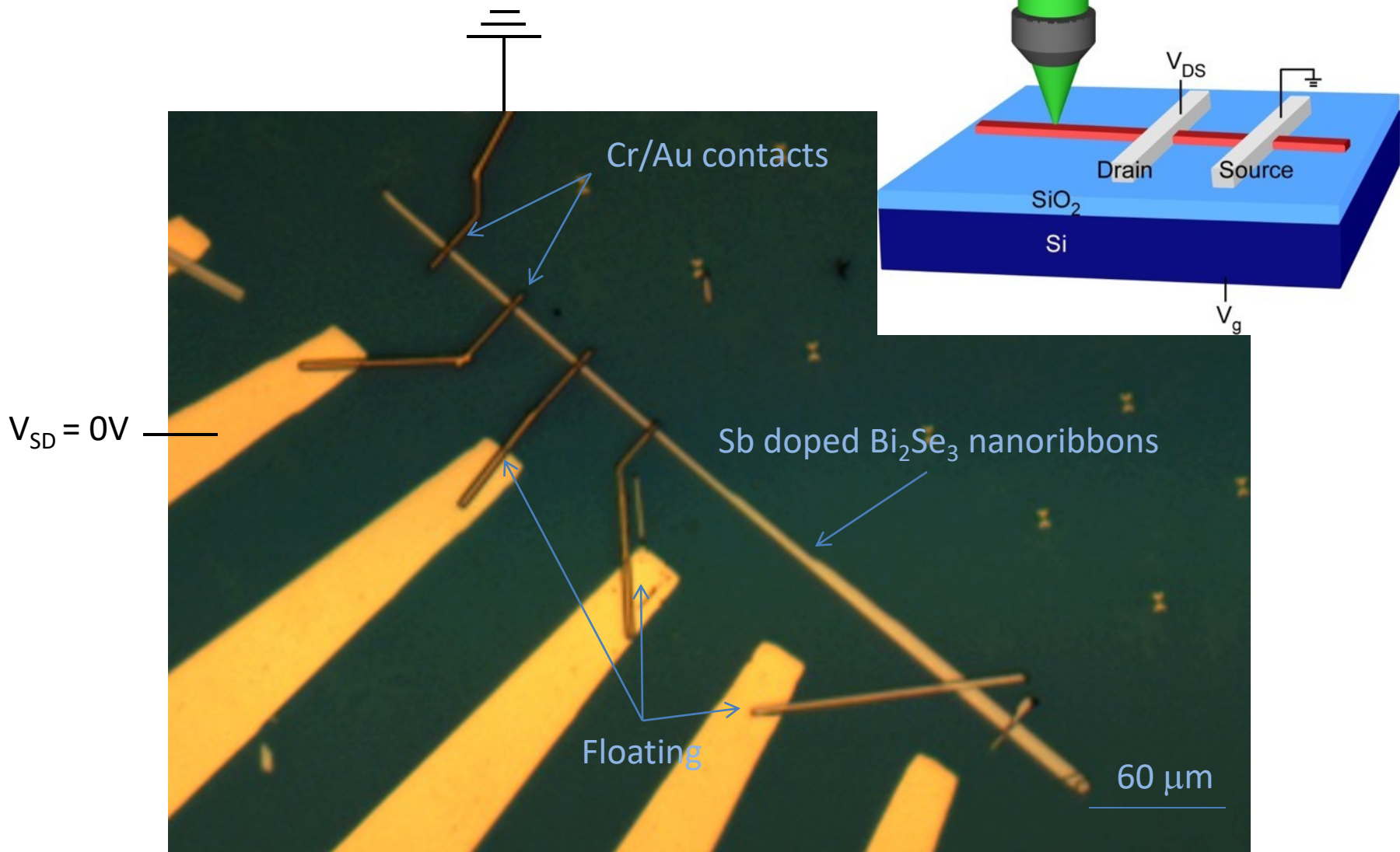


Optical chopper

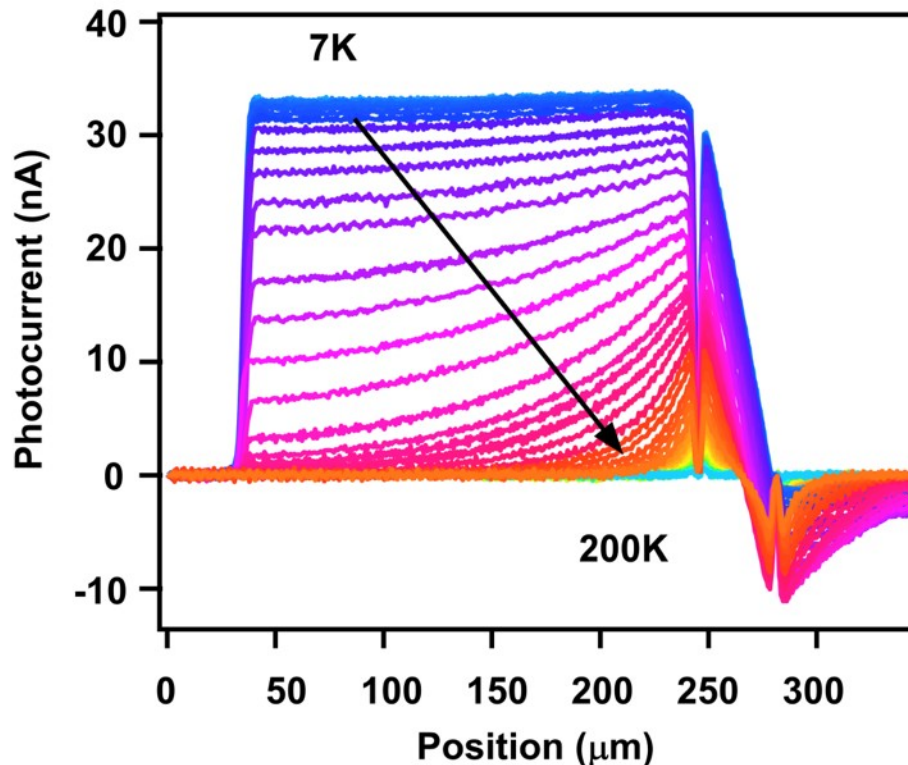
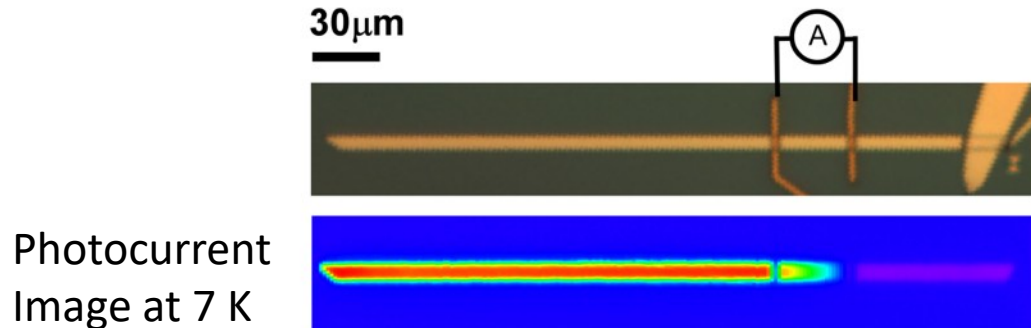


Scan mirror

TI Nanoribbon Device



Photocurrent Distributions at Low T



- Local photoexcitation 200 μm away from contact can still create strong current

- Photocurrent decay length (L_d) increases rapidly as T decreases and reaches 0.9 mm at 7 K

- Highly non-local photocurrent generation!

$$I(x) = A \cosh\left(\frac{x-L}{L_d}\right)$$