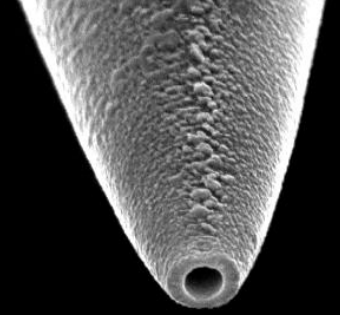
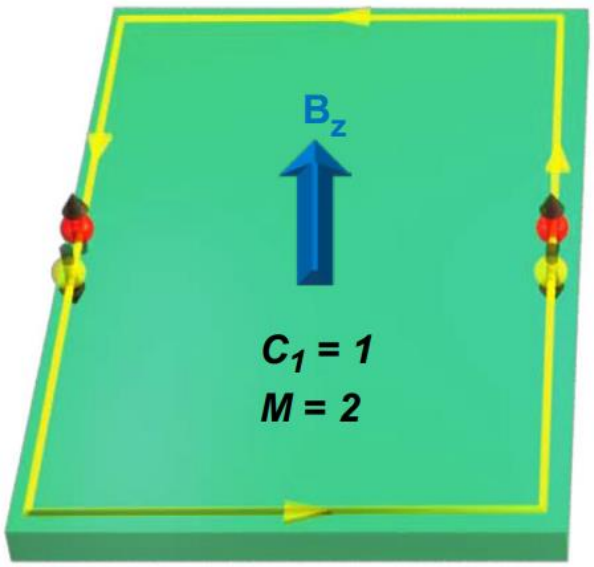


NanoSQUID On Tip Scanning Microscopy

Jiacheng Zhu
Young Lab, UC Santa Barbara

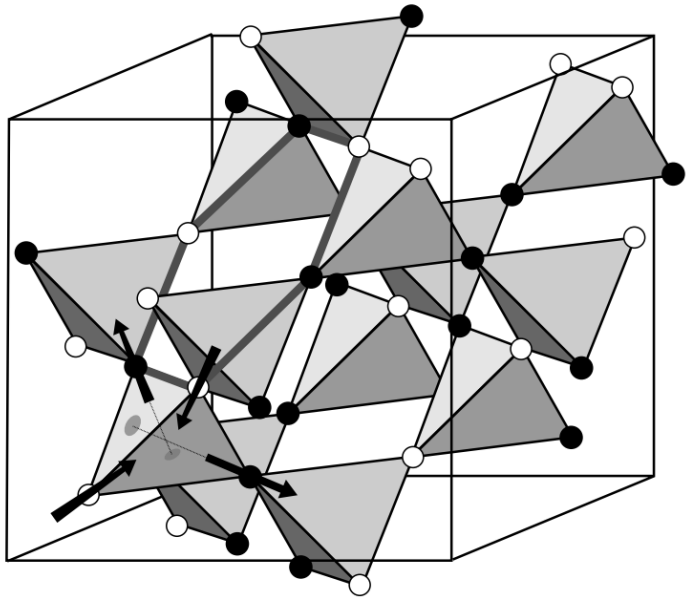
Magnetic Signal

Current



X. Kou et al., ScienceDirect 10.022 (2014)

Magnetism

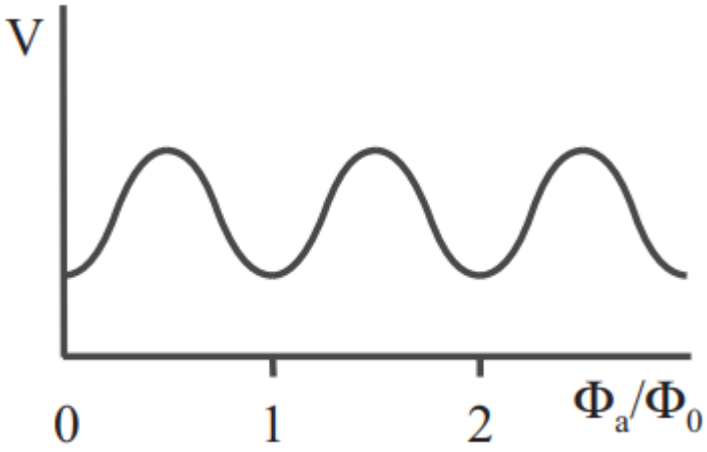


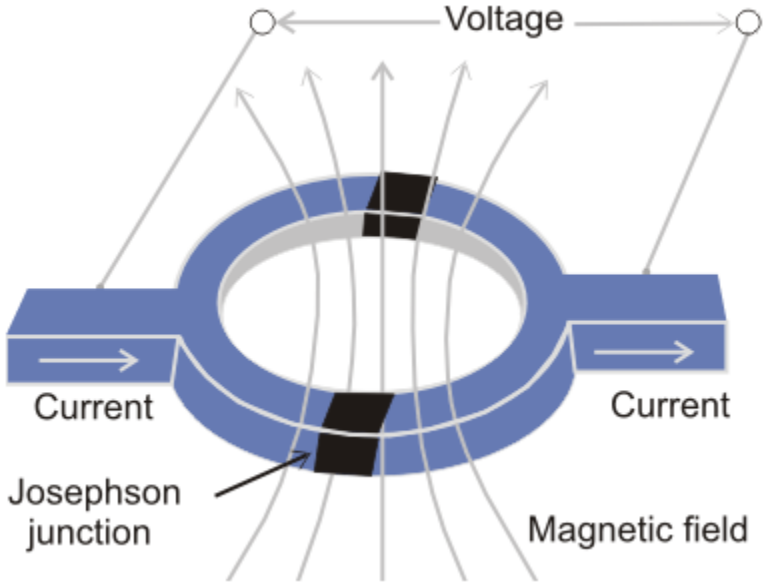
S. Bramwell, Science 294.5564 (2001)

Superconducting QUantum Interference Device(SQUID)

Two Josephson junctions reside on a SC ring

SQUID is sensitive to flux: periodic in $\frac{h}{2e^2}$





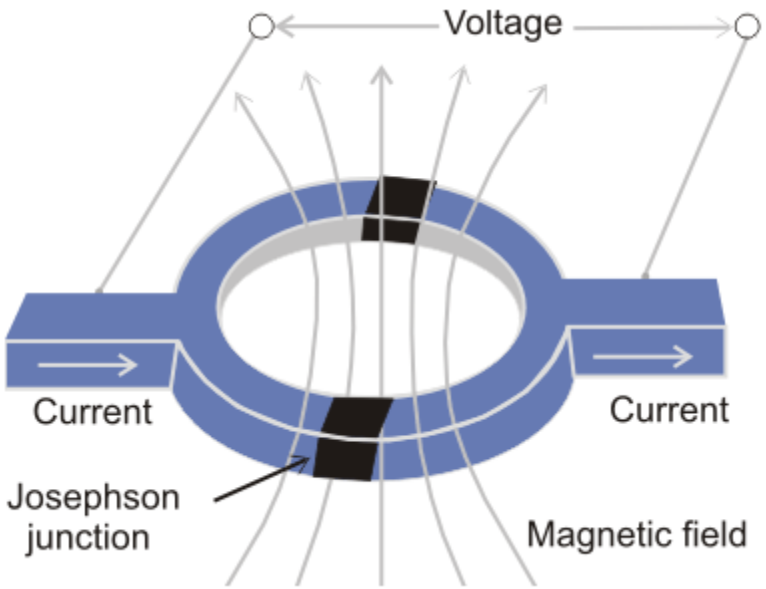
Smaller SQUID

Field sensitivity $\sim \frac{1}{R^2}$

Dipole moment $\sim \frac{1}{R^3}$

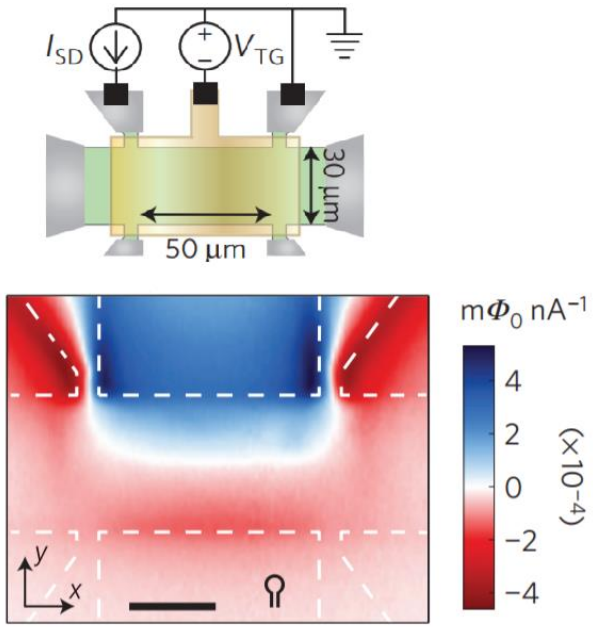
Spatial Resolution cutoff when h ~ R

Gain better sensitivity for varying field



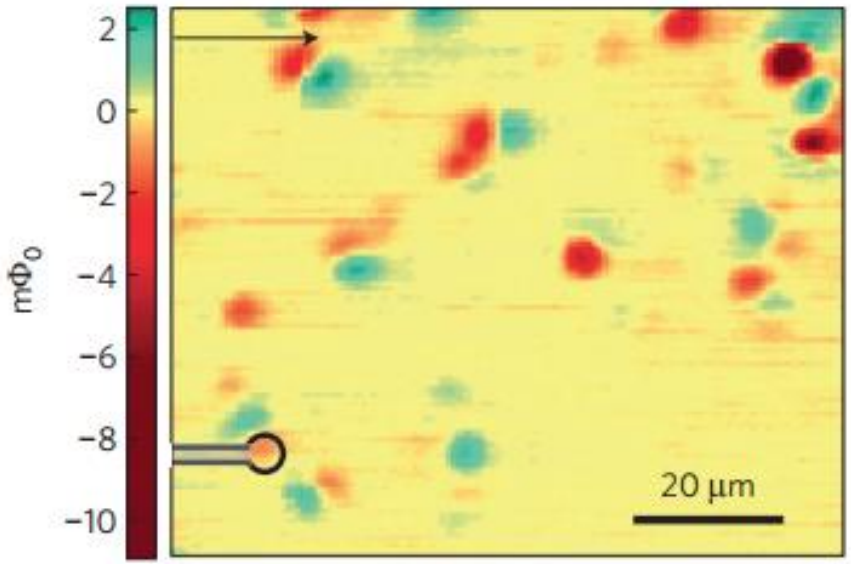
Application of SQUID to 2D Material

Imaging Current in HgTe Quantum Well



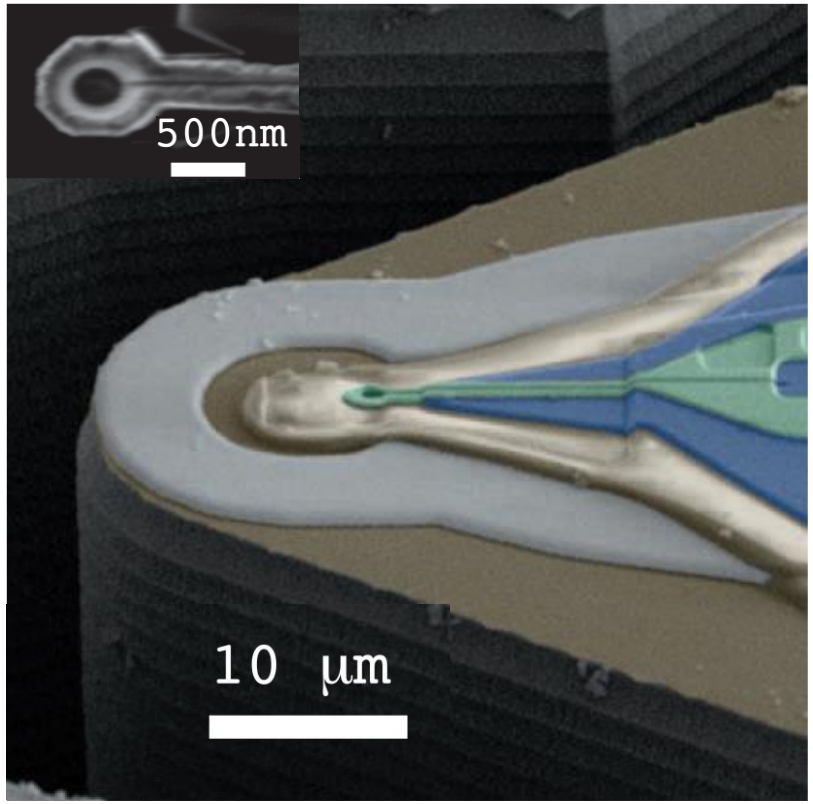
K. Nowack et al., Nature Materials 3682 (2013)

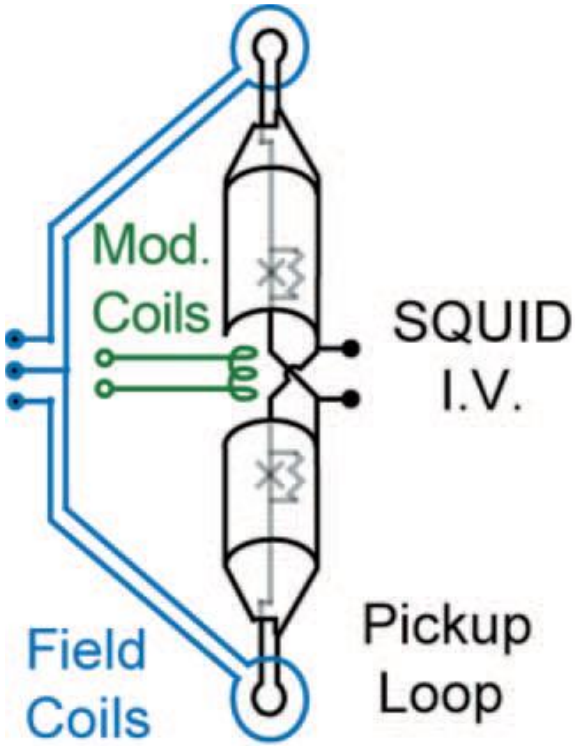
Detecting Ferromagnetism in LAO/STO



J. Bert et al., Nature Physics 2079 (2011)

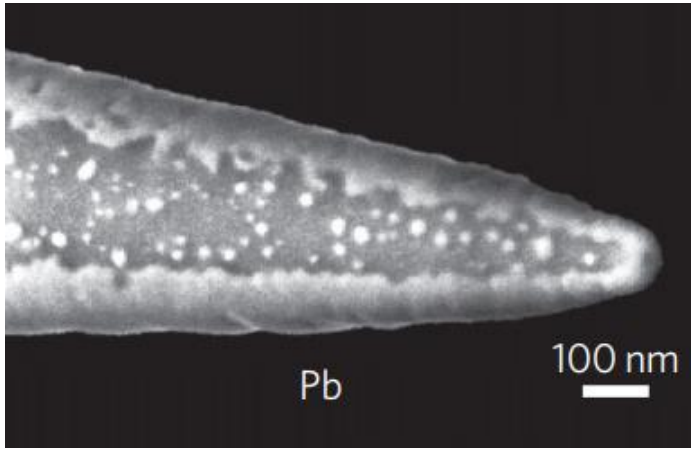
Application of SQUID to 2D Material



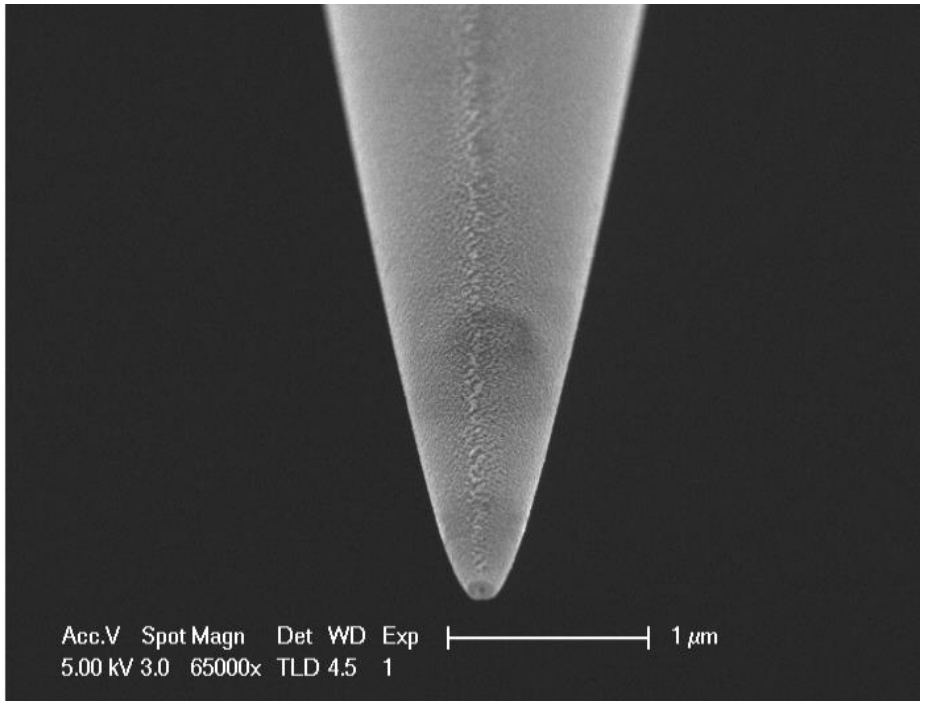


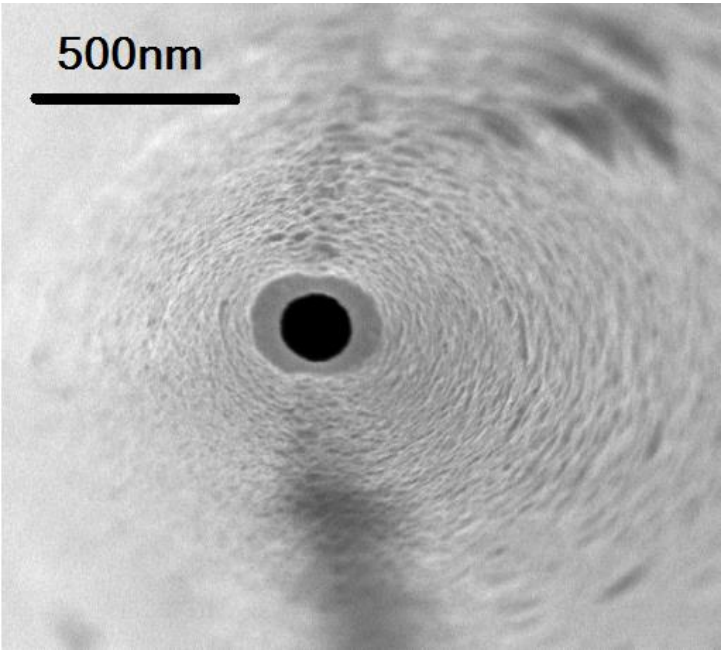
N. Koshnick et al. APL 93 243101 (2008)

NanoSQUID On Tip

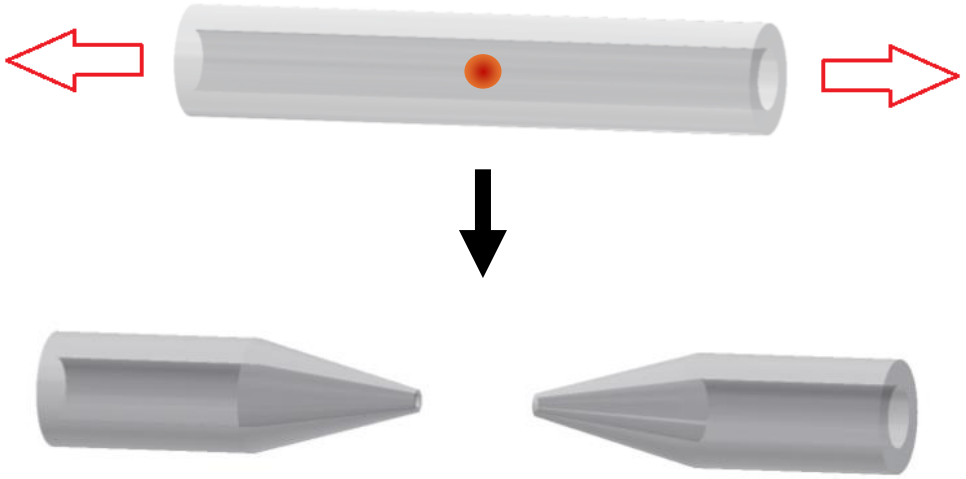


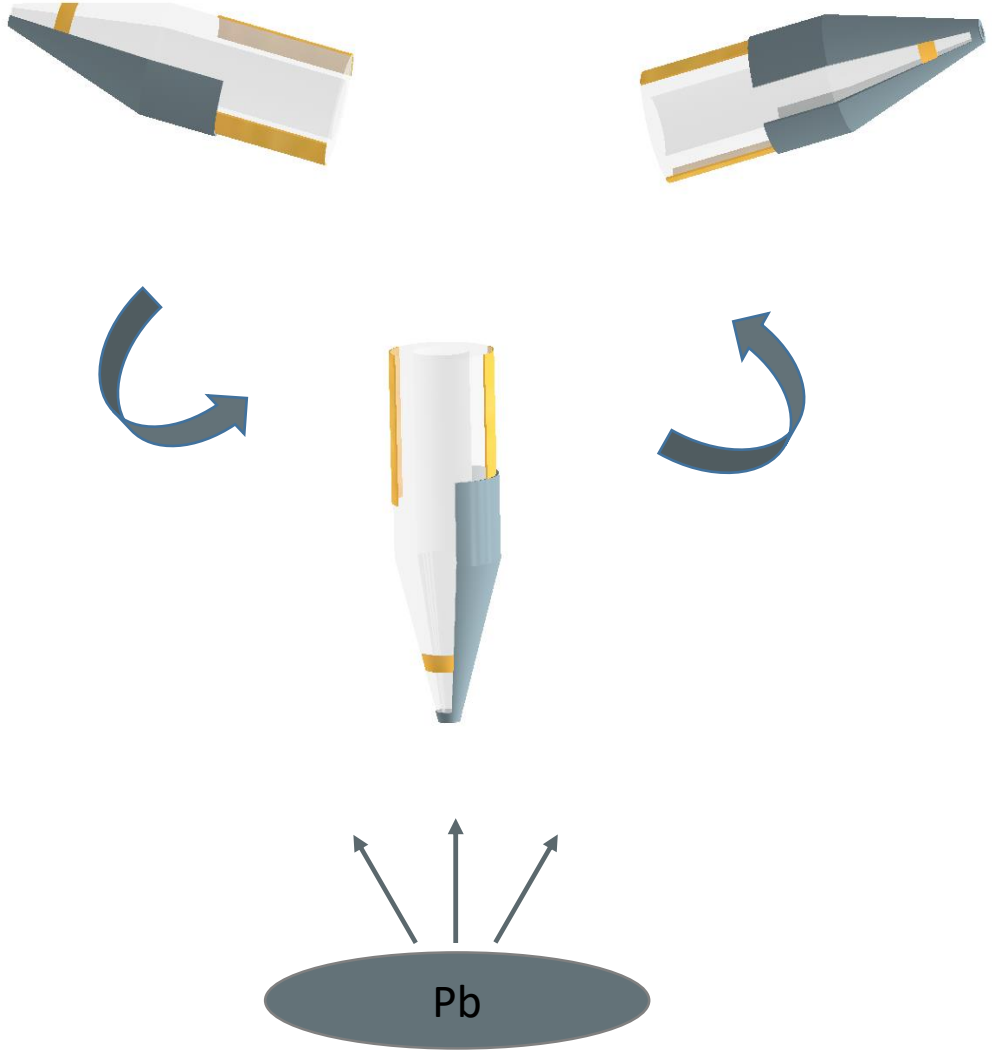
Vasyukov et al., Nature Nanotech 8.169(2013)



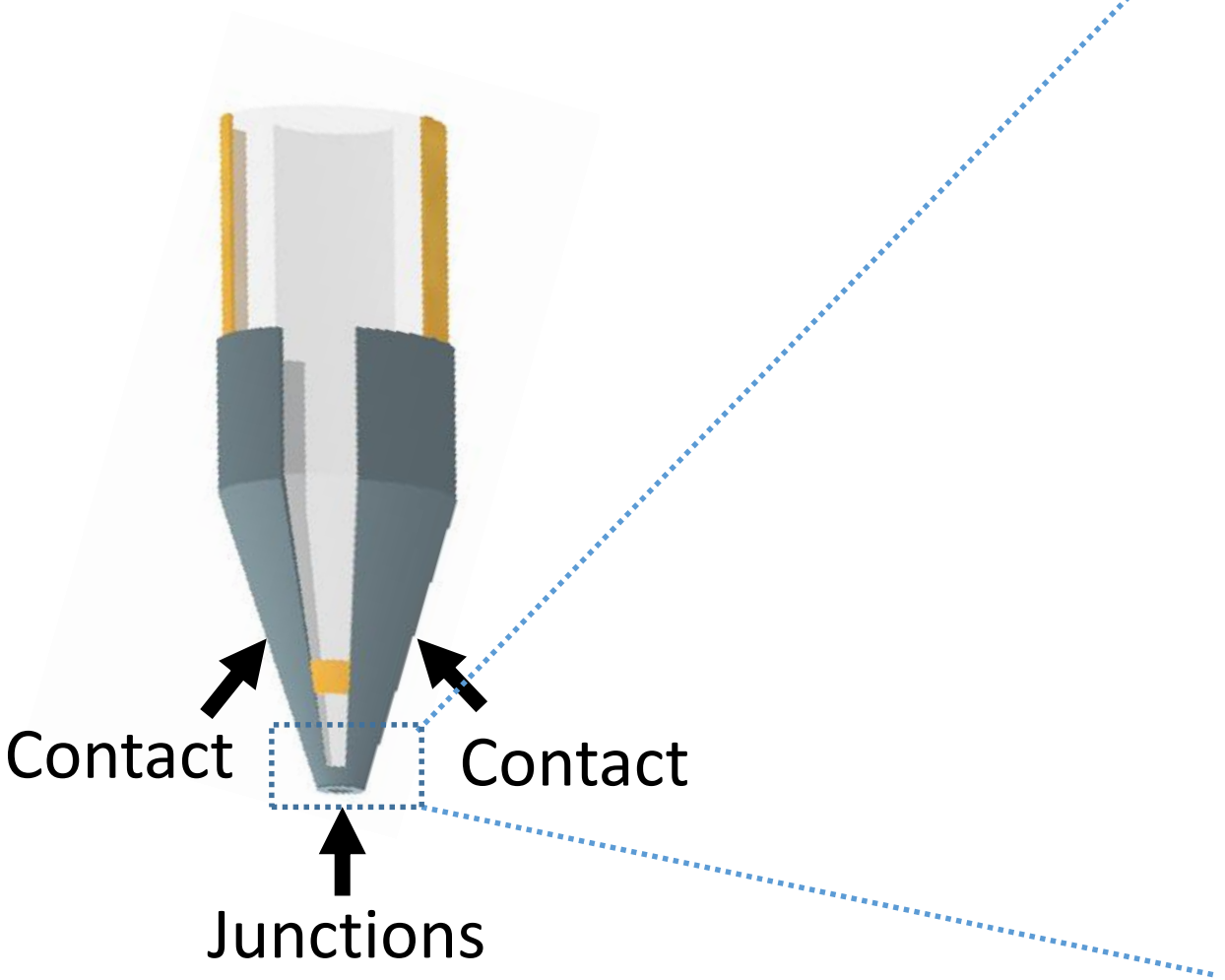


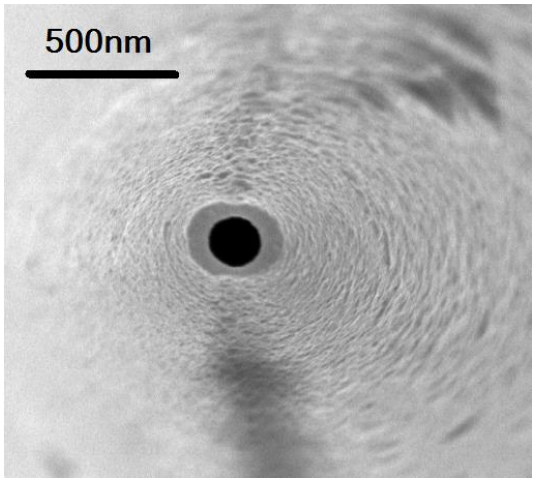
SQUID Fabrication



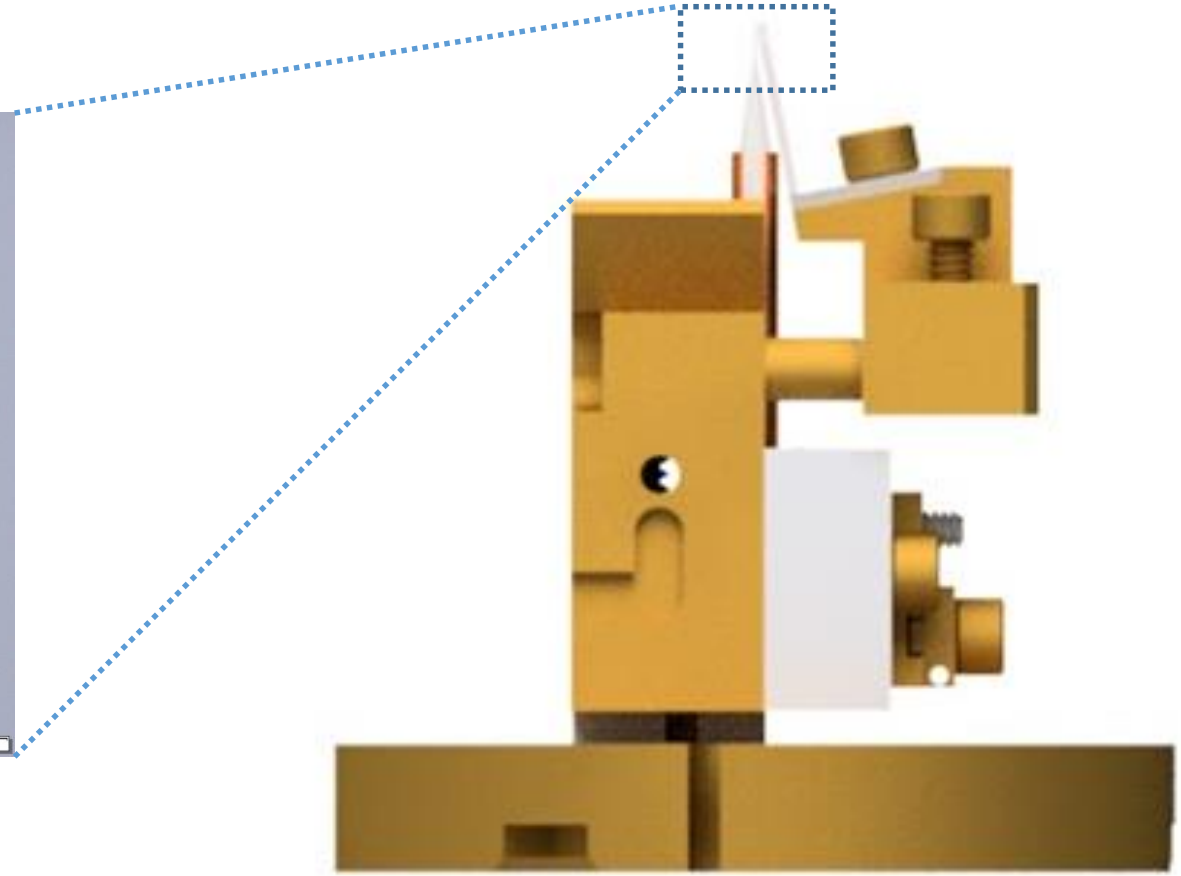


SQUID Fabrication

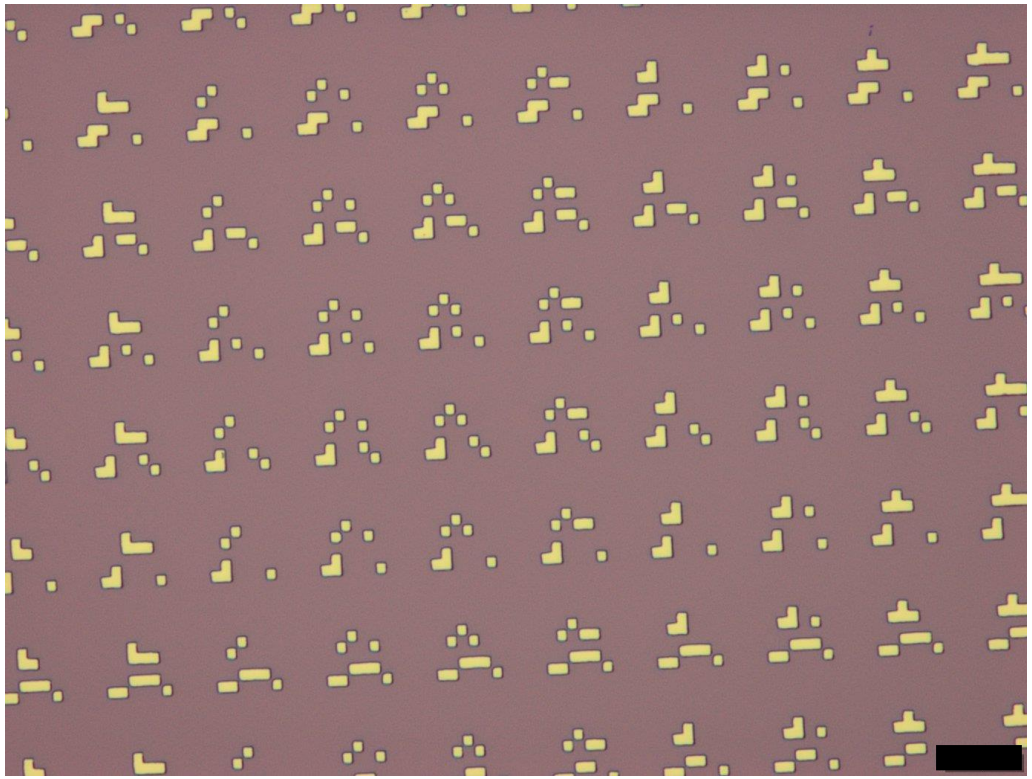


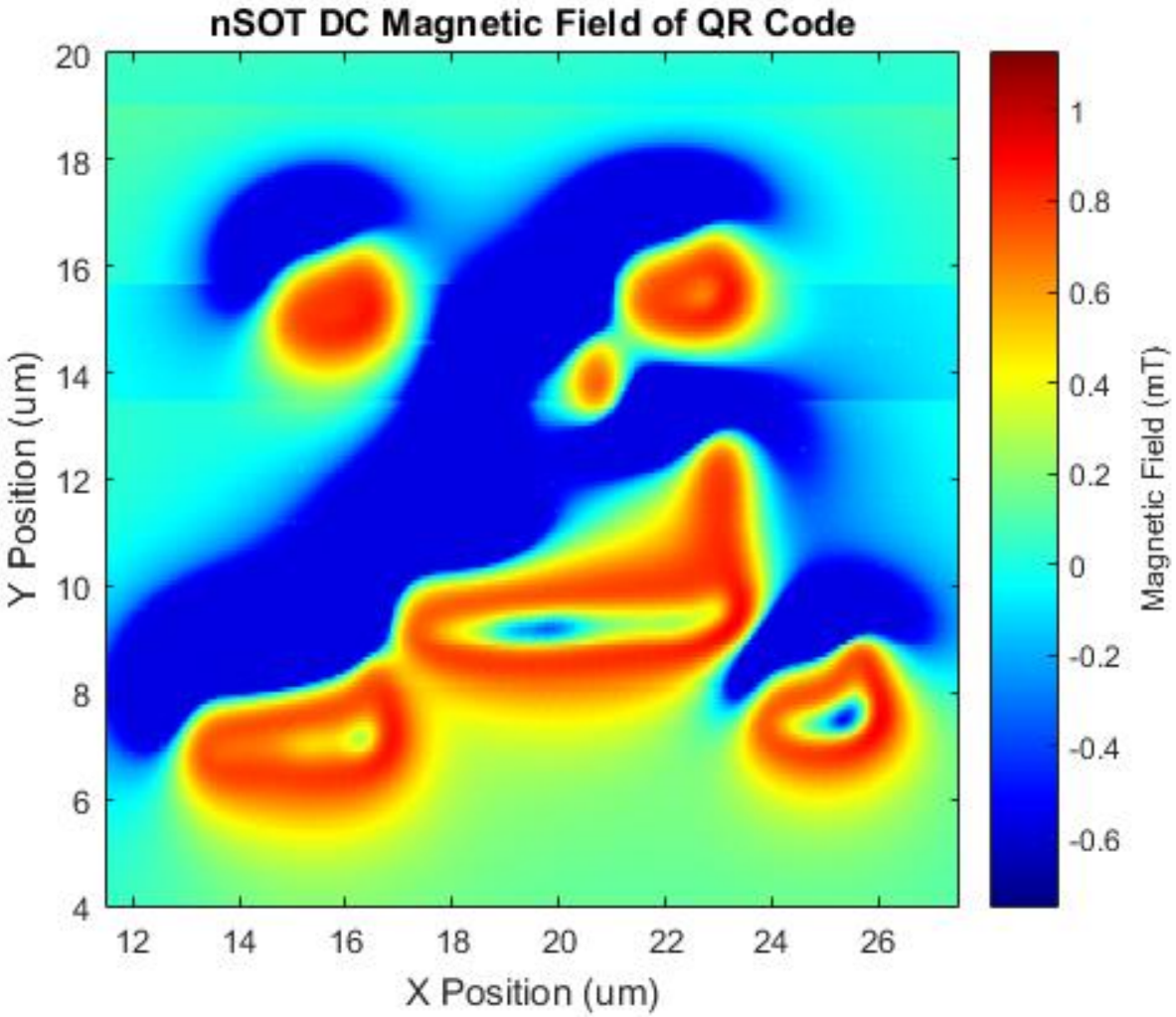


Couple Tuning Fork to SQUID

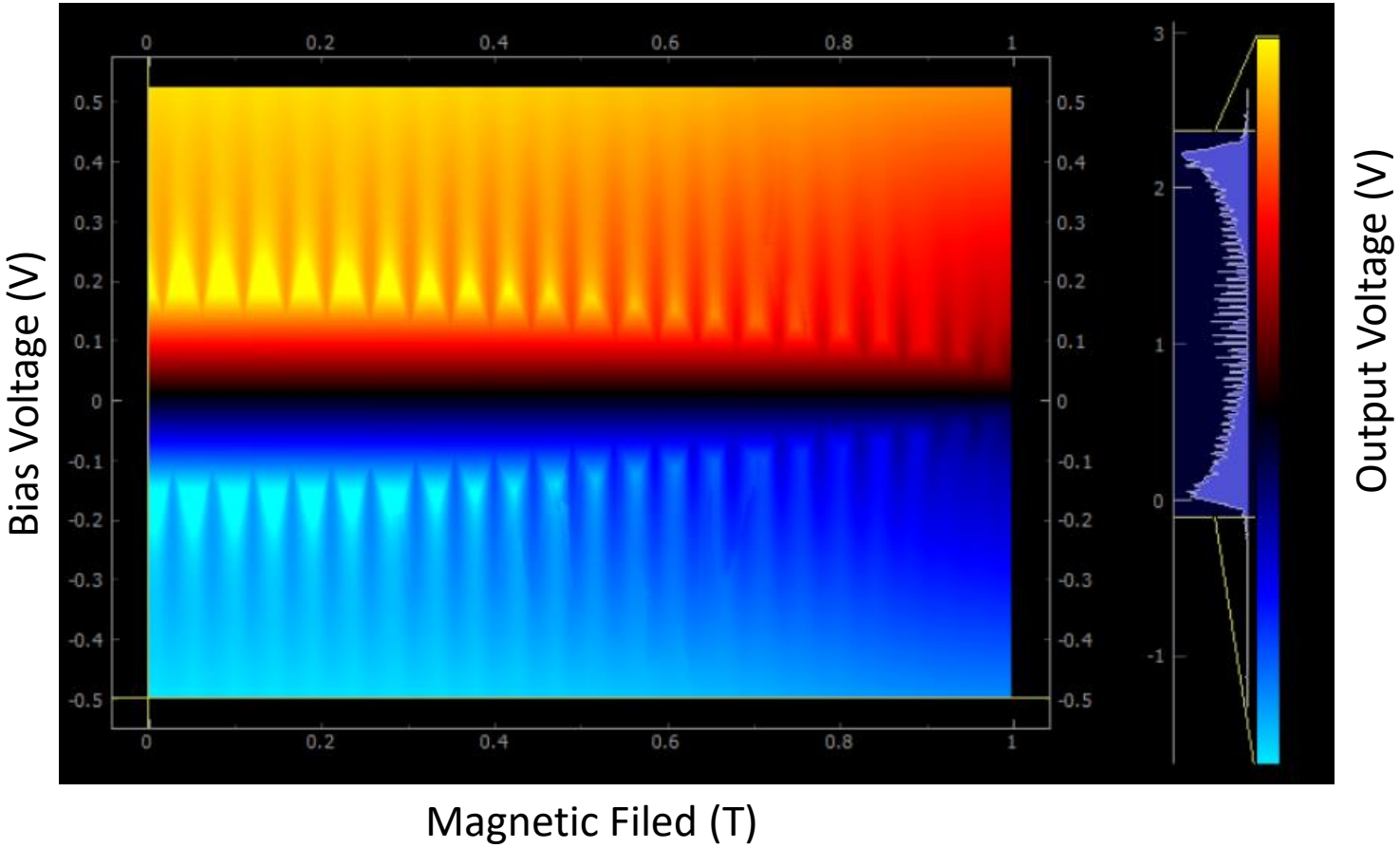


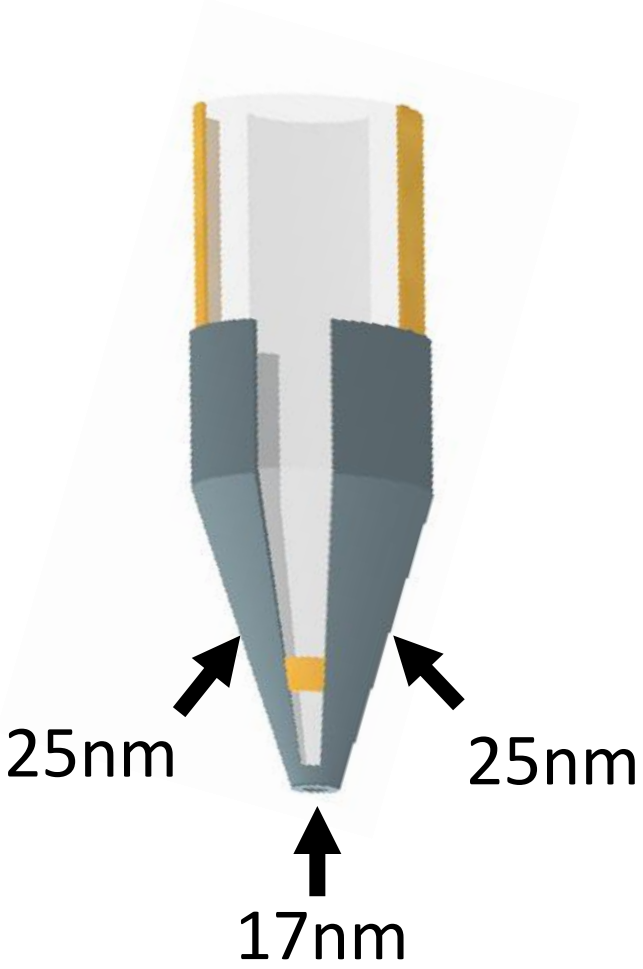
Imaging of Ferromagnetic QR Code



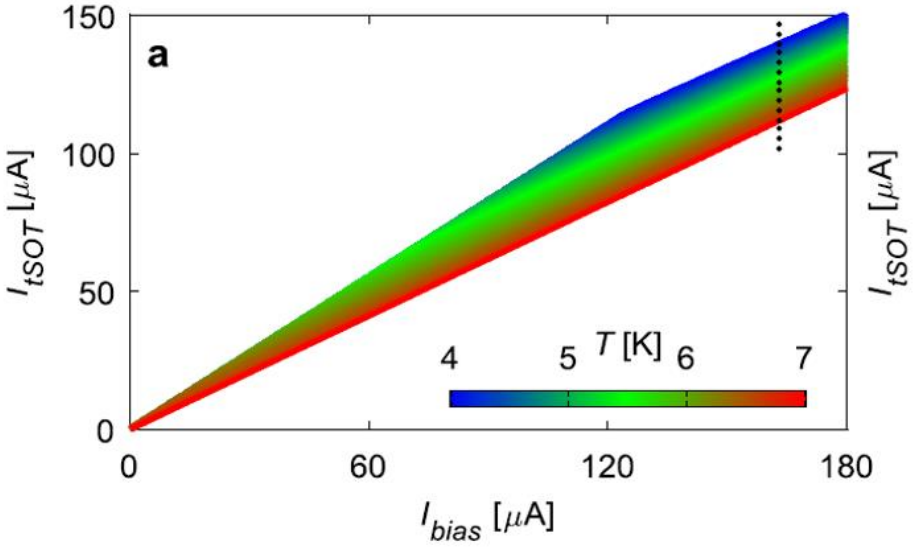


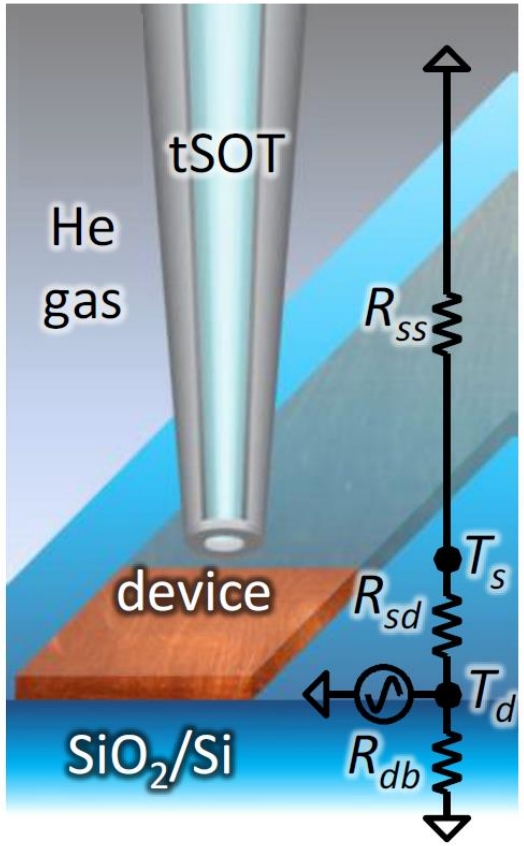
Operative Under High Ambient Field

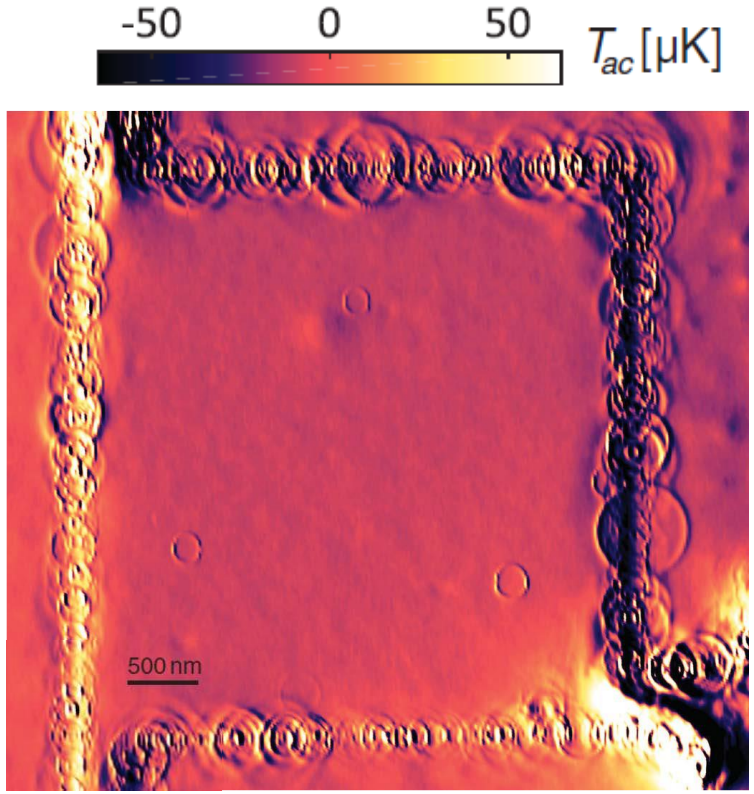




Thermal Imaging



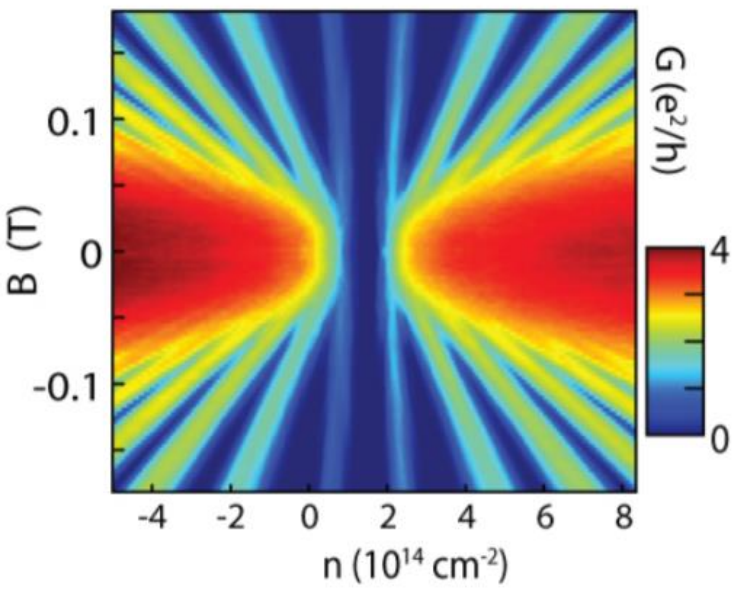




D. Halbertal et al., Science 358.1303 (2017)

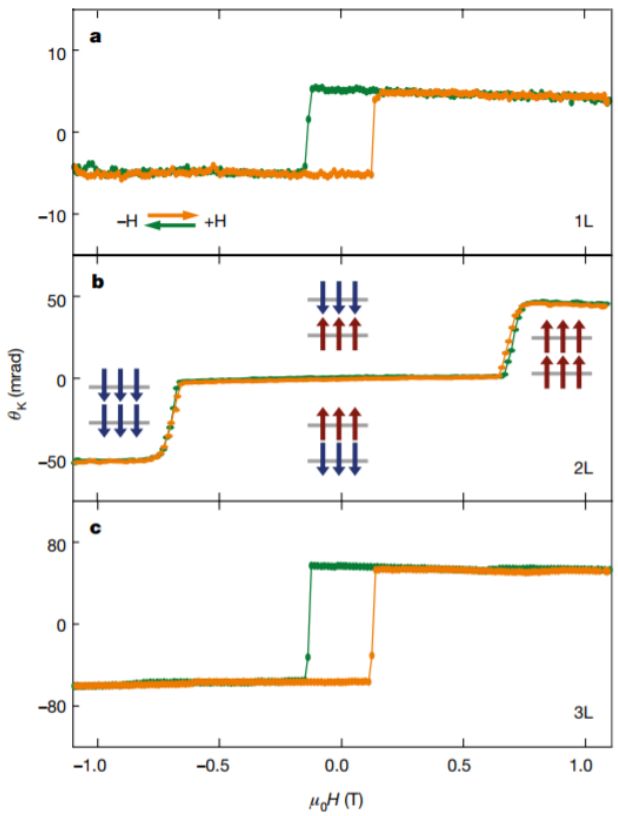
Next on the list

Integer Quantum Hall



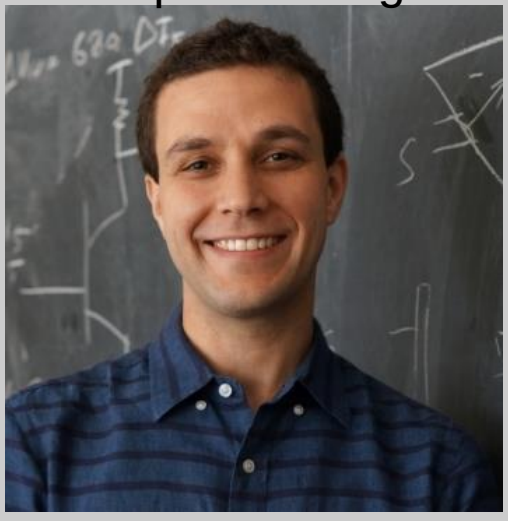
H. Polshyn et al., Preprints (2018)

CrI3 AFM/FM Transition



B. Huang et al., Nature 22391 (2017)

Principal Investigator



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