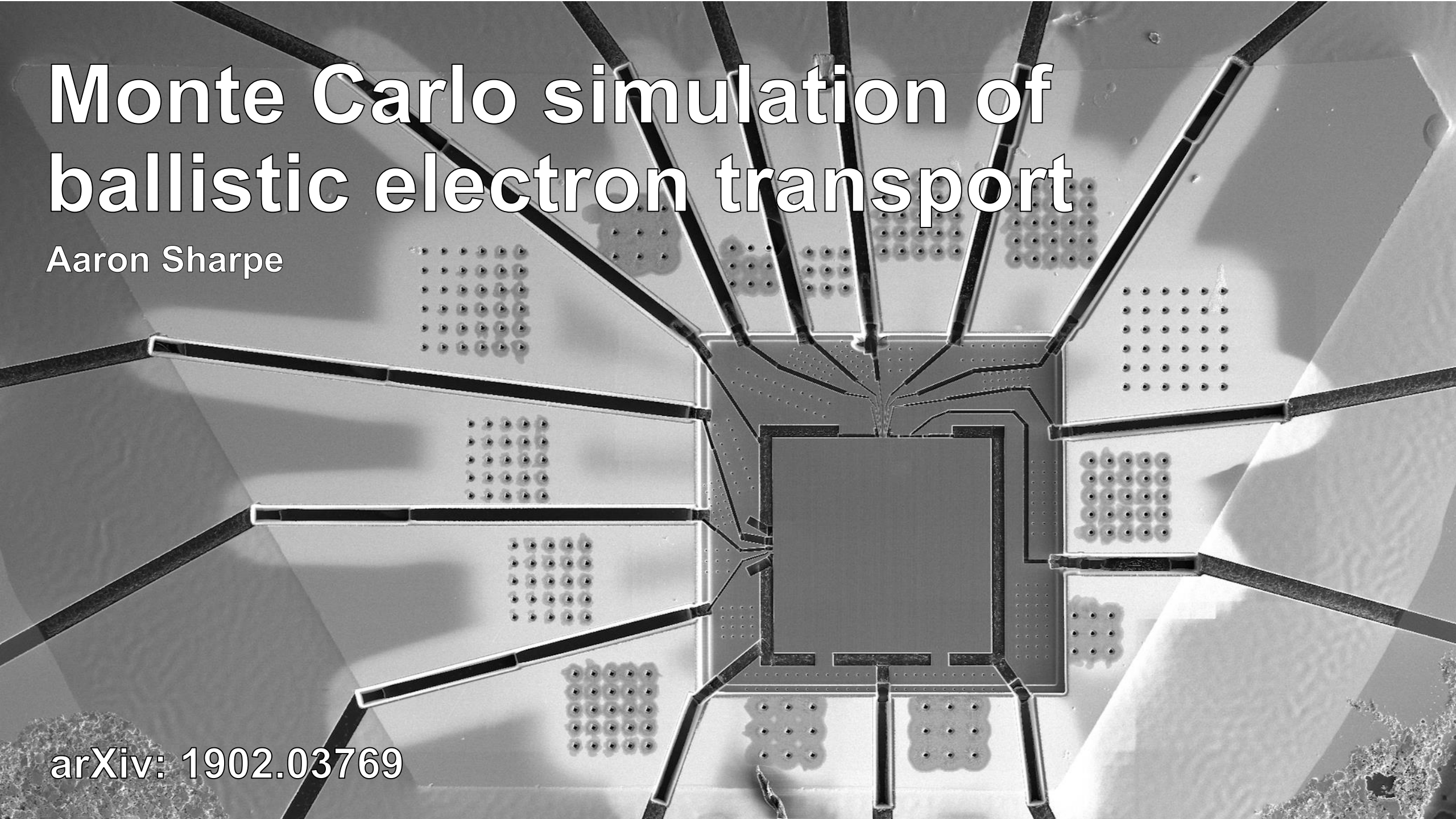# Monte Carlo simulation of ballistic electron transport
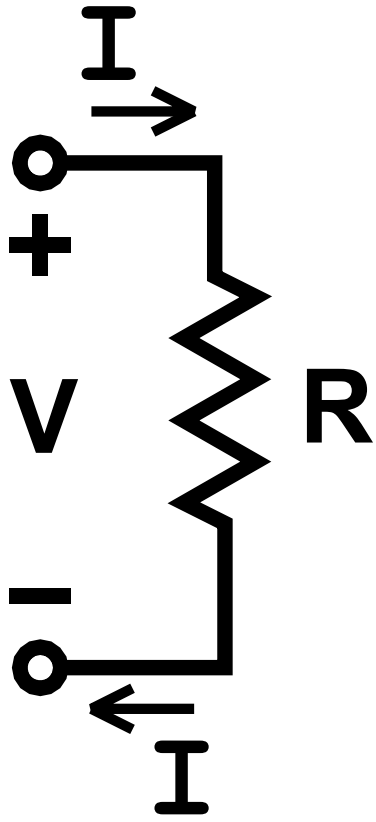
Aaron Sharpe

arXiv: 1902.03769
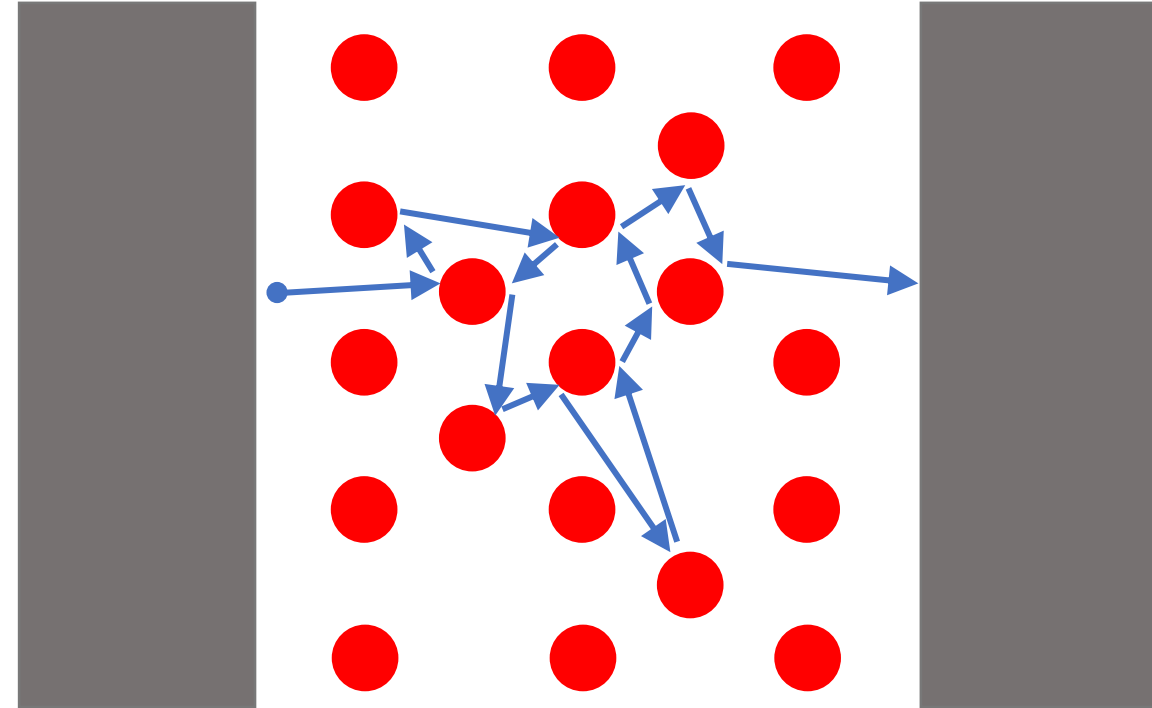
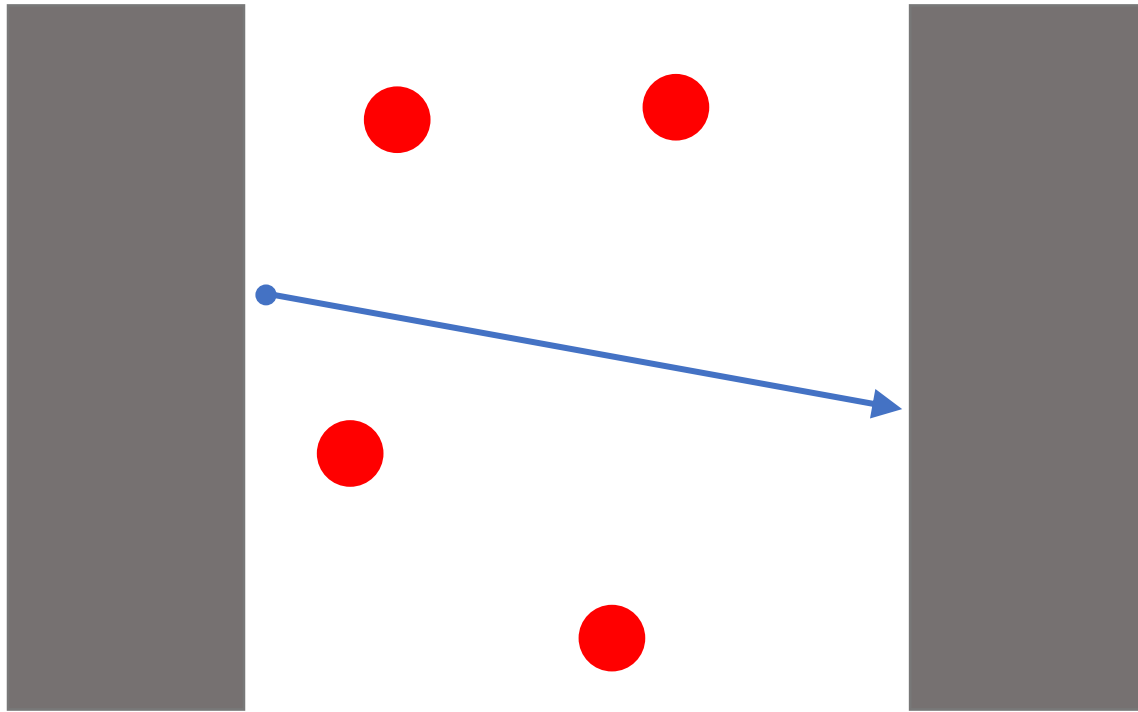# Diffusive Transport
Typical for most materials

$$V = IR$$
$$\mathbf{E} = \rho\mathbf{J}$$

Ballistic Transport
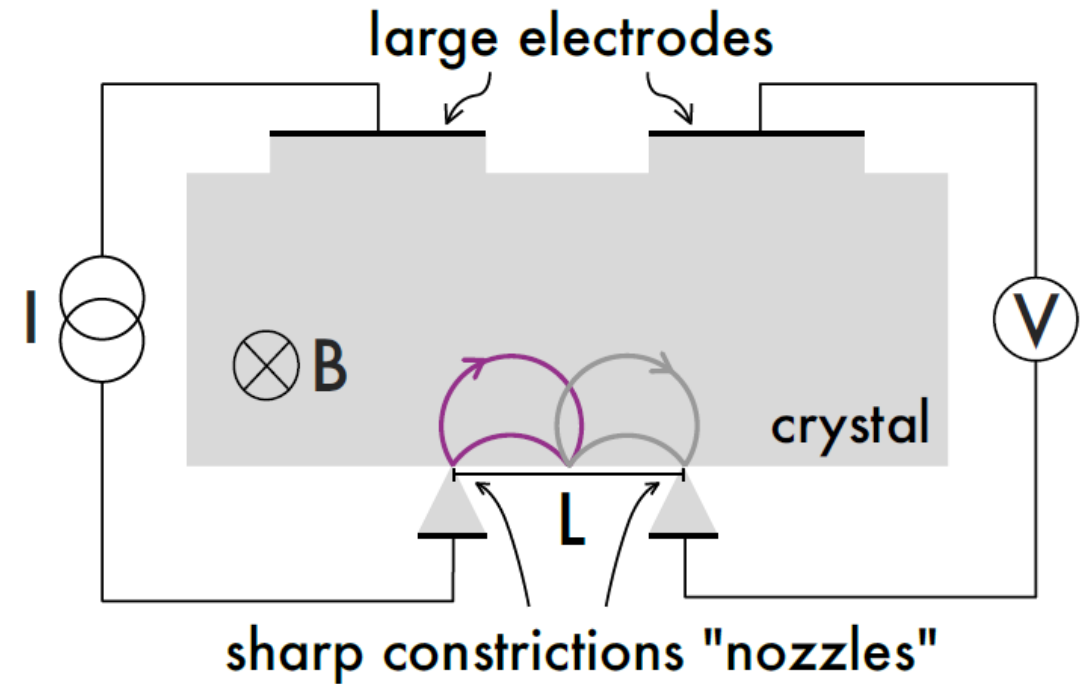Requires extremely clean materials
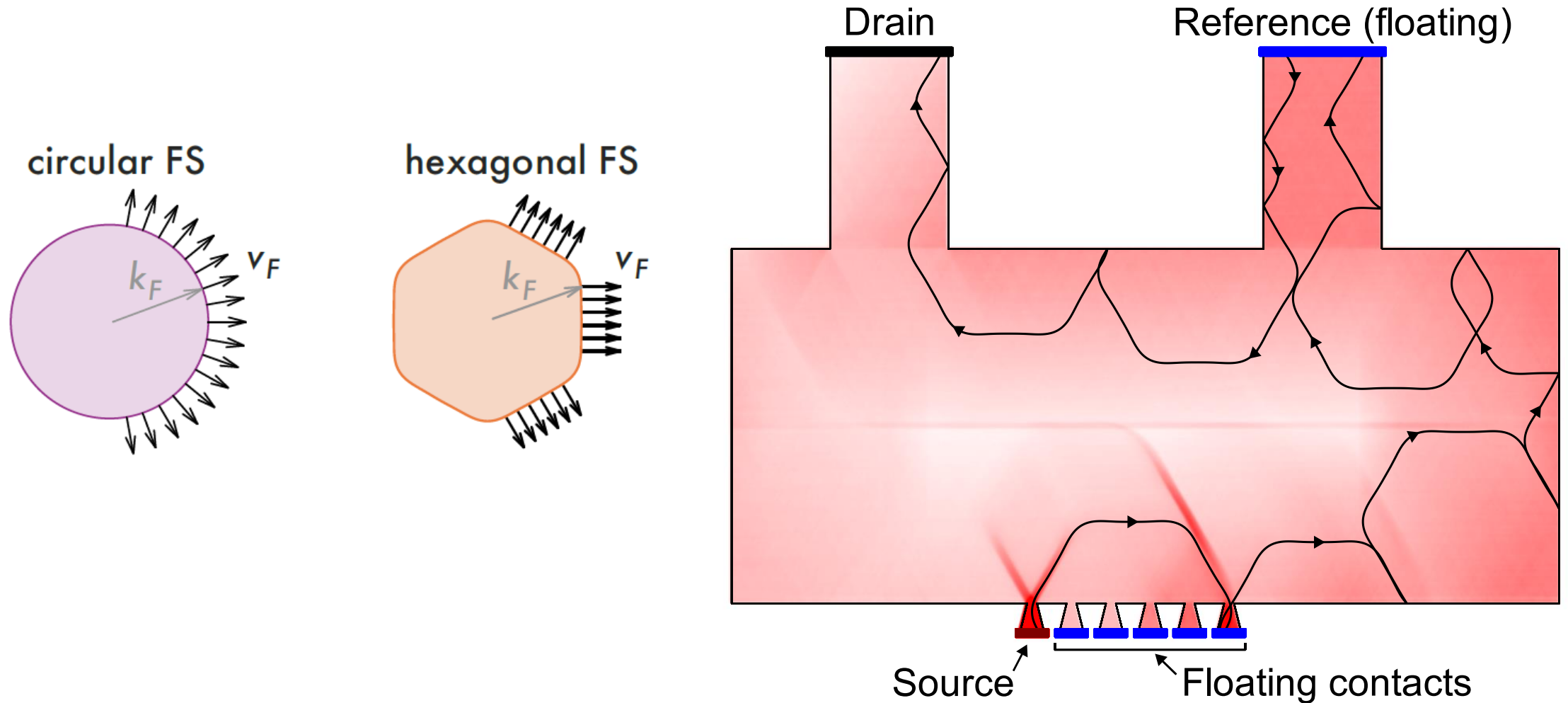
$$\mathbf{F} = q\mathbf{v} \times \mathbf{B}$$

large electrodes

crystal

$\otimes$ B
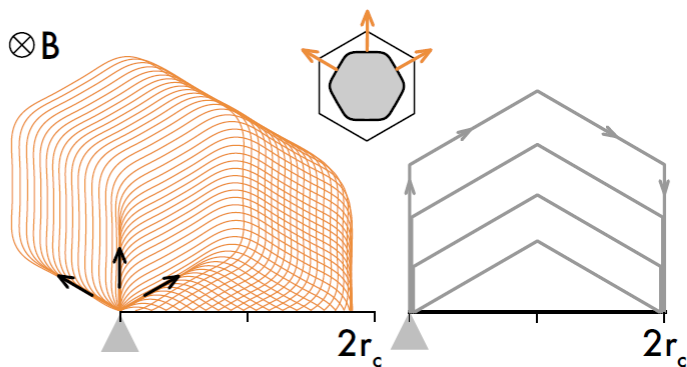
L

sharp constrictions "nozzles"

Different Rules for Crystals

Electrons are restricted to the bandstructure

circular FS

k_F v_F

hexagonal FS

k_F v_F

Drain

Reference (floating)

Source

Floating contacts

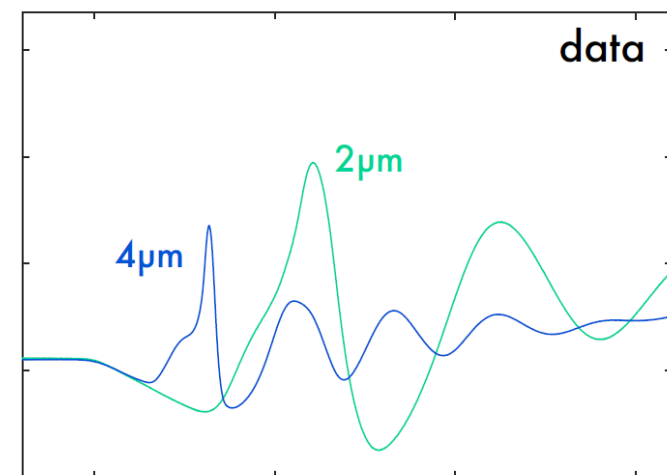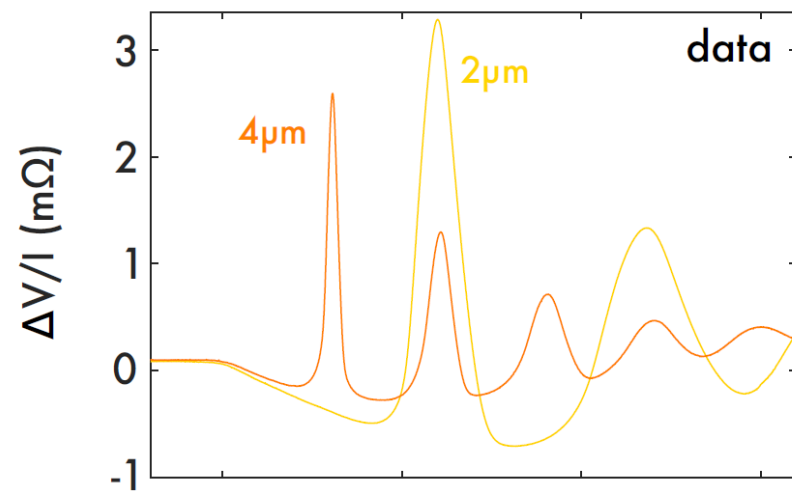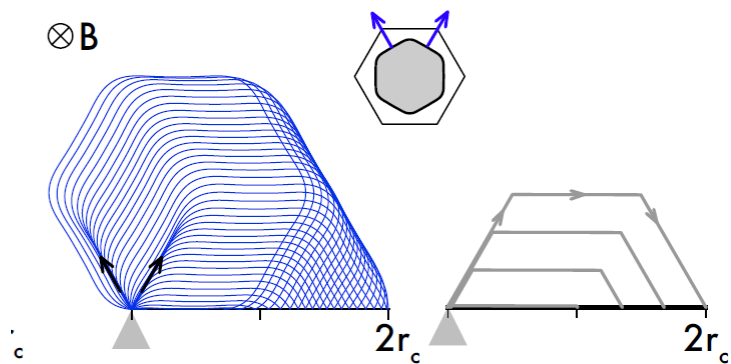# Comparison To experiment
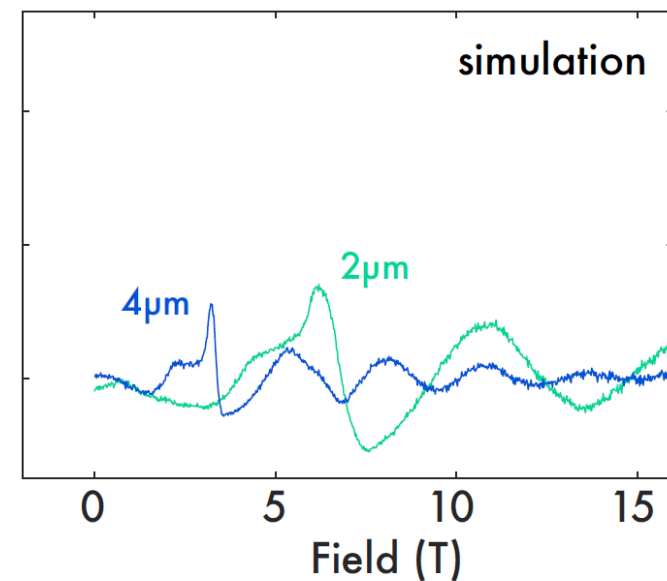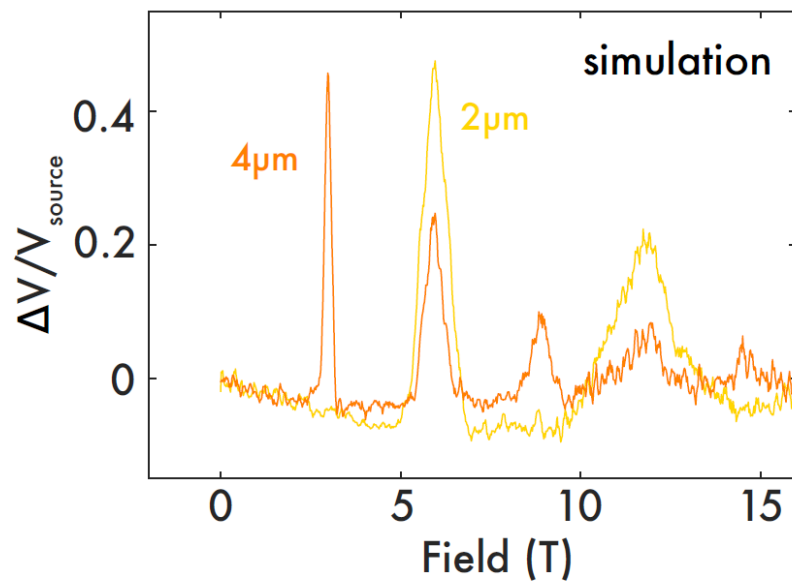
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arXiv: 1902.03769
github.com/dgglab/ballistic_montecarlo (under construction)

Questions?

Drain   Reference (floating)

Source   Floating contacts

B

$\Delta V/I$ (mΩ)

data

4μm   2μm

data

4μm   2μm

$\Delta V/V_{source}$

simulation

4μm   2μm

simulation

4μm   2μm

Field (T)   Field (T)