

Electron Beam Lithography for Quantum Devices in Silicon

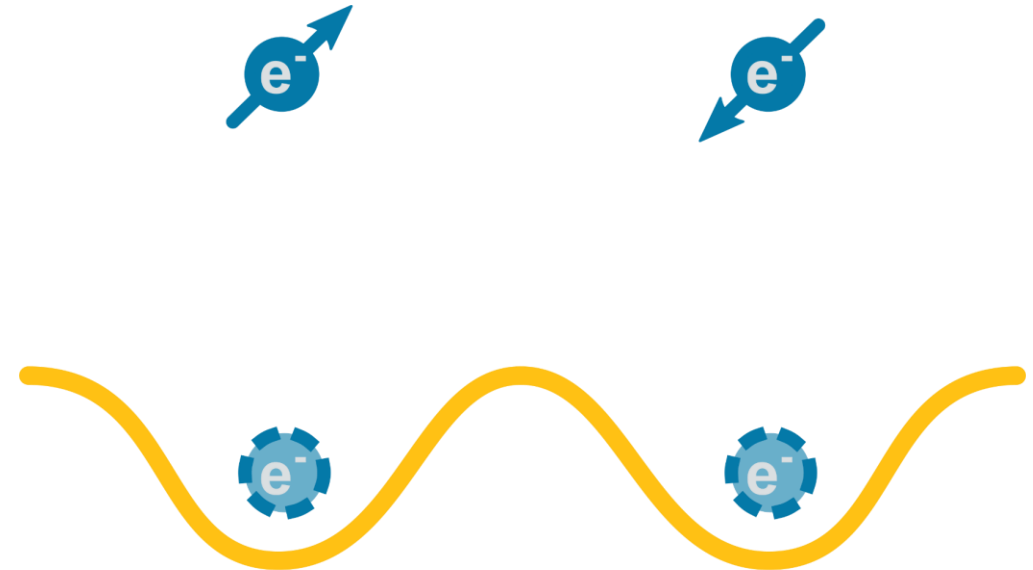
Evan MacQuarrie
Eriksson Group
Department of Physics
University of Wisconsin - Madison





Quantum Computing with Electrons

- Computing with both phase and amplitude of information
 - Flashlight versus laser light
 - Requires access to fragile quantum states
- Spin Qubits
 - Spin up / spin down
 - Long coherence times
- Charge Qubits
 - On the left / on the right
 - Fast operations

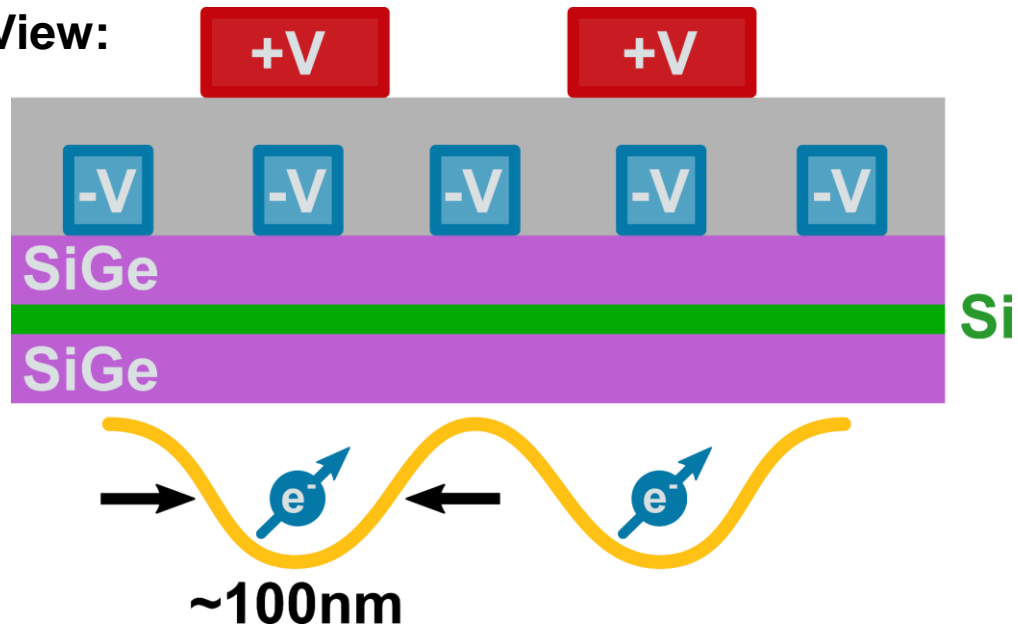




Trapping Electrons in Silicon

- Electrodes create electric field landscape
 - Trap and control electrons
 - Access quantum information

Side View:



Top-Down View:

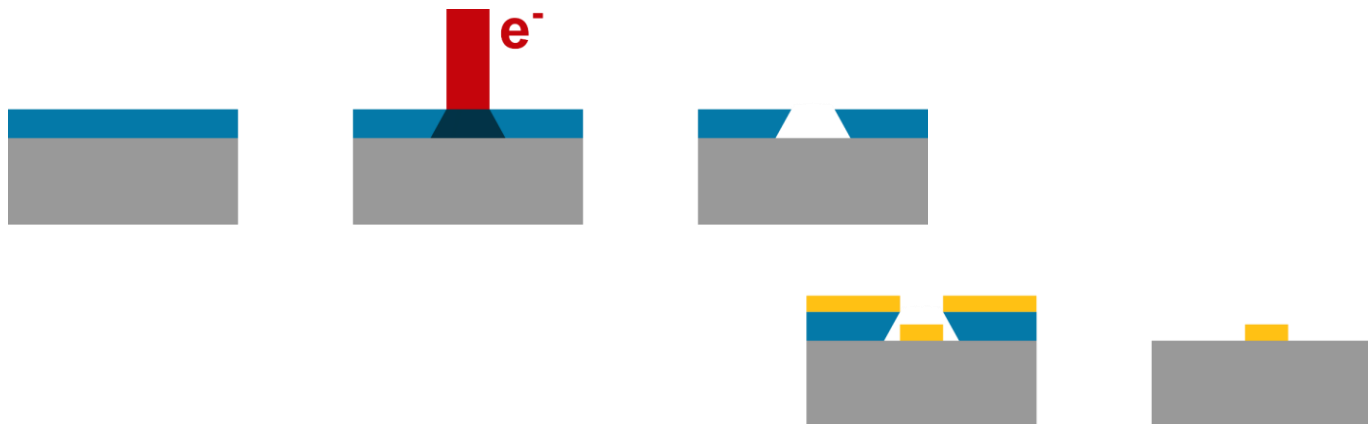


Challenge: Electrons are small!



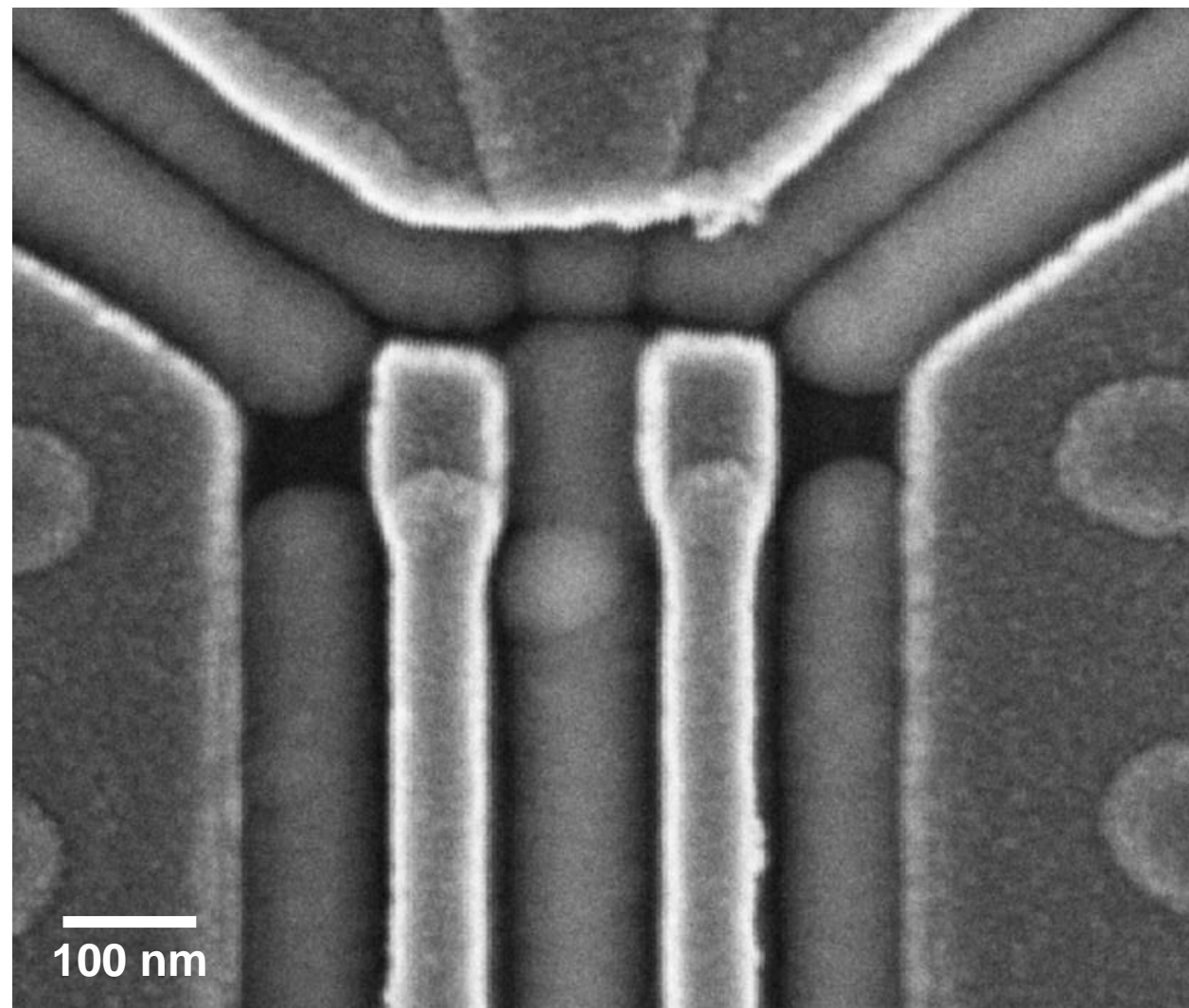
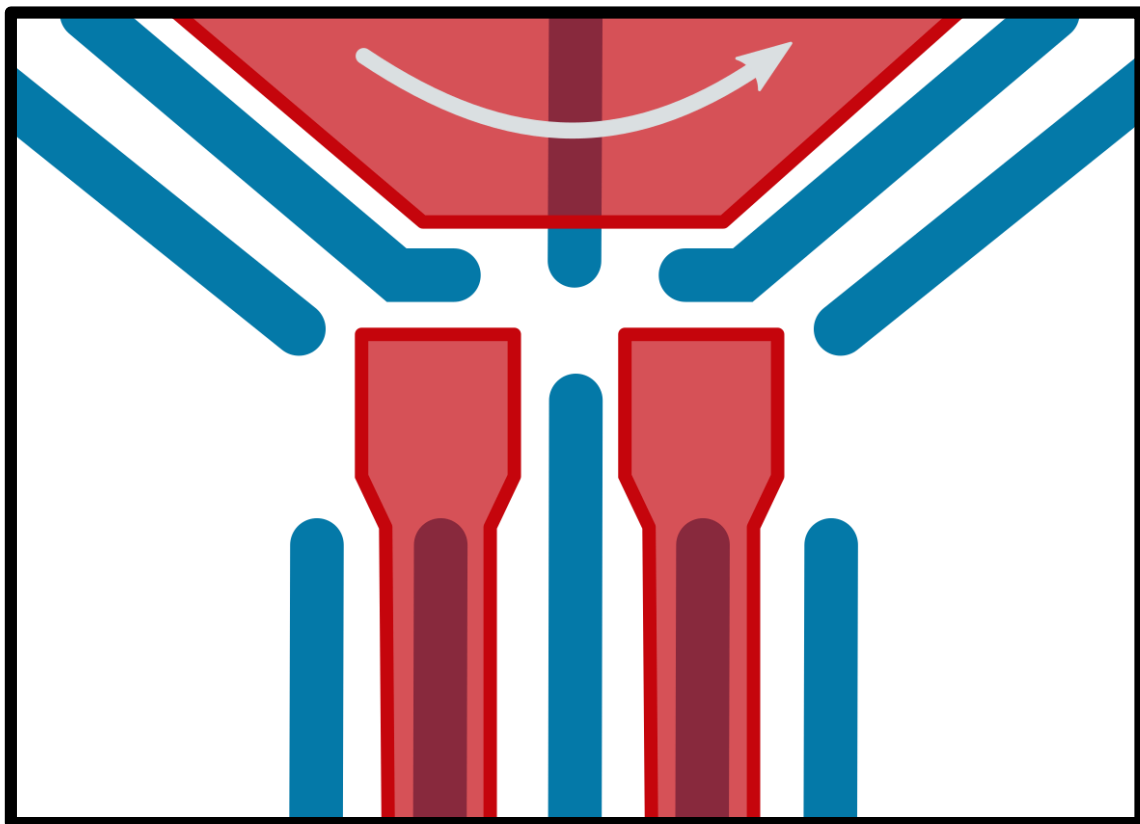
Electron Beam Lithography

- Nanoscale electrodes require nanoscale device patterning
- Elionix ELS-G100 E-writer
 - High speed, high yield processing
 - Chips and wafers
 - Happy grad students and postdocs
- Lift-off processing of patterned resists



Dots in Madison

“It just works”
“Fab is solved”
“10/10”



Thanks!
