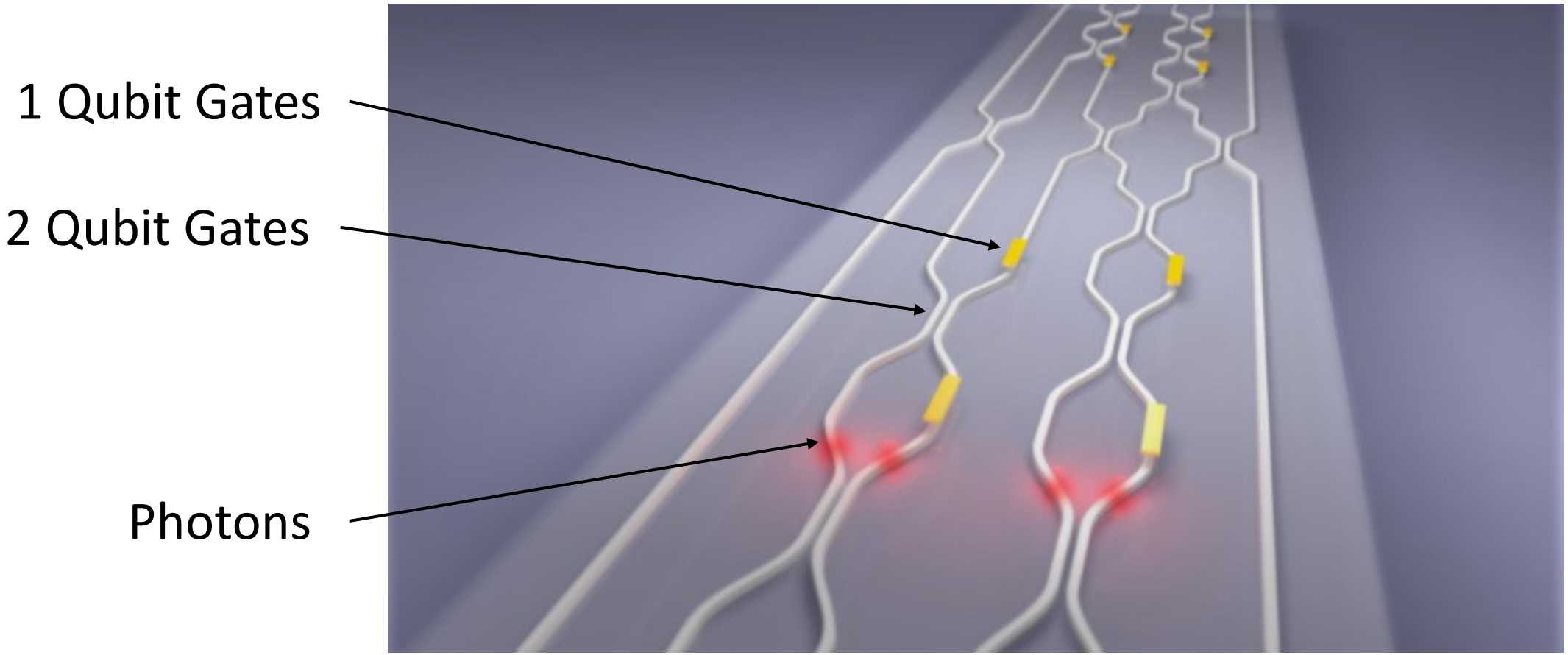
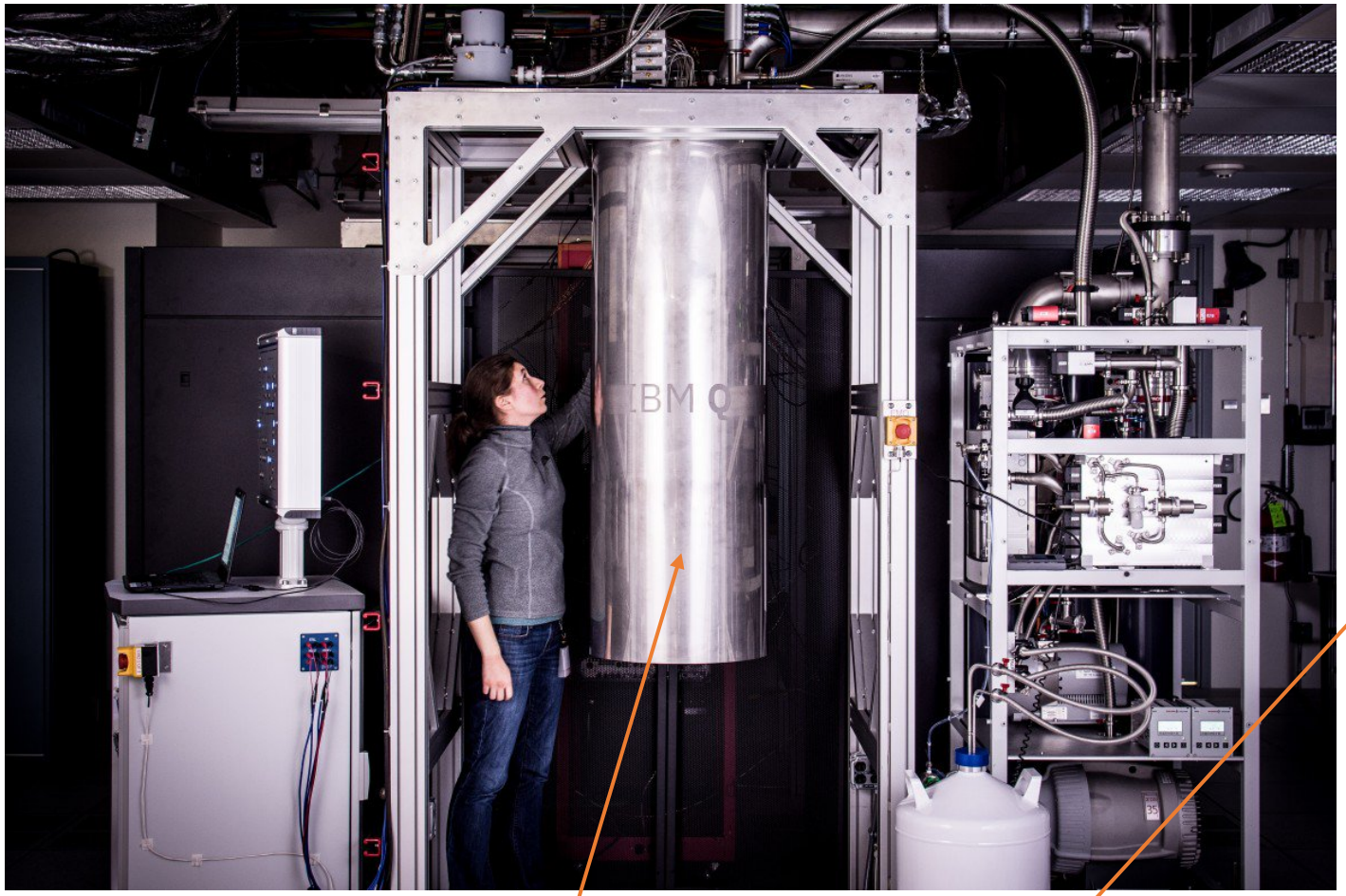
Quantum Computing: Hardware

Photonic Quantum Computing



Superconducting Qubits: IBM



Dilution Refrigerator (T < 1 K inside)

Photo Credit: MIT Tech Review

Superconducting Qubits: IBM

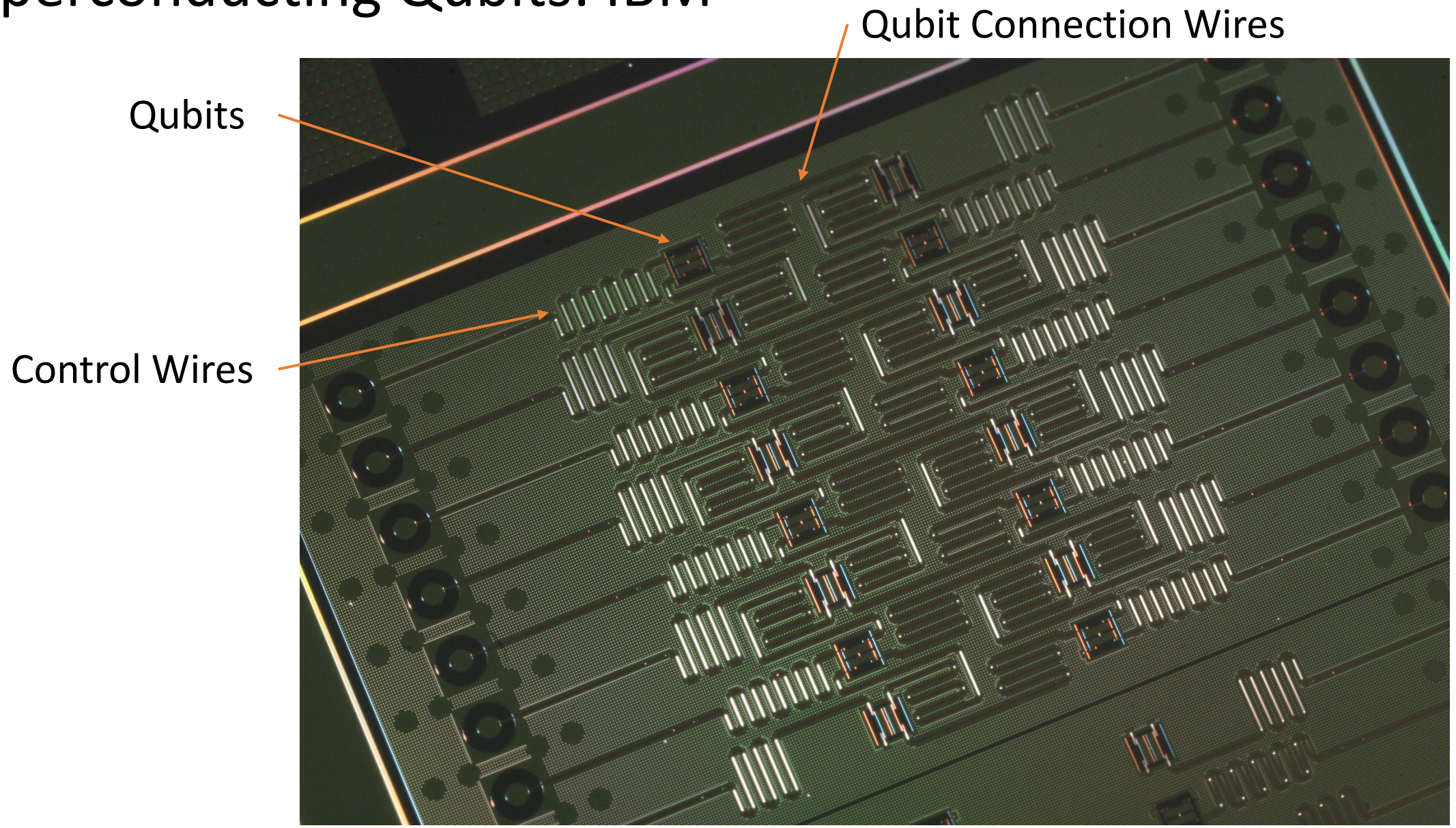
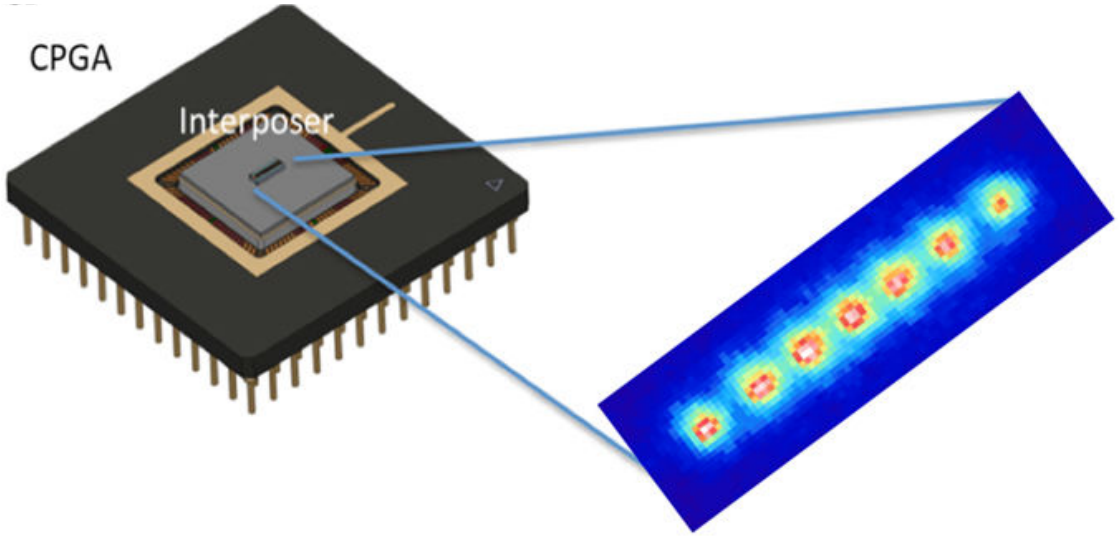
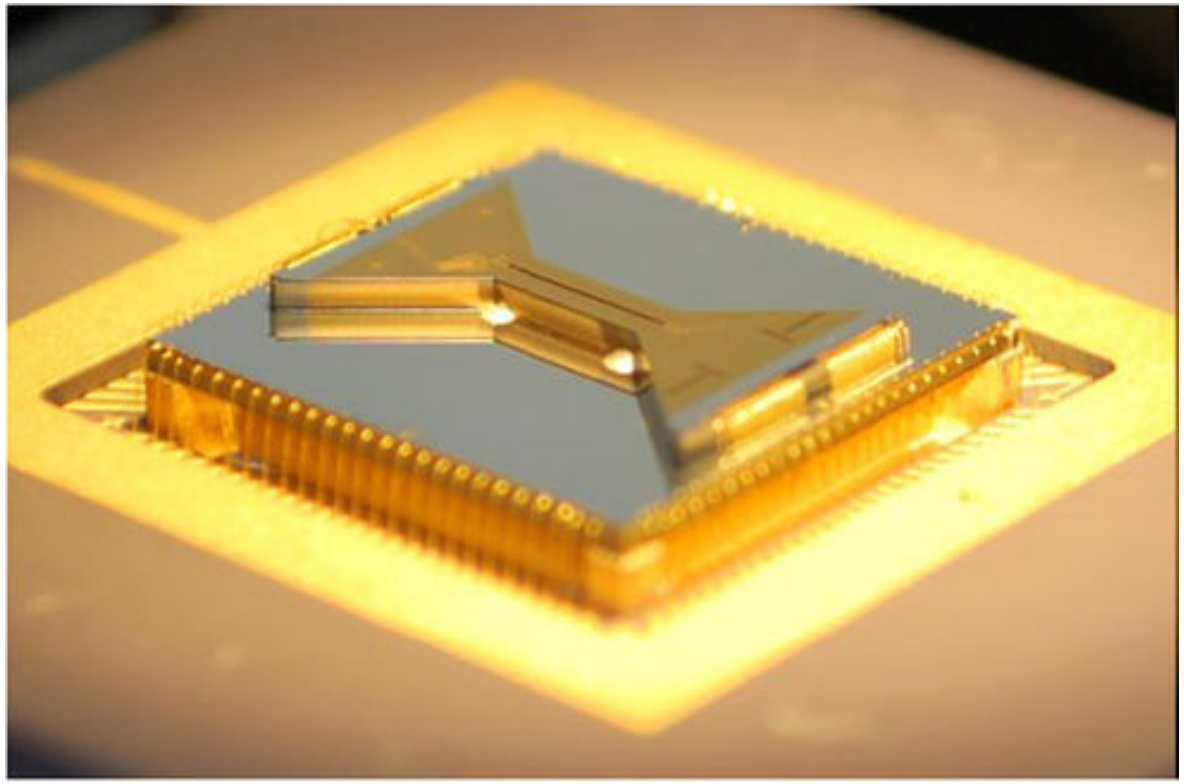


Photo Credit: MIT Tech Review

Ion Trap Hardware



Levitated Ion String



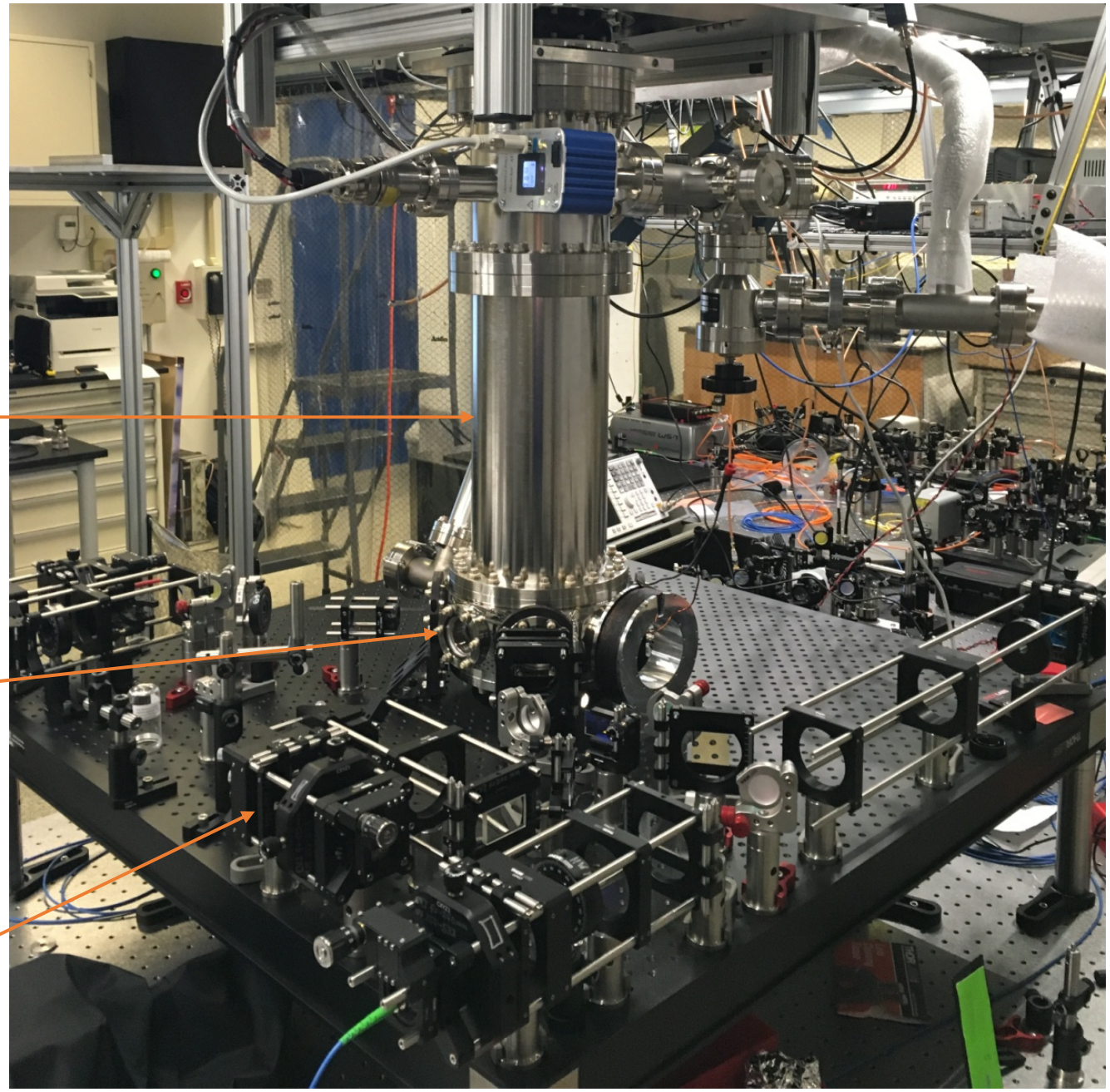
“High Optical Access”: HOA 2 Trap
Sandia National Labs

Ion Trap Hardware

Ultrahigh-Vacuum Chamber

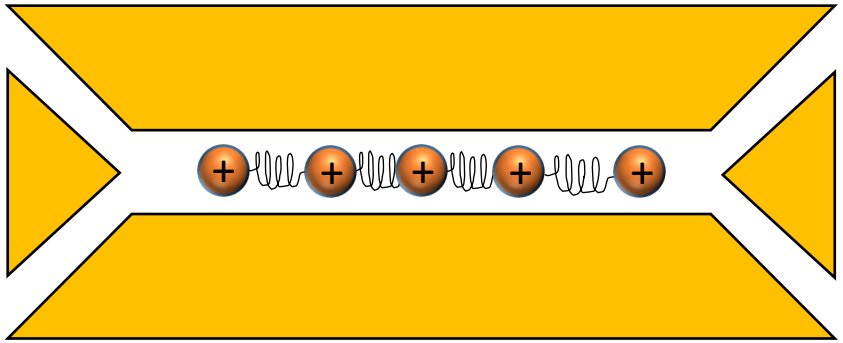
Windows

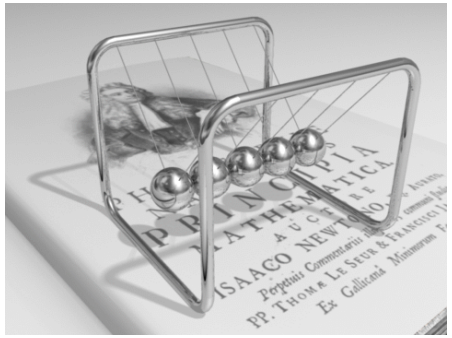
Optics for delivering laser light



Linear Chains of Ions

Artist's Rendition of a Trapped Ion Quantum Computer





Newton's Cradle

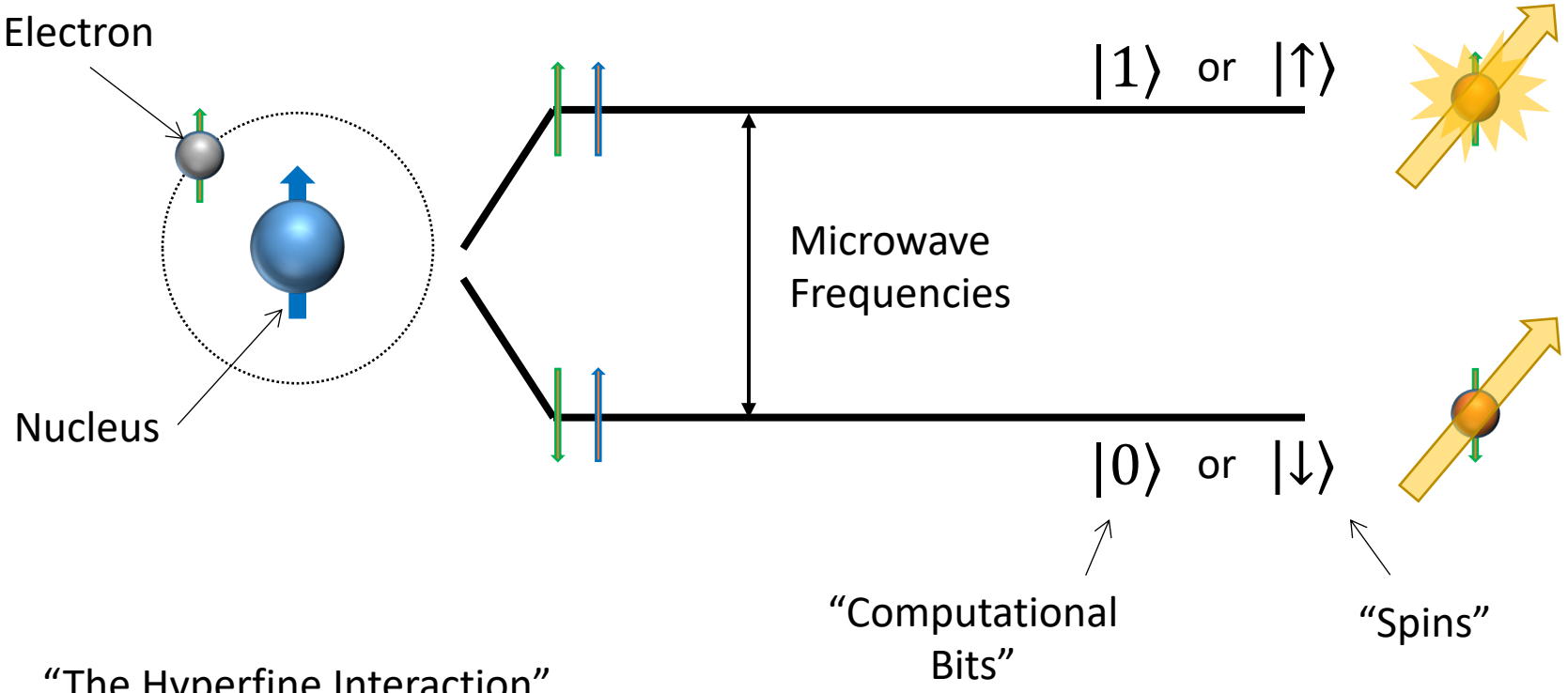
<u>Trapped Ion Motional Modes</u>

Center of Mass $\omega_{com} = \omega_a$

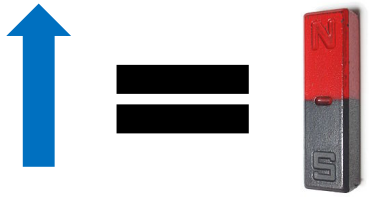
Breathing $\omega_{brth} = \sqrt{3}\,\omega_a$

Photo Credit: Scientific American

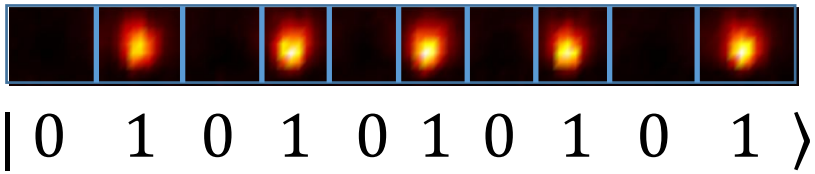
Atomic Qubits



“The Hyperfine Interaction”
Interacting Bar Magnets

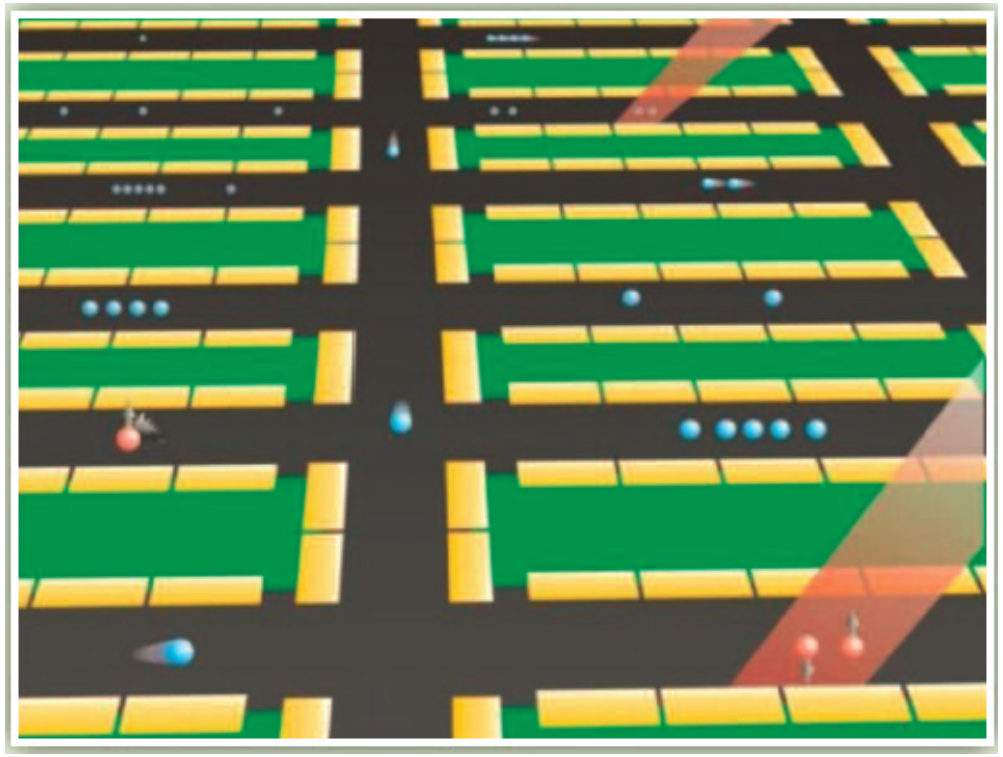


A trapped ion quantum state measurement



A Moveable Qubit

"Quantum CCD" Ion QI Processor

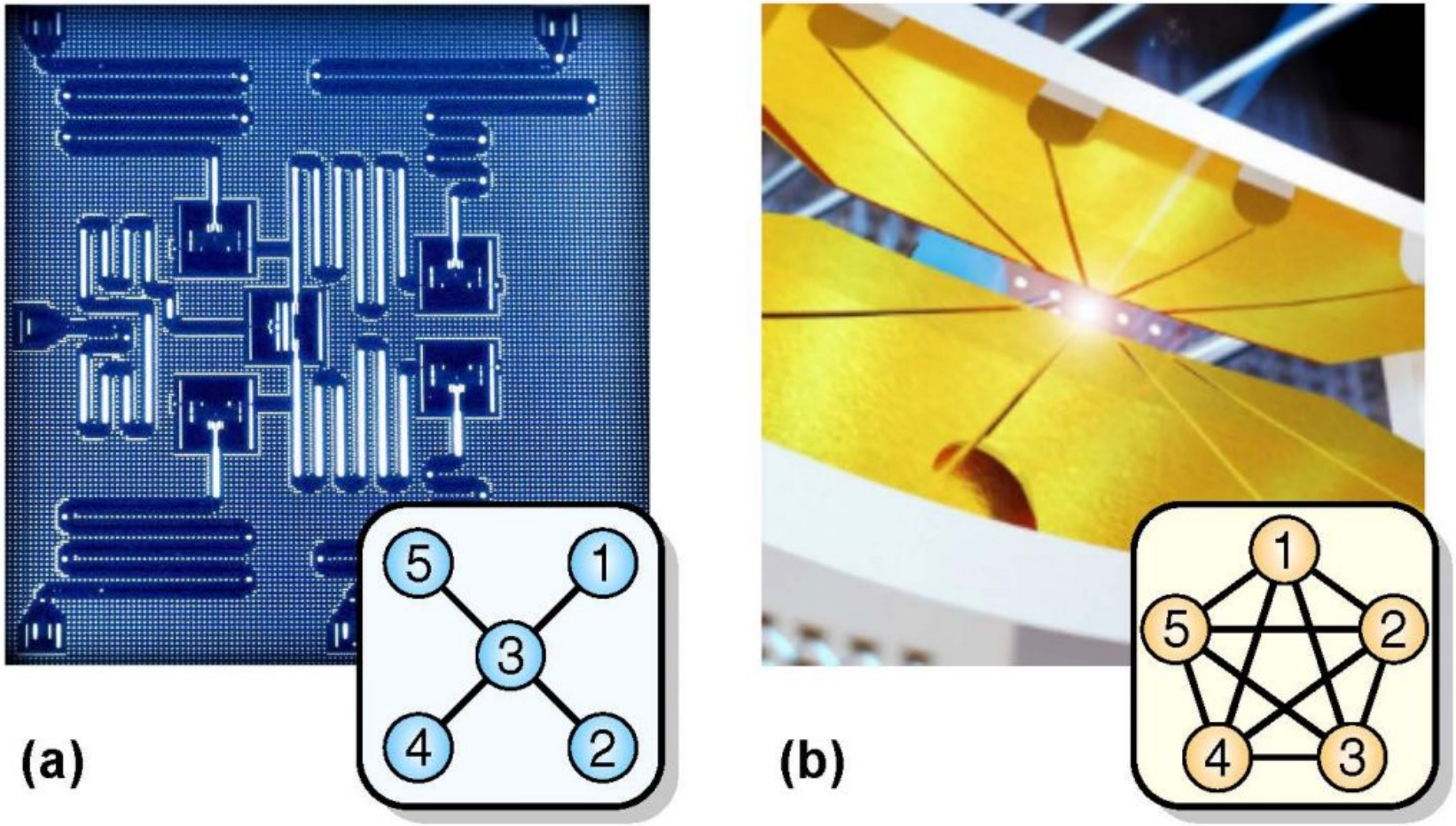


- NIST Ion Storage group

Shuttling in a surface trap

- GTRI QS group

Wiring Matters:
Superconductors vs. Trapped Ions



Experimental Comparison of Two Quantum Computing Architectures," N. M. Linke, et. al. Proceedings of the National Academies of Science 114, 13 (2017).