



## Sandia National Laboratories

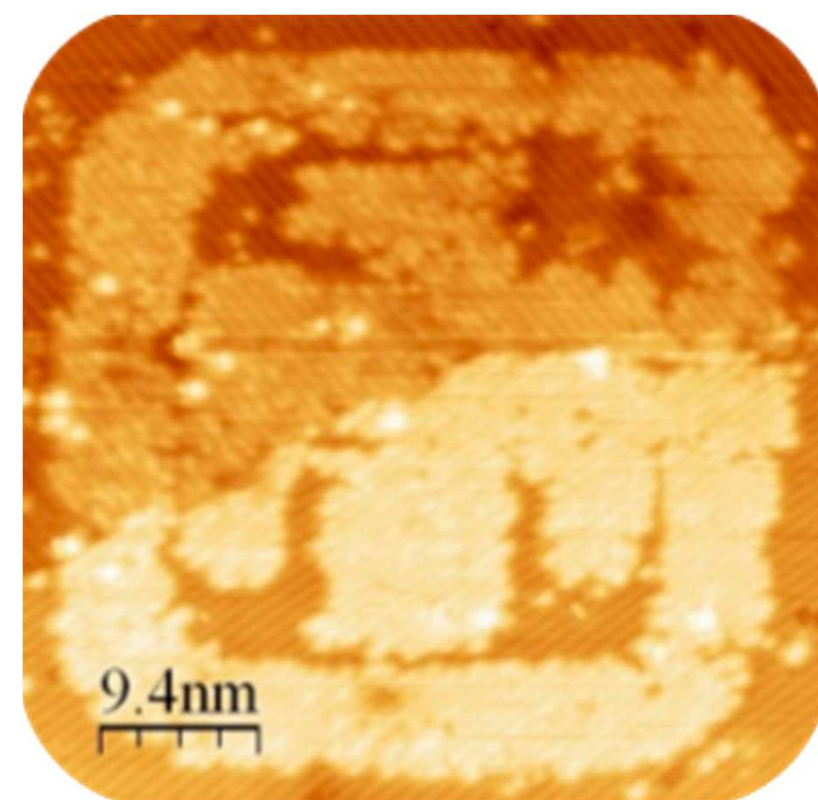
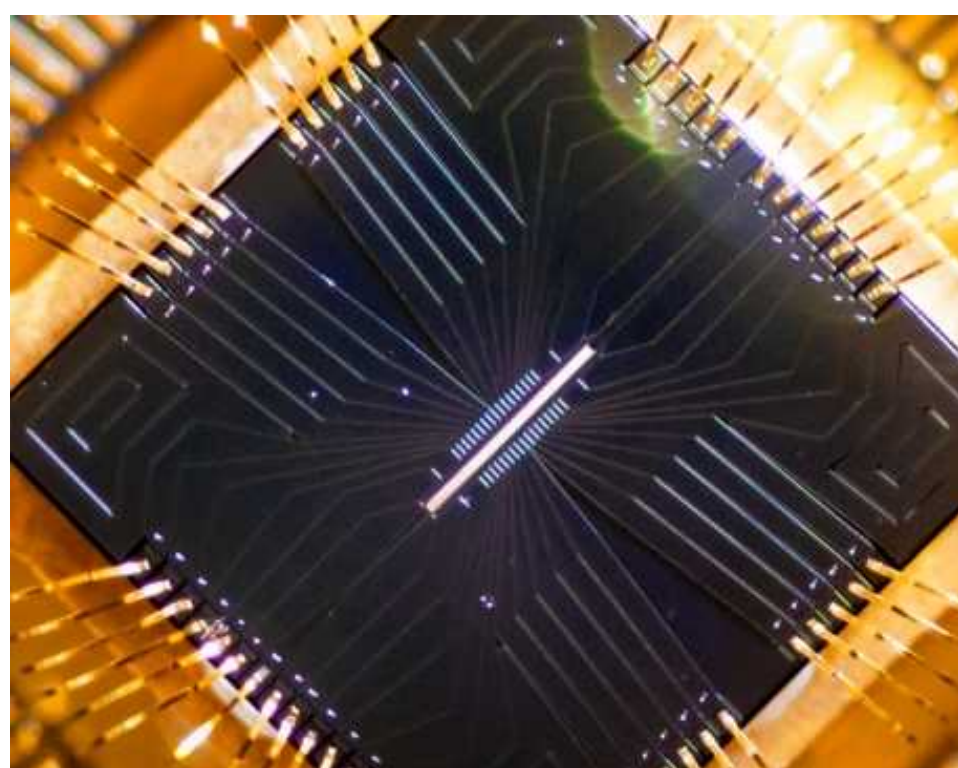
Tzvetan Metodi (PI), R. Muller (PM), R. Blume-Kohout, A. Landahl, M. Carroll, and P. Maunz

## Importance of Quantum

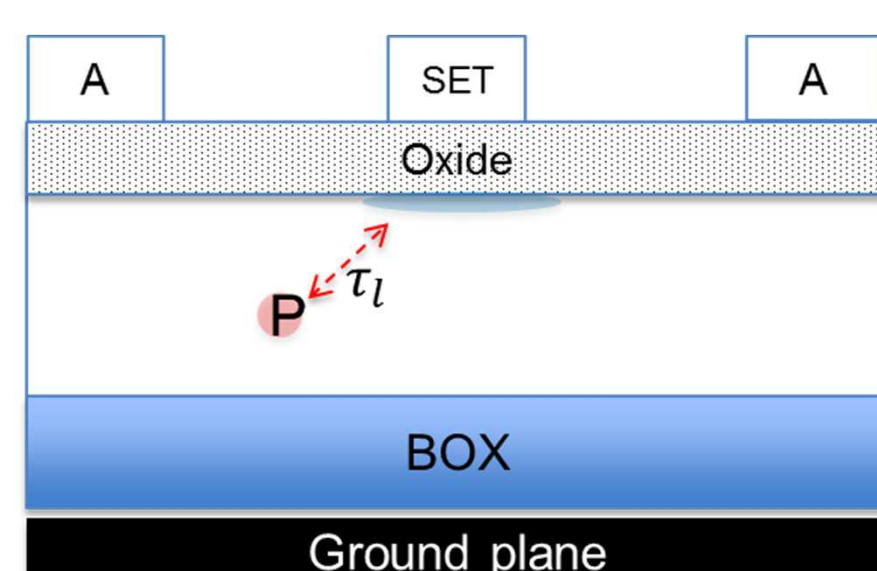
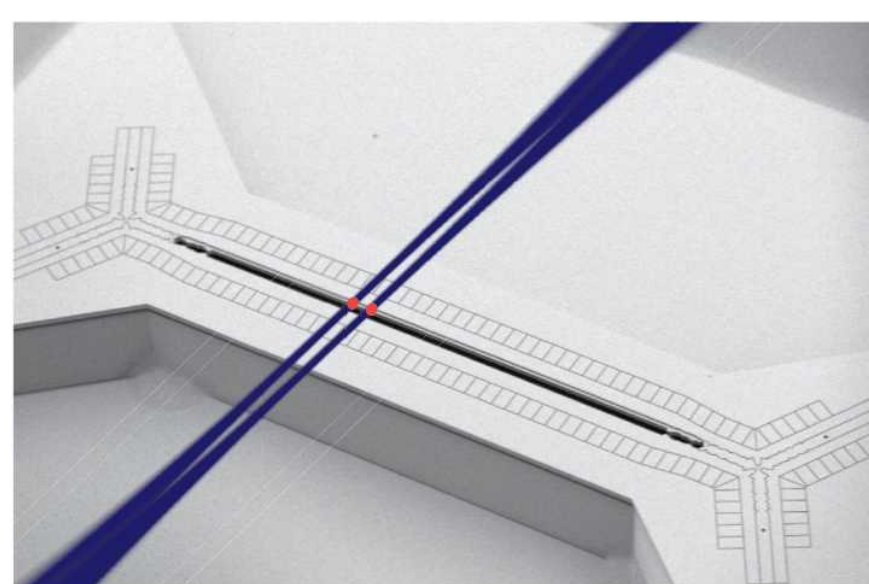
- Information is physical
- Quantum physics is different
- Quantum Information (QI) yields a new set of rules
  - Disruptive, exciting applications!
- QI is fragile and hard to manipulate
  - What **robust, useful, near-term** applications can we find?

## Qubits

- Quantum bits
- What you make quantum information out of.
- Sandia primarily focuses on trapped-ions and silicon qubits:

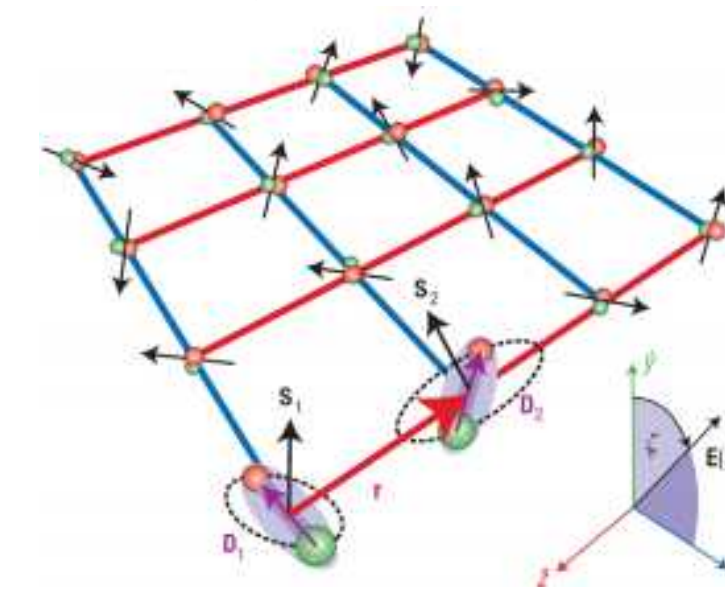


- How can we make these more robust?

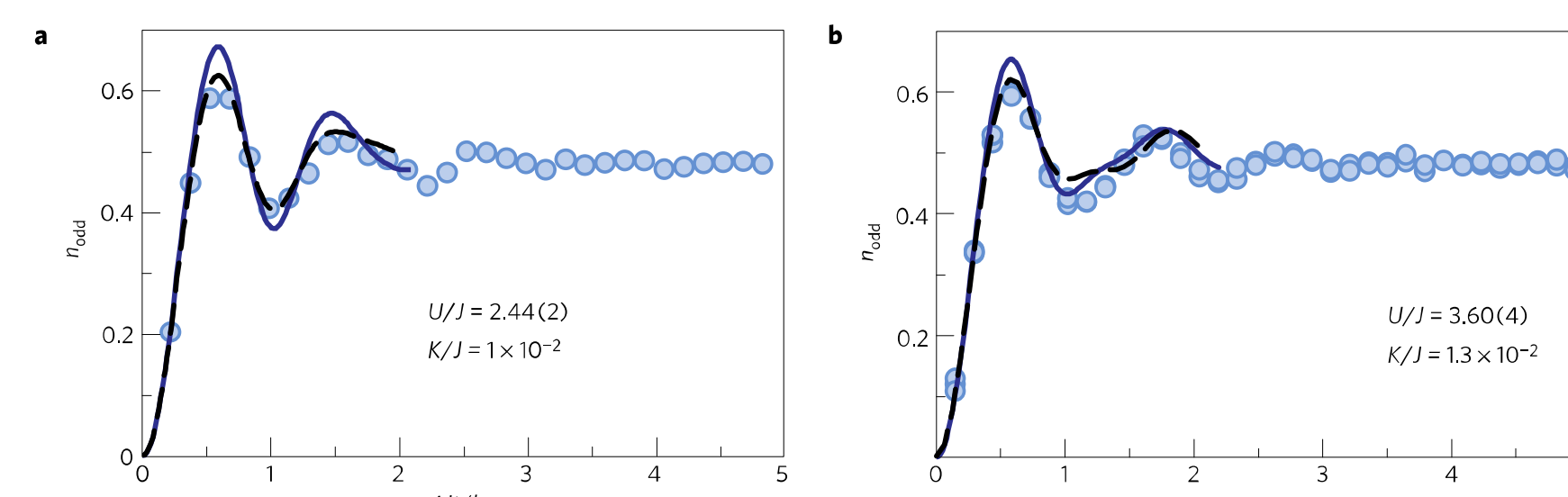


## Quantum Applications

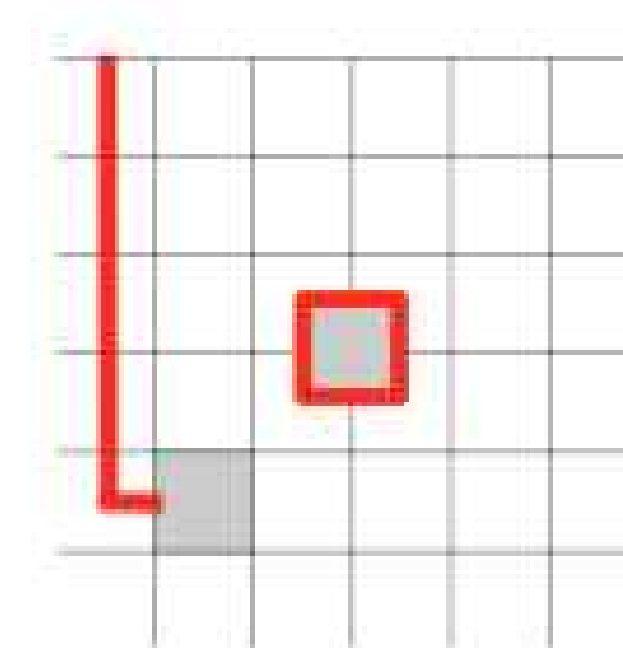
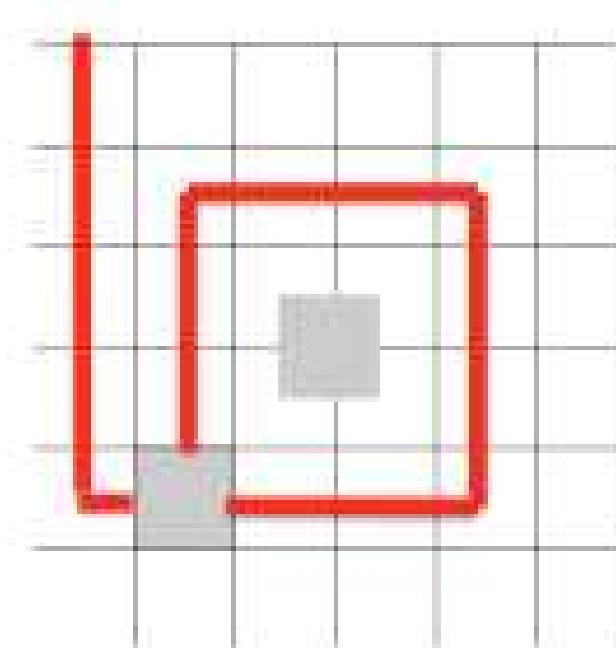
- Potential near-term application of robust quantum information is **Quantum Simulation**:
  - New drugs, superconductors, ...



- Simulate quantum simulation to understand how it works so well



- What other applications can we find?
- What makes an operation robust? Study “topological operations”



## Goals of Project

- Discover practical, near-term applications of QI
- Improve physical qubits and devices
- Identify algorithms robust to error
- Combine robust devices with algorithms to determine unique applications for national security