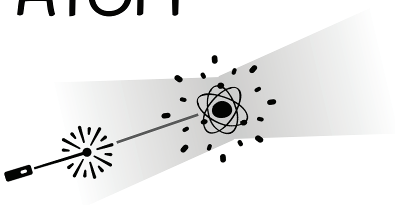
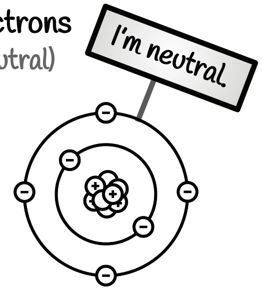
NEUTRAL ATOM QUANTUM COMPUTERS

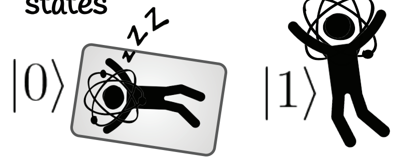


NEUTRAL ATOMS

- Have equal numbers of protons & electrons (electrically neutral)



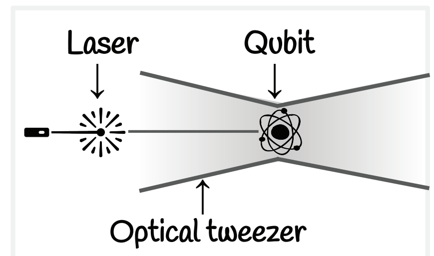
- Can be in different energy states



"TRAPPING" QUBITS

To be useful as a qubit, a single atom must be caught and held in place.

To do this:
- lasers cool & slow the atoms
- optical tweezers hold them in place



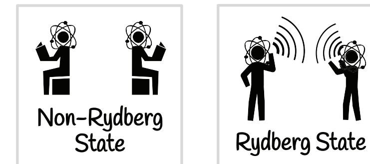
QUANTUM GATES

Single qubit gates

Lasers and microwaves are used to change the energy state of a qubit.

Multi-qubit gates are tricky!

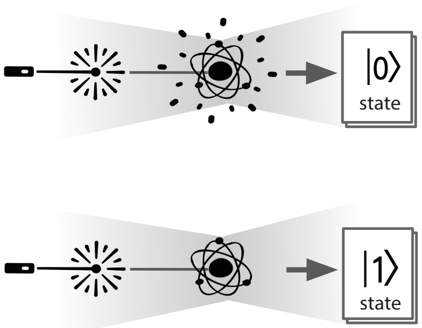
Normally, neutral atoms do not interact with one another when spaced apart.



Exciting a qubit to a high-energy "Rydberg state" allows the qubit to interact with (affect the state of) a nearby qubit

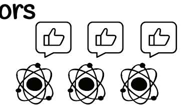
MEASUREMENT

Qubits are measured with lasers
- Qubits in the 0 state emit light
- Qubits in the 1 state do not

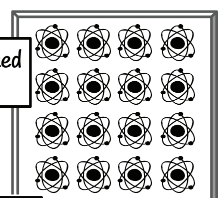


ADVANTAGES

1. Stable! — Able to hold a quantum state for a relatively long period of time
2. No manufacturing errors — Naturally occurring – each qubit is the same



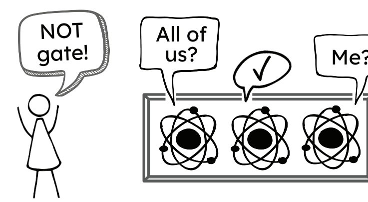
3. Good connectivity — Can be organized into 2D grid



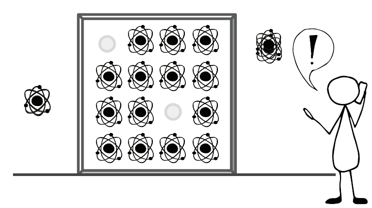
4. Highly Scalable — Can be densely packed and individually controlled

CHALLENGES

1. Individual qubits can be difficult to control



2. Atoms occasionally break free from trap



FIND MORE QUANTUM COMPUTING ZINES HERE:

https://www.epiqc.cs.uchicago.edu/resources/

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