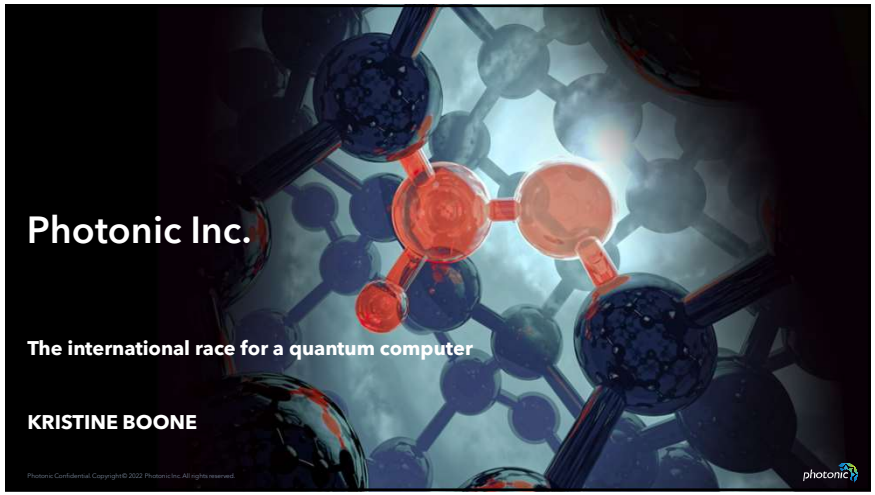
Photonic Inc.
The international race for a quantum computer
KRISTINE BOONE
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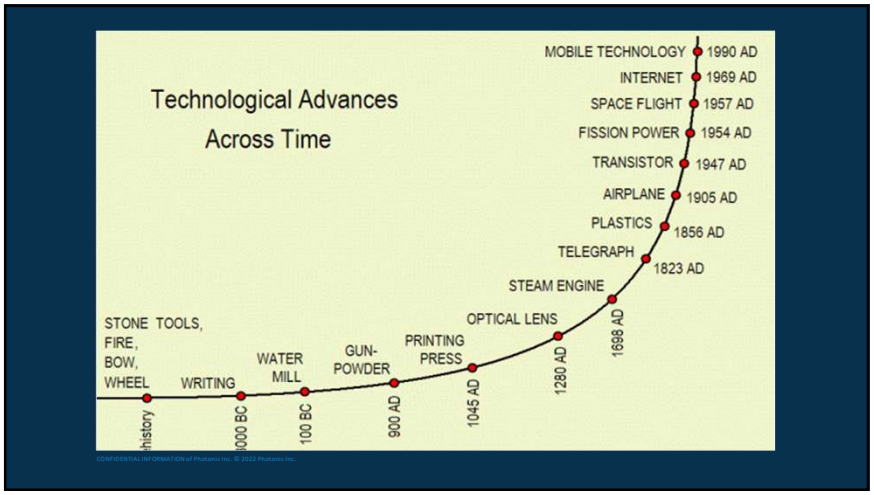
1


Technological Advances
Across Time
MOBILE TECHNOLOGY 1990 AD
INTERNET 1969 AD
SPACE FLIGHT 1957 AD
FISSION POWER 1954 AD
TRANSISTOR 1947 AD
AIRPLANE 1905 AD
PLASTICS 1856 AD
TELEGRAPH 1823 AD
STEAM ENGINE
OPTICAL LENS
1698 AD
1280 AD
PRINTING PRESS
1045 AD
GUN-POWDER
900 AD
WATER MILL
100 BC
WRITING
1000 BC
STONE TOOLS, FIRE, BOW, WHEEL
history
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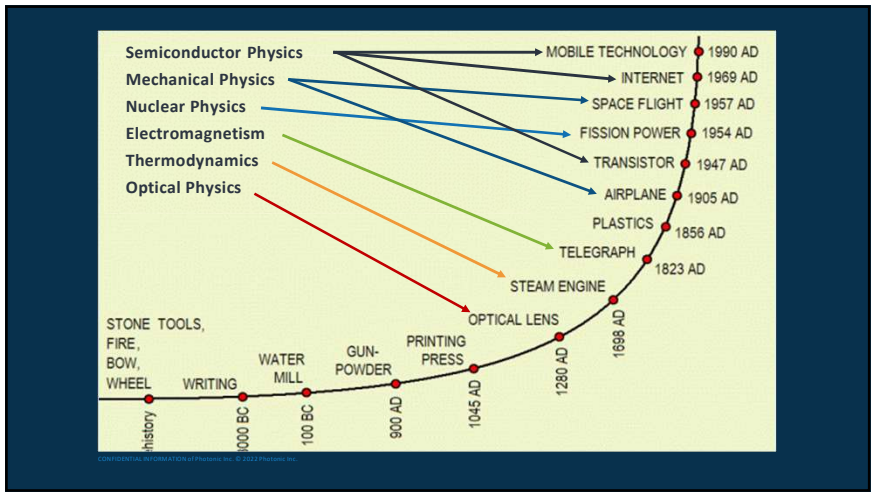
Semiconductor Physics
Mechanical Physics
Nuclear Physics
Electromagnetism
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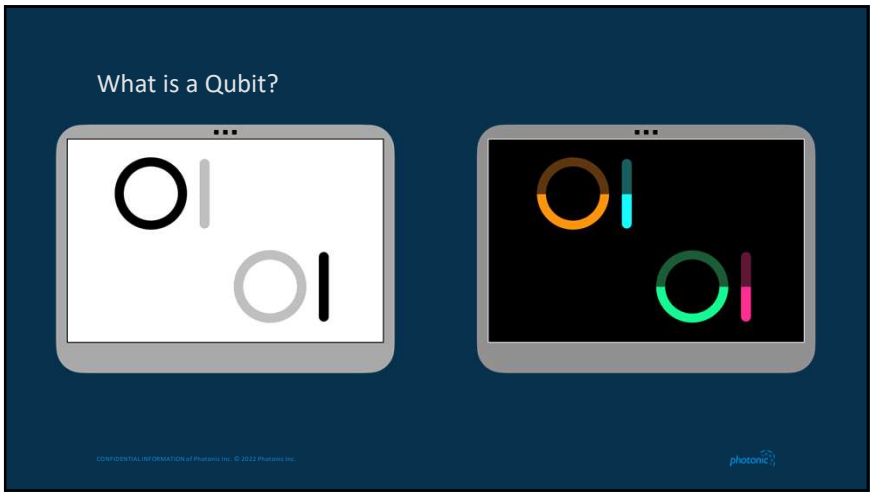
What is a Qubit?
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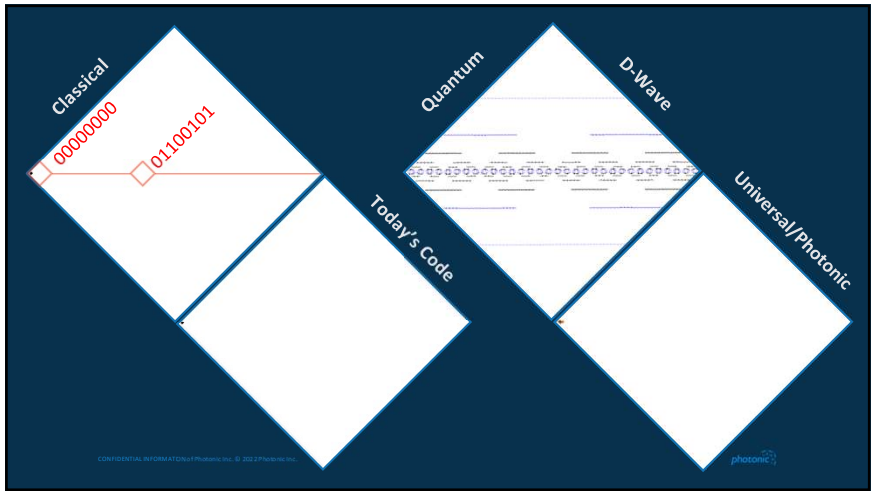


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## Key Known Applications

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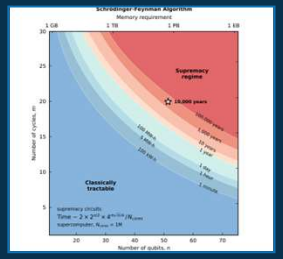
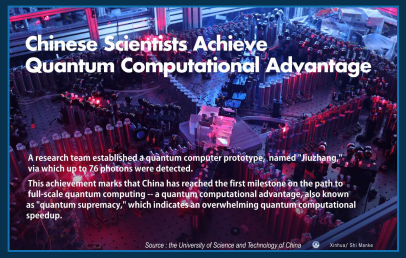
## Quantum “supremacy”, “advantage”

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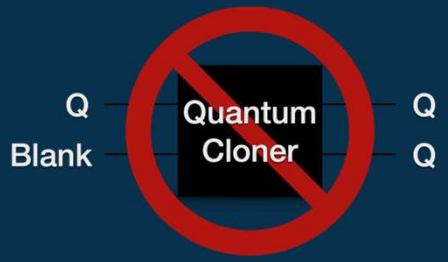
## What Quantum Computers Will Not Do

(AT LEAST NOT STRAIGHT AWAY)

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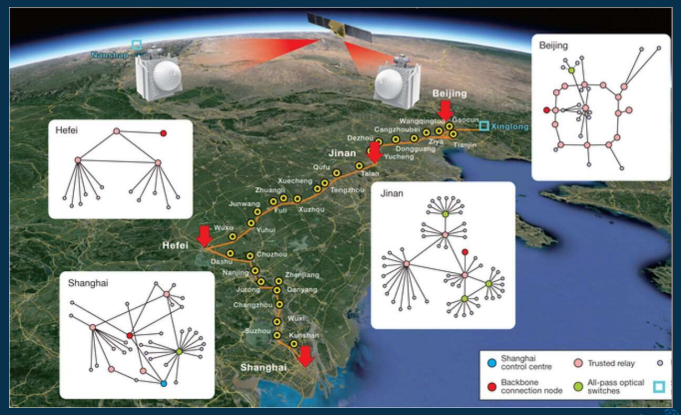


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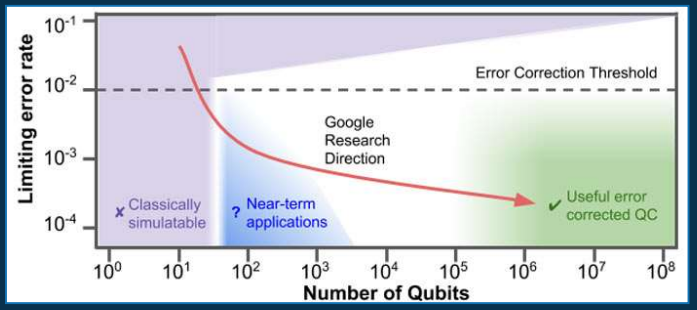
## The Quantum Error Correction Challenge

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## Quantum computing: hardware

| Technology | Best Argument For | Best Argument Against | Companies Involved |
|---|---|---|---|
| Majorana | Fundamentally protected from errors | Hard to engineer | Microsoft |
| Solid-state spins (P:Si, NV centers, etc.) | Small footprint | Heterogeneous, hard to scale | Turing, CQC2T |
| Quantum dots | Small footprint, scalable fabrication | Connectivity | HRL, Intel |
| Neutral atoms | Homogeneous, long-range gates | Lack of demonstrated good 2-qubit gates | Atom Computing, Inc. |
| Linear optics[50] | Scalable fabrication | Lack of key components (single photon sources) | PsiCorp, Xanadu |
| Superconductors | Demonstrated programmability, lithographically definable | Large footprint, 10 mK | Google, IBM, Rigetti, Intel, QCI |
| Ions[51] | Demonstrated programmability, long coherence, homogeneous, | Microsecond gate speeds, lasers | IonQ, Honeywell |

arXiv:1903.10541

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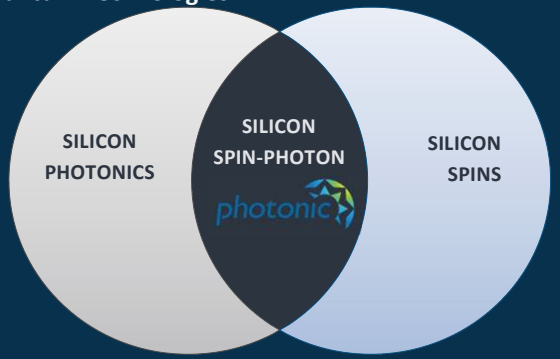
## Silicon Quantum Technologies

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