

CHICAGO QUANTUM EXCHANGE

Spooky Action Creating Economic Growth

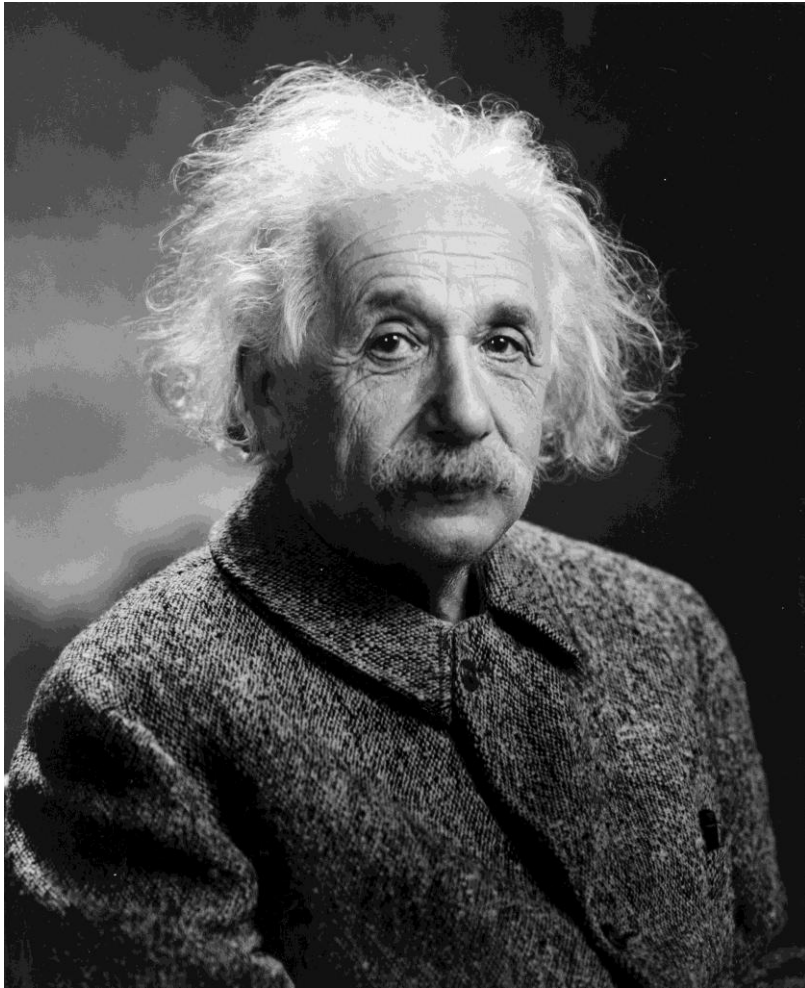
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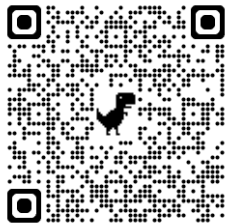
What is quantum?

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In a letter to Niels Bohr in 1947:

*"I cannot seriously believe in it because the theory [of quantum mechanics] cannot be reconciled with the idea that physics should represent a reality in time and space, free from **spooky action at a distance**."*



Quantum Fundamentals

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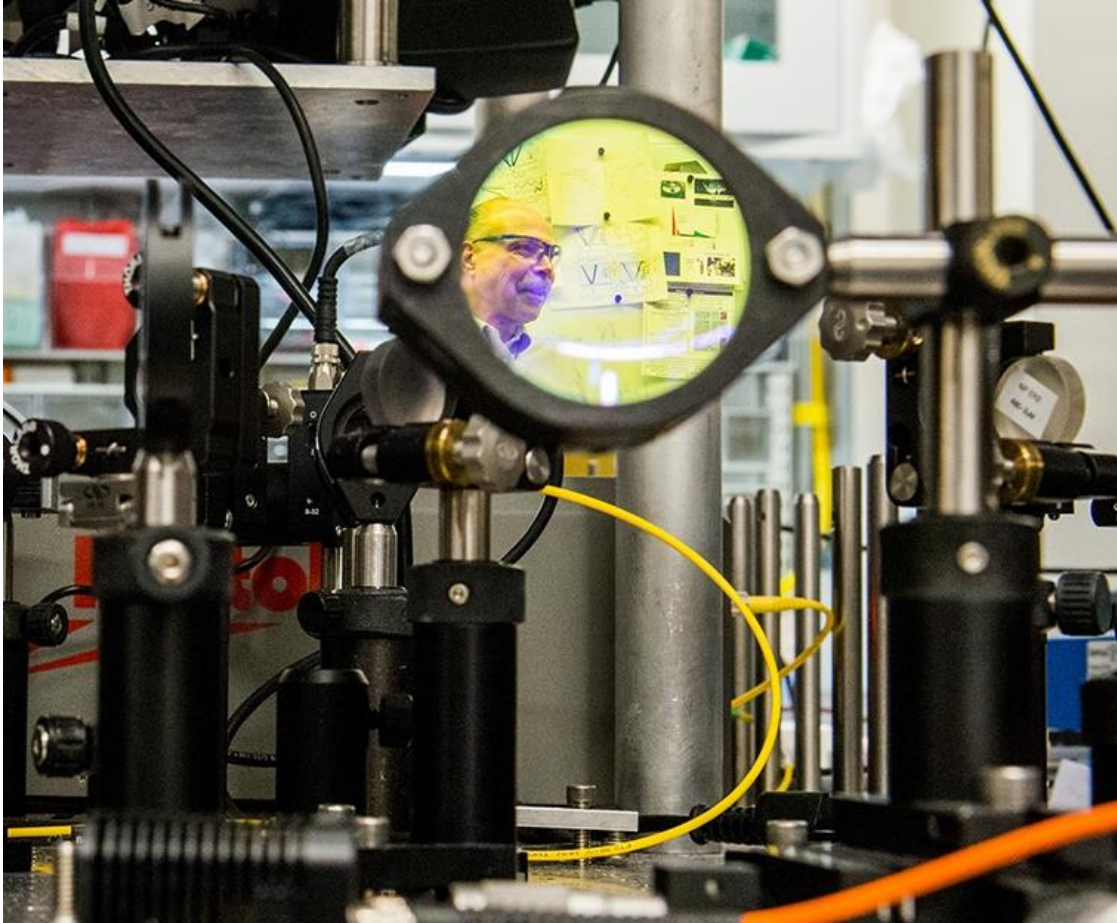
- **Superposition:** Particles can be in multiple states at the same time.
- **Coherence:** The ability for a quantum system to maintain in a state of superposition, which can be tricky – environmental factors, even just observation, can cause systems to decohere.
- **Entanglement:** Particles can influence each other across long distances at small scales.



Learn more about superposition, entanglement, qubits, and quantum science [here](#).

Technological advances enable us to now **visualize, understand, and manipulate** objects at the **nanoscale** and **harness quantum physics** in a way previously impossible.

What is "quantum"?



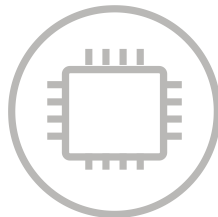
1. **Quantum physics** is the study of how matter behaves at the smallest possible levels, where the rules of classical physics shift.
2. Utilizing these features of nature is called **Quantum Information Science and Engineering (QISE)**.
3. QISE will impact the way we **communicate**, **compute**, and **sense** information.

The Future is Quantum

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Quantum
Communications



Quantum
Computing



Quantum
Sensing



Security

Transportation

Geology

Elections

Healthcare

Logistics

Finance

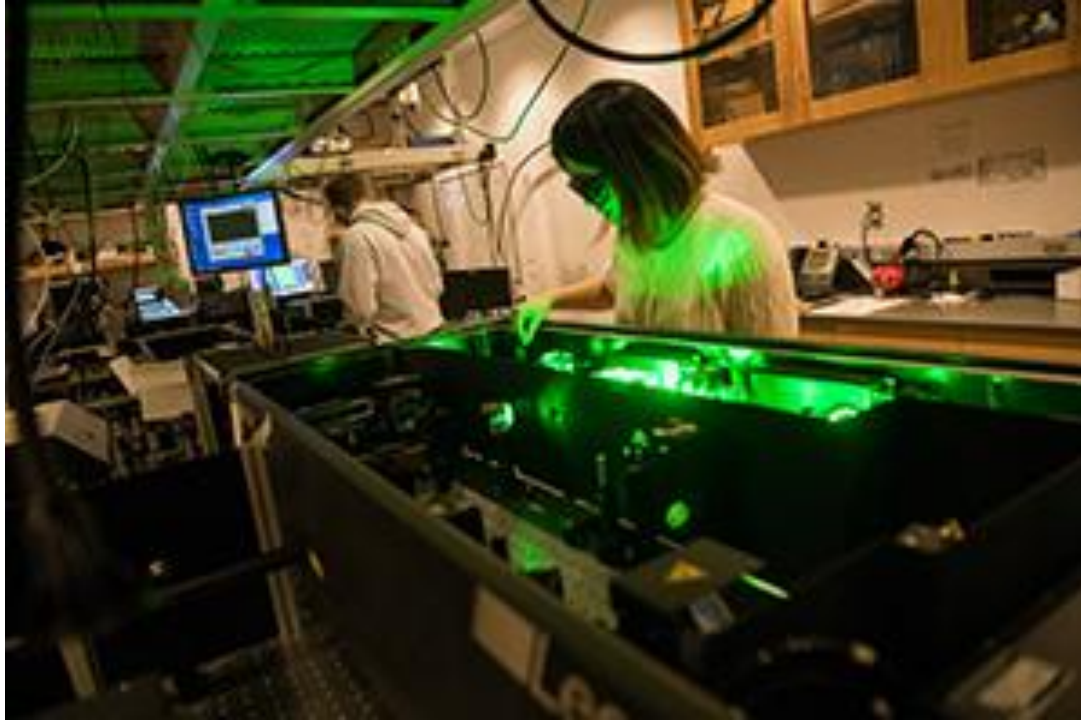
Materials

Biology and Pharma

Energy

Quantum Sensing

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1. Quantum sensors **detect information**, including small changes, **very precisely** and work effectively at a **small-scale and across long distances**.
2. Quantum sensors have strong potential for **healthcare diagnostics** and **advanced positioning and navigation** that does not rely on GPS.

Quantum Communications

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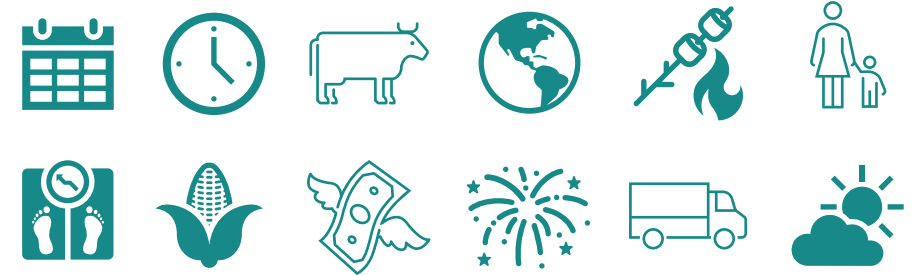
1. Quantum communication networks are **provably secure**.
2. Breaches or hacks can be detected when they happen.
3. Supports next-generation technology in **cybersecurity**, **banking**, and **national security**.



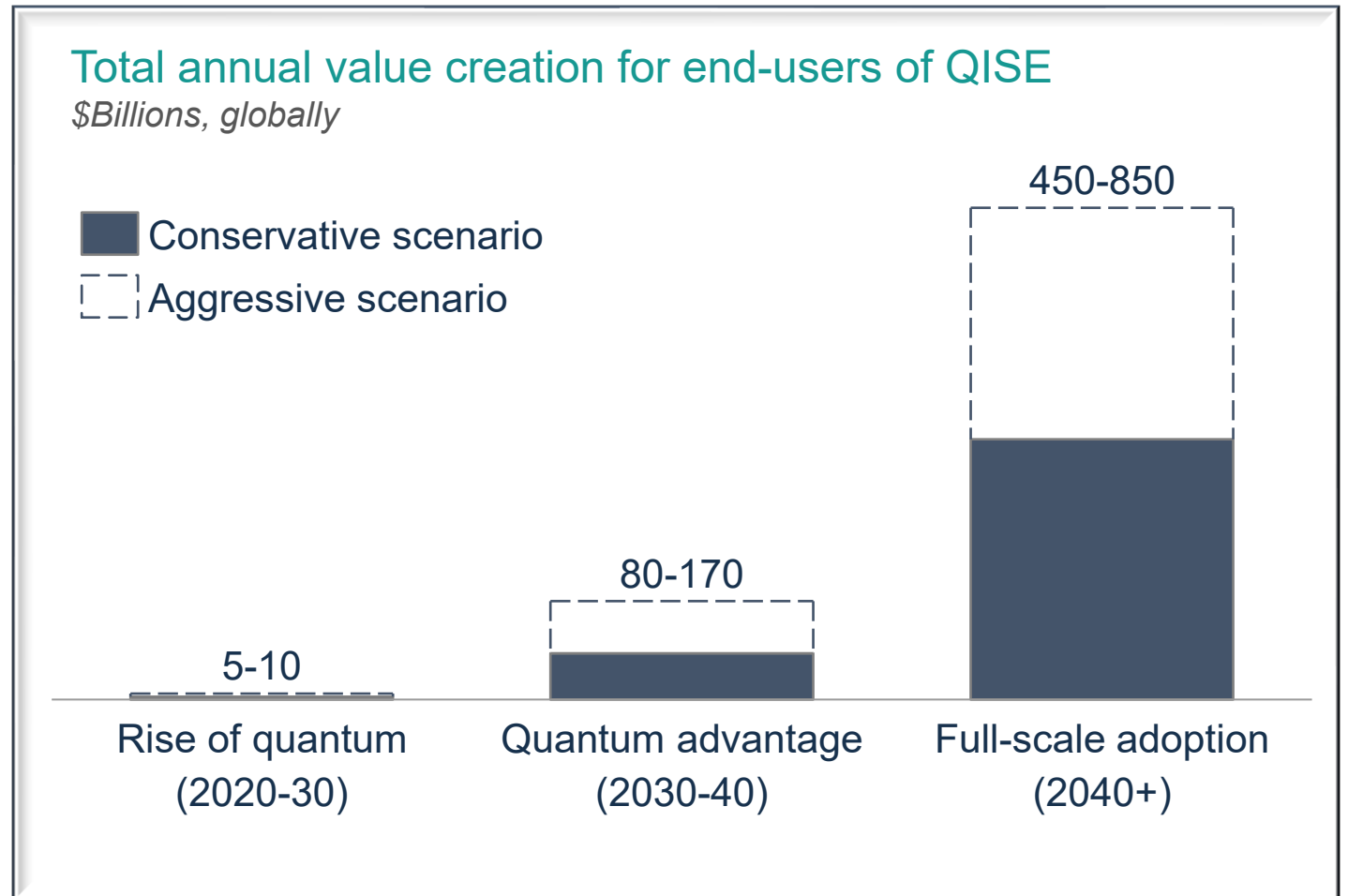
Quantum Computers

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1. Quantum computers use **quantum mechanics** to perform calculations on specialized hardware that leverages superposition, **using qubits**.
2. Quantum computers will excel at solving certain types of tasks, like **multi-variable problems, factoring, and simulations**.
3. Supports extreme advancements in a range of fields, including **drug discovery, cryptography, climate change, and optimization**.



Quantum is expected to reach \$450-850B in annual value creation in the coming decades



Source: BCG analysis

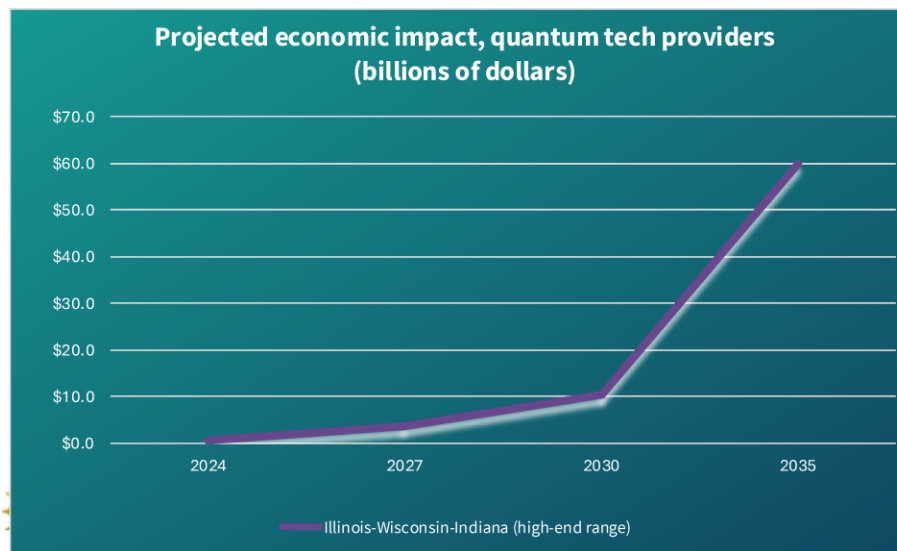
Economic Projections for IL-WI-IN region



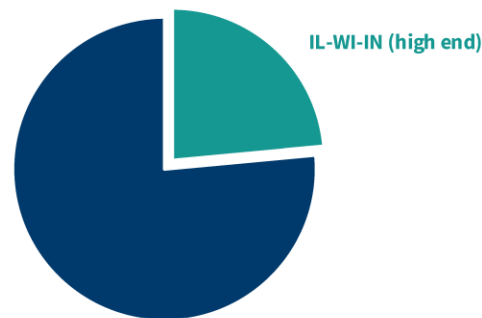
Economic value creation, quantum tech providers

Shown in billions of dollars

	Region	Metric	Now	2027	2030	2035
Tech providers	Midwest (IL-WI-IN)	Quantum tech provider economic impact (low to high range)	< \$0.05B	\$1 – 3.5B	\$3.5 – 10.5B	\$20 – 60B
		Share of global (low to high range)	3%	10 – 30%	10 – 30%	10 – 30%
	Global	Quantum tech provider economic impact	\$2B	\$12B	\$36B	\$194B



Illinois-Wisconsin-Indiana quantum tech providers,
share of global impact



Source: Boston Consulting Group for the CQE.
Assumes continued government investment.

Job Creation Projections

IL-IN-WI region by 2035

- Up to 191K jobs
- More than 70% open to people without graduate degrees
- Nearly 1/3 open to people with associates degrees or technical training
- Growth will be fast:
 - 200+% between 2027 and 2030
 - 550+% between 2030 and 2035

We still need **fundamental** and **applied research** to fully understand and control their properties.

Making Quantum Technology a Reality

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Chicago Quantum Exchange

Founded 2017



**Bridging Academia,
Industry, and Government**



**Advancing Research,
Discovery, and Impact**



**Preparing Quantum
Workers and Careers**



**Driving the Quantum
Economy**

124 miles

Length of Chicago-region
Quantum Network

210+

Researchers

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Member Institutions Across
the Chicago Region

50+

Corporate, Nonprofit,
International, and Regional
Partners

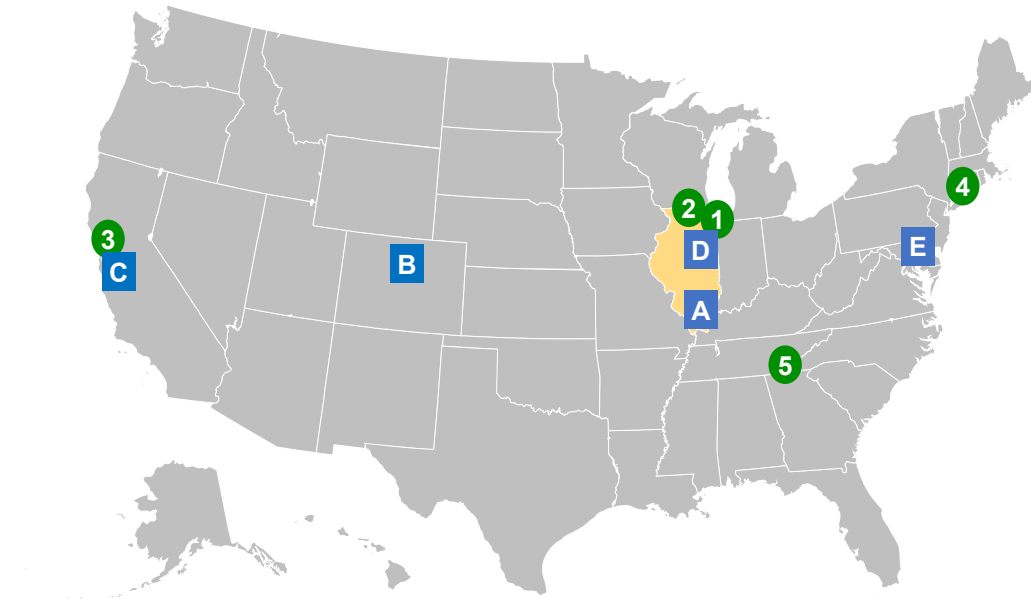
Industry Partnerships

40+ Companies: Fund and Support Research, Collaborations, Student Training, and Career Pathways



National Quantum Initiative and the CQE

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1 Argonne-led



2 Fermilab-led



A UIUC-led



D UChicago-led

QuBBE
Quantum Sensing for
Biophysics and
Bioengineering



First-of-its-kind public-private quantum park

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Illinois Quantum and Microelectronics Park



- **128-acre park** with shared cryo facilities, labs, and research spaces on Chicago's Southeast Side.
- Anchor tenant **PsiQuantum** — 300K-sq-ft site
- **DARPA-Illinois Quantum Proving Ground**
- Will become **full ecosystem** of companies, suppliers, end users, and other partners.



Purdue Quantum Science and Engineering Institute (PQSEI) connects researchers and leverages collaborations with industry, government, and academia.

Expertise includes:

- Atomic, molecular, optical physics
- Solid-State Quantum Systems
- Quantum Nanophotonics
- Quantum Information & Communication

Purdue leads the NSF Center for Quantum Technologies and is a partner of the Midwest Quantum Collaboratory, DOE Quantum Science Center, and Quantum Collaborative.



NSF Engine: Advancing quantum tech in the Midwest

In 2024, cross-sector coalition received \$1M Development Award, held workshops to strengthen plans



Areas of focus:

- Translating quantum innovation into practice
- Building an inclusive quantum workforce

Activities:

- Community workshops
- Forecast reports, asset maps, other data
- Partner engagement

The Bloch Quantum is a designated US EDA Tech Hub

One of only 31 inaugural US EDA Tech Hubs across the US, out of ~400 applications



“A Tech Hubs Designation is a strong endorsement of a region's plan to supercharge a critical technology ecosystem and become a global leader over the next decade.”

– US EDA

LEADS



CHICAGO QUANTUM EXCHANGE



THE UNIVERSITY OF
CHICAGO

Argonne 
NATIONAL LABORATORY



Fermilab



UNIVERSITY OF
ILLINOIS
URBANA-CHAMPAIGN



WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON



Northwestern
University



PURDUE
UNIVERSITY