

Quantum Systems Accelerator



QUANTUM SYSTEMS ACCELERATOR

Catalyzing the Quantum Ecosystem

Overview

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 QuantumSystemsAccelerator.org



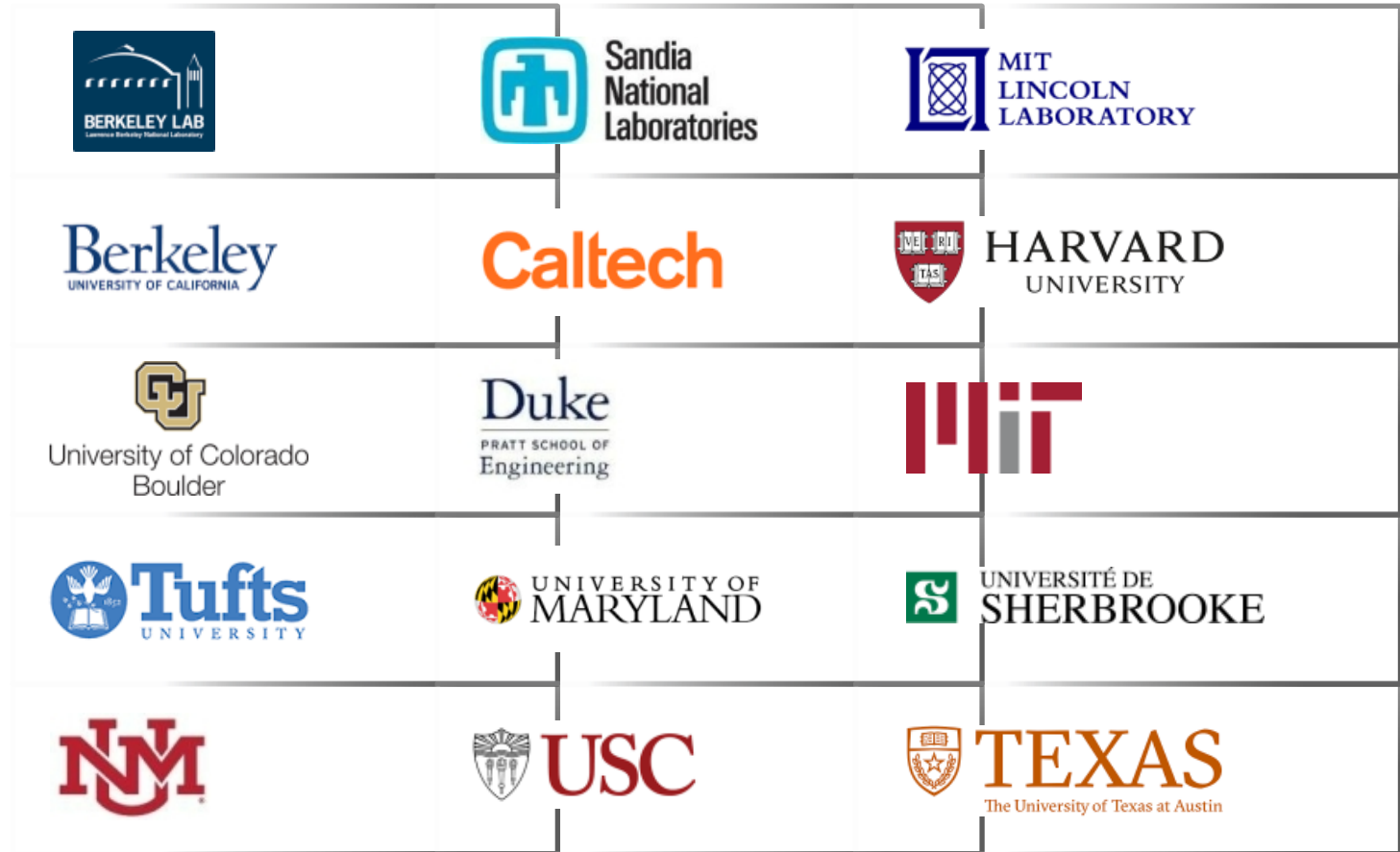
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Quantum Systems Accelerator

Catalyzing national leadership in quantum information science to co-design the algorithms, quantum devices, and engineering solutions needed to deliver certified quantum advantage in Department of Energy scientific applications.

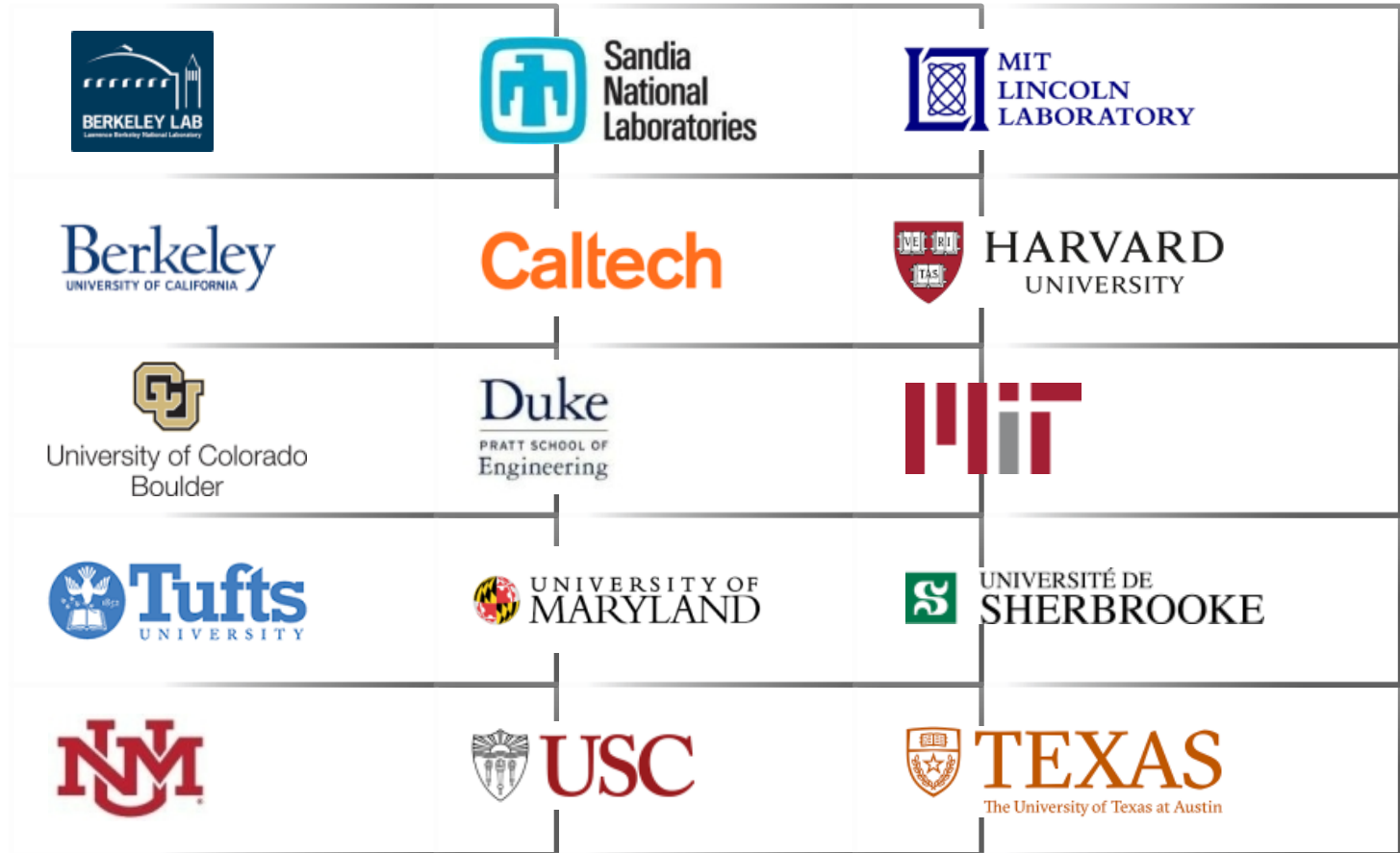


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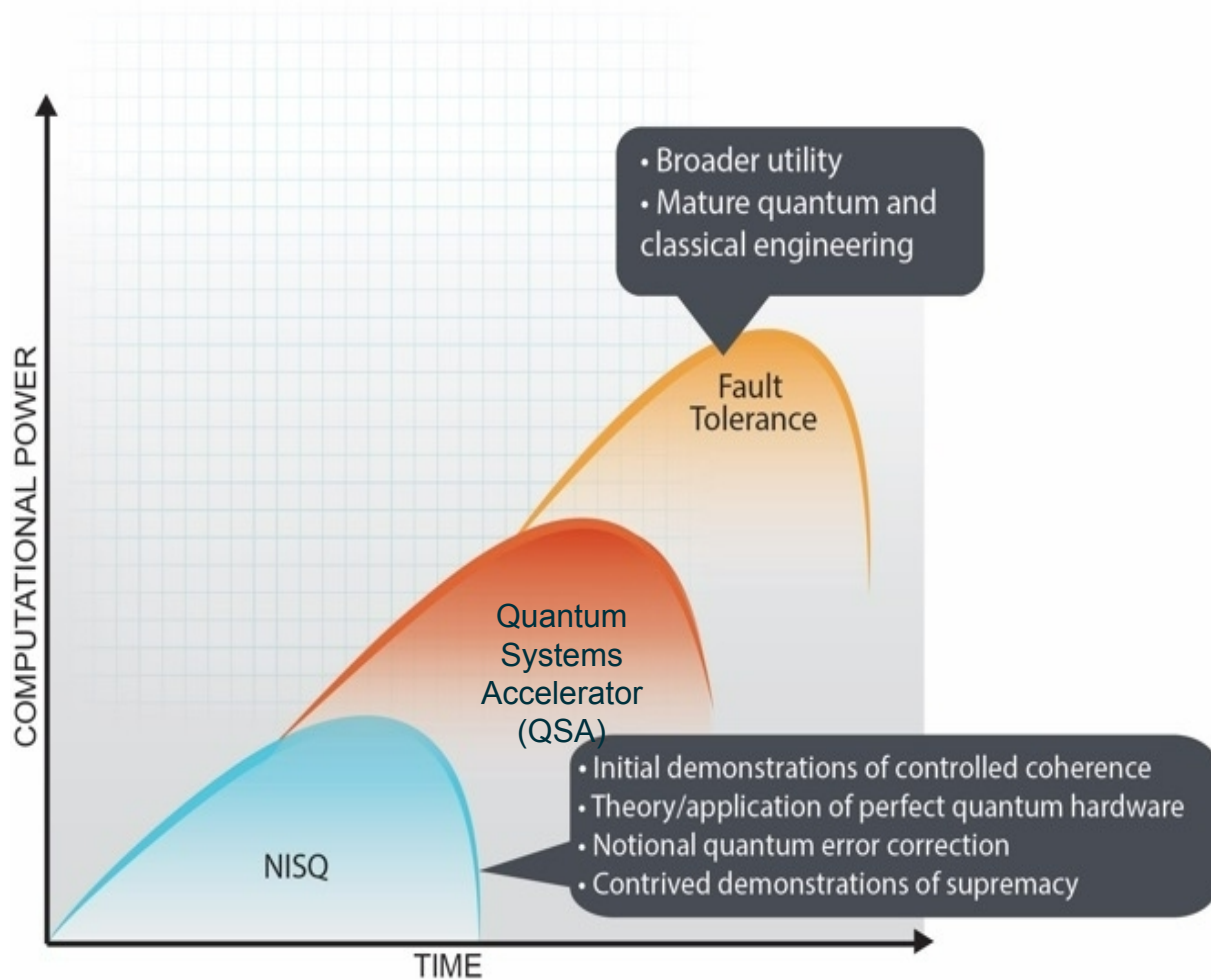
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SIMONS
INSTITUTE
for the Theory of Computing



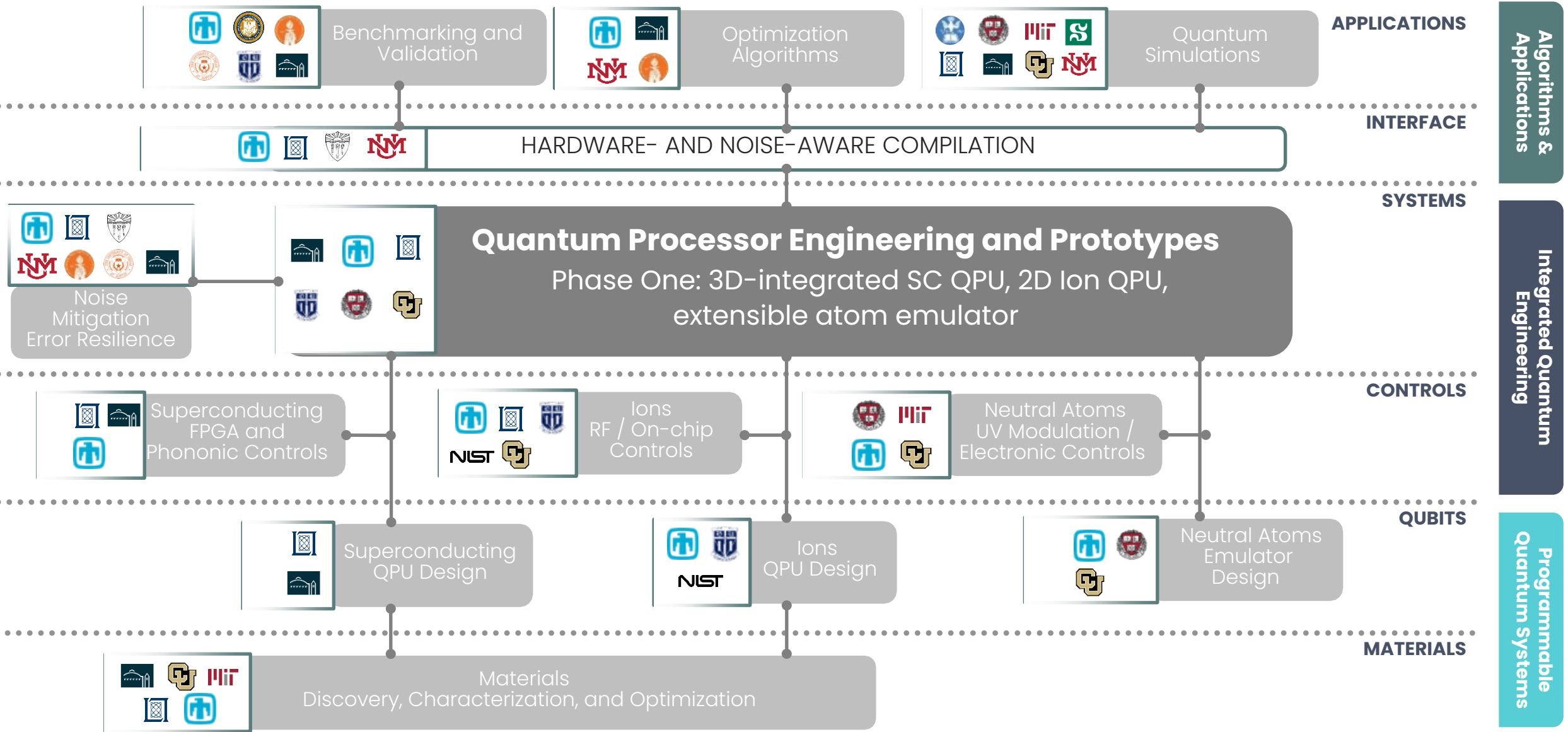
Scientific Foundations for Quantum Computation



What are the biggest obstacles to progress in QIS?

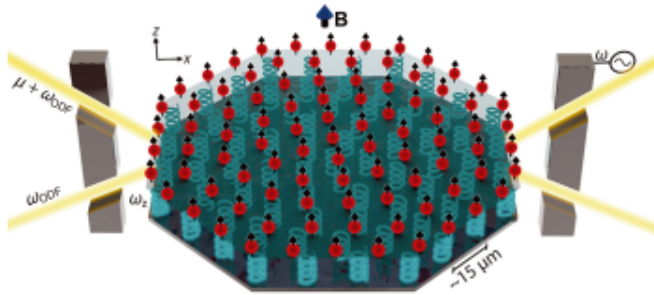
- Quantum systems are imperfect and have limited coherence
 - Develop optimized NISQ Hardware
- Controls for quantum systems are not extensible
 - Develop high-fidelity, modular control technologies
- Unexplored domain of meaningful applications for NISQ hardware with quantified advantage
 - Explore analog and digital quantum algorithms
- Lack protocols to quantify and benchmark performance of imperfect hardware
 - Develop techniques to benchmark quantum supremacy

Co-Design Across the Quantum Computing Stack



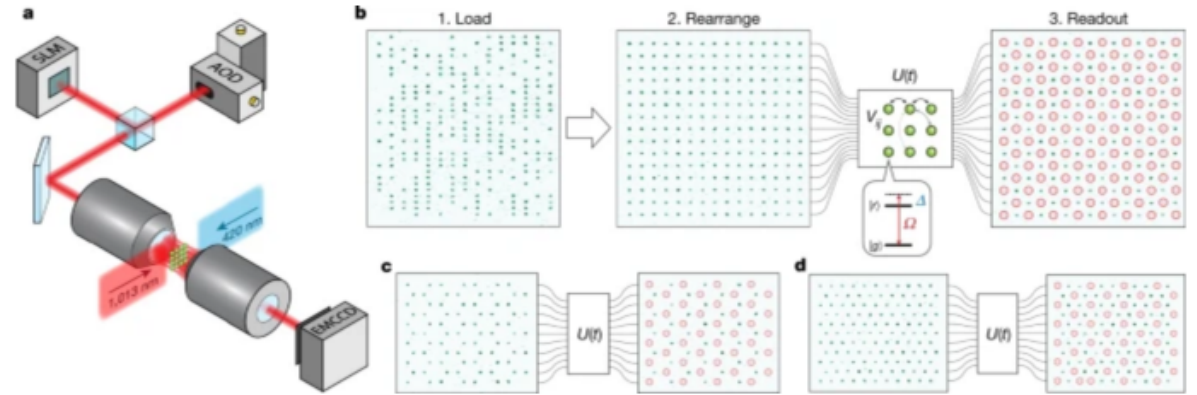
Science Emerging from the QSA

Quantum-enhanced sensing of displacements and electric fields with two-dimensional trapped-ion crystals



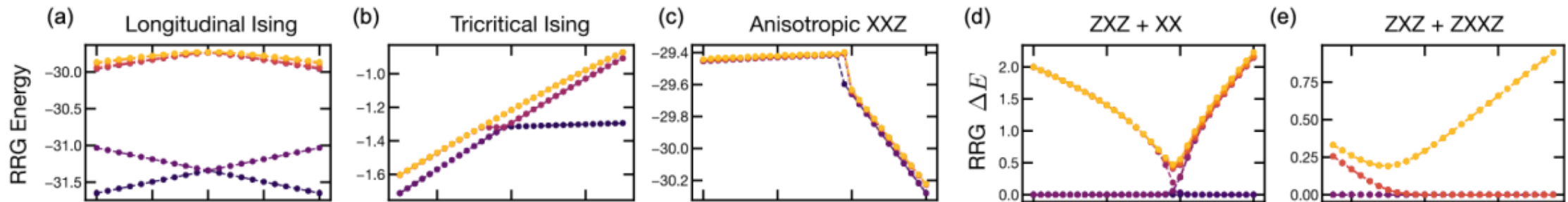
Gilmore *et al.*, *Science* 373, 6555

Quantum phases of matter on a 256-atom programmable quantum simulator



Ebadi *et al.*, *Nature* 595, 227–232

Performance of the rigorous renormalization group for first-order phase transitions and topological phases



Block *et al.*, *Phys. Rev. B* 103, 195122

Ecosystem Goals

QSA will catalyze the QIS ecosystem by bringing together the research network, engaging industry, and preparing the next generation of QIS scientists and engineers.

Industry Engagement

Goal: Form, build, and sustain the US commercial quantum enterprise

QSA will partner with industries across the spectrum: from large multinational companies to start-ups, and from basic R&D to interactions with end users. QSA will identify opportunities for engagement that are synergistic with the broader Center objectives.



Workforce Development

Goal: Meet the immediate and longer term needs of the QIS workforce

QSA will support the quantum workforce with a series of programs, including internships, apprenticeships, and academic partnerships. Initial efforts focus on developing pipelines and resources for students and early-career staff.

Diversity and Inclusion (IDEAS)

Goal: Build a diverse and inclusive workforce

The QSA is committed to creating pathways at various educational levels to educate and build a diverse and inclusive workforce through IDEAS – Inclusion, Diversity, Equity, Accountability and Solutions. Early activities include an annual DEI summit and collaboration with the other DOE QIS centers.

Workforce Development Goals and Opportunities

Dedicated effort to preparing the next generation of QIS researchers



Student Engagement

Goal:

Connect interns with QSA opportunities and partner institutions, provide platform for students to engage with industry partners

Opportunities:

Partnership with Growth Sector, 2021 Summer internships (Tipping Point), Bi-weekly QSA Science Meetings, and QSA sponsored lectures and team engagements.



Workforce Development

Goals:

Identify key resources for each level of engagement in the QSA R&D ecosystem, able cross-disciplinary, trans-sector exchanges, and Maximize impact through collective action

Opportunities:

Collective compilation of a holistic syllabus covering each of the key thrust areas within the Center and the creation of an online portal to connect center members.



Simons Institute

Goal:

Provide dedicated and sustained programs to support next generation QIS researchers.

Opportunities:

Hold 8-week summer programs and sponsor research pods and programs to focus on key QSA problem sets.

Industry Engagement

Research Partnerships

Collaborative research supports the transfer of QSA technology, processes, research & development capabilities, and technical know-how to private sector partners

Technology Partnerships

Technology partnerships allow QSA to meet current challenges and evolving research goals through improvements in production efficiency, cost-effectiveness, and innovation

Technology Transfer

The labs are committed to supporting startups and transferring viable technologies (IP with applications in industrial or other commercial markets) into the private sector for the benefit of the US economy



Questions?

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