Thomas Schuster

Curriculum vitae

E-mail: schuster@caltech.edu

Office: 101 Annenberg, Caltech

Experience & Education

California Institute of Technology — Pasadena, CA
Sherman Fairchild Postdoctoral Scholar — *Sept. 2023—present*
Host: John Preskill

University of California, Berkeley — Berkeley, CA
Postdoctoral Researcher — *Jan. 2023—Aug. 2023*
Advisor: Norman Y. Yao

University of California, Berkeley — Berkeley, CA
Ph.D., Physics — *Aug. 2016—Dec. 2022*
Thesis: Many-Body Quantum Information Dynamics
Advisor: Norman Y. Yao

- 1 of 4 Finalists for the Deborah Jin Award for Best Thesis in AMO Physics (2024)
- National Science Foundation Graduate Research Fellowship (2016–2021)
- Theory Fellowship, UC Berkeley Physics Department (2016–2017)

University of California, Berkeley — Berkeley, CA
Bachelors of Science, Engineering Physics — *Aug. 2011—May 2015*

- Minor in Mathematics

Additional Experience

Google Quantum AI — Venice, CA
Visiting Researcher — *Dec. 2024—present*

Google Quantum AI — Venice, CA
Research Intern & Student Researcher — *May 2021—Dec. 2022*

Boston University — Boston, MA
Visiting Researcher, Physics Department — *Aug. 2015—July 2016*

Publications & Preprints

*: co-first authors.

[1] **Thomas Schuster***, Chao Yin*, Xun Gao, Norman Y. Yao, *A polynomial-time classical algorithm for noisy quantum circuits.* arxiv:2407.12768 (2024).

[2] **Thomas Schuster**, Jonas Haferkamp, Hsin-Yuan Huang, *Random unitaries in extremely low depth.* arxiv:2407.07754 (2024).

[3] **Thomas Schuster**, Nathanan Tantivasadakarn, Ashvin Vishwanath, Norman Y. Yao, *A holographic view of topological stabilizer codes.* arxiv:2312.04617 (2023).

[4] Alicja Dutkiewicz, Thomas O'Brien, **Thomas Schuster**, *The advantage of quantum control in many-body Hamiltonian learning.* arxiv:2304.07172 (2023). **(QIP 2023)**

[5] **Thomas Schuster**, Norman Y. Yao, *Operator growth in open quantum systems.* Physical Review Letters, **131** 160402 (2023).

[6] **Thomas Schuster**, Murphy Niu, Jordan Cotler, Thomas O'Brien, Jarrod R. McClean, Masoud Mohseni, *Learning quantum systems via out-of-time-order correlators.* Physical Review Research **5** 043284 (2023).

[7] Jordan Cotler, **Thomas Schuster**, Masoud Mohseni, *Information-theoretic hardness of out-of-time-order correlators.* Physical Review A **108** 062608 (2023).

[8] Bryce Kobrin, **Thomas Schuster**, Norman Y. Yao, *Comment on "Traversable wormhole dynamics on a quantum processor".* arxiv:2302.07897 (2023).

[9] **Thomas Schuster***, Bryce Kobrin*, Ping Gao, Iris Cong, Emil Khabiboulline, Norbert Linke, Chris Monroe, Mikhail D. Lukin, Beni Yoshida, Norman Y. Yao, *Many-body quantum teleportation via operator spreading in the traversable wormhole protocol.* Physical Review X, **12** 031013 (2022).

[10] Machiel S. Blok*, Vinay V. Ramasesh*, **Thomas Schuster**, Kevin O'Brien, John M. Kreikebaum, Dar Dahlen, Alexis Morvan, Beni Yoshida, Norman Y. Yao, Irfan Siddiqi, *Quantum information scrambling on a superconducting qutrit processor.* Physical Review X, **11.2** 021010 (2021).

[11] **Thomas Schuster**, Felix Flicker, Ming Li, Svetlana Kotochigova, Joel E. Moore, Jun Ye, Norman Y. Yao, *Realizing Hopf insulators in dipolar spin systems.* Physical Review Letters, **127.1** 015301 (2021).

[12] **Thomas Schuster**, Felix Flicker, Ming Li, Svetlana Kotochigova, Joel E. Moore, Jun Ye, Norman Y. Yao, *Floquet engineering ultracold polar molecules to simulate topological insulators.* Physical Review A, **103.6** 063322 (2021).

[13] Jiho Noh*, **Thomas Schuster***, Thomas Iadecola, Sheng Huang, Mohan Wang, Kevin P. Chen, Claudio Chamon, Mikael C. Rechstman, *Braiding photonic topological zero modes.* Nature Physics **16**, 989-993 (2020).

[14] **Thomas Schuster**, Snir Gazit, Joel E. Moore, Norman Y. Yao, *Floquet Hopf insulators.* Physical Review Letters, **123** 266803 (2019).

[15] Kevin Landsman, Caroline Figgatt, **Thomas Schuster**, Norbert M. Linke, Beni Yoshida, Norman Y. Yao, Chris Monroe, *Verified quantum information scrambling.* Nature **567**, 61-65 (2019).

[16] Quntao Zhuang, **Thomas Schuster**, Beni Yoshida, Norman Y. Yao, *Scrambling and complexity in phase space.* Physical Review A, **99** 062334 (2019).

[17] Rupert A. Croft, Peter E. Freeman, **Thomas Schuster**, Chad M. Schafer, *Prediction of galaxy ellipticities and reduction of shape noise in cosmic shear measurements.* Monthly Notices of the Royal Astronomical Society, **469** 4422-4427 (2017).

[18] **Thomas Schuster**, Thomas Iadecola, Claudio Chamon, Roman Jackiw, So-Young Pi, *Dissipationless conductance in a topological coaxial cable.* Physical Review B, **94** 115110 (2016).

[19] Thomas Iadecola, **Thomas Schuster**, Claudio Chamon, *Non-abelian braiding of light.* Physical Review Letters, **117** 073901 (2016).

Invited Talks

[1] *A polynomial-time classical algorithm for noisy quantum circuits.* Seminar, **AWS Center for Quantum Computing, Pasadena**, September 2024.

[2] *Random unitaries in extremely low depth.* CS Theory Tea, **California Institute of Technology, Pasadena**, July 2024.

[3] *The fidelity and complexity of noisy quantum dynamics.* Theory seminar, **Max Planck Institute for Quantum Optics, Garching**, July 2024.

[4] *The fidelity and complexity of noisy quantum dynamics.* Seminar, **Ludwig-Maximilians University, Munich**, July 2024.

[5] *The fidelity and complexity of noisy quantum dynamics.* Workshop on Non-Equilibrium Many-body Physics Beyond the Floquet Paradigm, **Max Planck Institute for the Physics of Complex Systems, Dresden**, June 2024.

[6] *Many-body quantum information dynamics.* Deborah Jin Thesis Prize Session, **Division of Atomic, Molecular, and Optical Physics Annual Meeting**, Fort Worth, June, 2024.

[7] *Noise, complexity, and information dynamics in quantum circuits.* IPAM workshop on Many-body Quantum Systems via Classical and Quantum Computation, **University of California, Los Angeles**, November 2023.

[8] *Noise, complexity, and information dynamics in quantum circuits.* IQIM Seminar, **California Institute of Technology**, September 2023.

[9] *The power of time-reversal in quantum learning.* Quantum Machine Learning Seminar, **National University of Singapore** (virtual), July 2023.

[10] *Many-body quantum information dynamics.* AMO Seminar, **University of California, Berkeley**, April 2023.

[11] *Many-body quantum information dynamics.* Quantum Information Group Meeting, **Massachusetts Institute of Technology** (virtual), January 2023.

[12] *Many-body teleportation and error propagation via quantum information dynamics.* HQI Quantum Fest, **Harvard University**, December 2022.

[13] *Many-body quantum teleportation via quantum information dynamics.* Condensed Matter Theory Group Meeting, **California Institute of Technology**, November 2022.

[14] *Many-body quantum teleportation via quantum information dynamics.* Quantum Information Group Meeting, **Massachusetts Institute of Technology**, September 2022.

[15] *Many-body quantum teleportation via quantum information dynamics.* Harvard Quantum Information Group Meeting, **Harvard University**, September 2022.

[16] *Learning quantum systems via out-of-time-order correlators.* Theory Seminar, **Google Quantum AI** (virtual), March 2022.

[17] *Many-body quantum teleportation via operator spreading in the traversable wormhole protocol.* It from Qubit Seminar, **Stanford University**, March 2022.

[18] *Operator size and error propagation: the Loschmidt echo in many-body quantum systems.* Geoflow Collaboration Meeting, **University of California, Berkeley**, September 2021.

[19] *Many-body quantum teleportation via operator spreading in the traversable wormhole protocol.* Quantum/Gravity Seminar, **Brandeis University** (virtual), May 2021.

[20] *Floquet Hopf insulators.* Condensed Matter Seminar, **Technion, Israel Institute of Technology**, June 2019.

Contributed Talks

[1] *A polynomial-time classical algorithm for almost any noisy quantum circuit.* Contributed poster. **Conference on Quantum Information Processing**, Taipei, Taiwan, 2024.

[2] *The advantage of quantum control in many-body Hamiltonian learning.* Contributed poster. **IPAM workshop on Mathematical Aspects of Quantum Learning**, Los Angeles, CA, USA, 2023.

[3] *Learning quantum systems via out-of-time-order correlators.* Contributed talk. **APS March Meeting**, Las Vegas, NV, USA, 2023.

[4] *Operator size and error propagation: the Loschmidt echo in many-body open quantum systems.* Contributed talk. **APS March Meeting**, Chicago, IL, USA, 2022.

[5] *Many-body quantum teleportation via operator spreading in the traversable wormhole protocol.* Contributed poster. **Conference on Quantum Information Processing** (virtual), 2021.

[6] *Many-body quantum teleportation via operator spreading in the traversable wormhole protocol.* Contributed poster. **Annual Meeting of the APS Division of Atomic, Molecular, Optical Physics** (virtual), 2021.

[7] *Unitary designs for continuous variable systems.* Contributed talk. **APS March Meeting**, Boston, MA, USA, 2019.

[8] *Distinguishing information scrambling from decoherence in a trapped ion quantum simulator.* Contributed poster. **Annual Meeting of the APS Division of Atomic, Molecular, Optical Physics**, Fort Lauderdale, FL, USA, 2018

[9] *Floquet Hopf insulator in dipolar spin systems.* Contributed talk. **APS March Meeting**, Los Angeles, CA, USA, 2018.

Workshops & Schools Attended

[1] Non-equilibrium Many-body Physics Beyond the Floquet Paradigm. Workshop at the Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, 2024.

[2] Near-Term Quantum Computers. Workshop at Simons Institute, University of California, Berkeley, 2024.

[3] Many-body Quantum Systems via Classical and Quantum Computation. Workshop at IPAM, University of California, Los Angeles, 2023.

[4] Mathematical Aspects of Quantum Learning. Workshop at IPAM, University of California, Los Angeles, 2023.

[5] Condensed Matter Summer School on Dynamics and Quantum Information in Many-body Systems. University of Minnesota, 2023.

[6] Online School on Ultra Quantum Matter. Perimeter Institute (virtual), 2020.

[7] Les Houches Summer School on Quantum Dynamics and Disorder. Les Houches, France, 2019.

[8] Quantum Connections Summer School. Stockholm, Sweden, 2018.

Additional Activities

- I am a regular reviewer for the Physical Review Journals (PRX, PRX Quantum, PRL, PRA, PRD), the Journal for High-Energy Physics (JHEP), and Quantum.
- I was a member of the program committee for the Theory of Quantum Computation (TQC) Conference, 2024.