ALICIA J KOLLÁR
Department of Physics
University of Maryland
College Park, MD 20742

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APPOINTMENTS

University of Maryland, Physics and JQI, Associate Professor	2026-Present
University of Maryland, ECE, Affiliate Associate Professor	2026-Present
University of Maryland, Physics and JQI, Assistant Professor	2019-2026
University of Maryland, ECE, Affiliate Assistant Professor	2019-2026

EDUCATION

Princeton University, Electrical Engineering, Postdoctoral Scholar	2017-2019
Stanford University, Applied Physics, Postdoctoral Scholar	2016-2017
Stanford University, Ph.D., Applied Physics.	2010-2016
Princeton University, B.A. Physics	2006-2010

FELLOWSHIPS AND AWARDS

Sloan Research Fellow	2022
Airforce Office of Scientific Research Young Investigator Prize	2021
National Science Foundation CAREER Award	2021
Princeton Materials Science Postdoctoral Fellowship	2017-2019
National Defense Science and Engineering Fellowship	2012-2015

RESEARCH INTERESTS

Quantum Simulation
Superconducting Circuits
Circuit and Cavity QED
Many-Body Physics with Photons
Open and Driven-Dissipative Systems
Graph Theory and Applied Mathematics

ADVISORS

Andrew Houck (Postdoc)

Benjamin Lev (Ph.D.)

COLLABORATORS
Peter Sarnak (Princeton University, Mathematics)
Alexey Gorshkov (JQI, NIST Gaithersberg)
Fan Wei (Institute for Advanced Study, Mathematics)
Gaurav Bahl (UIUC, Mechanical Engineering)
Ben Palmer (LPS)
Hong Tang (Yale University, Applied Physics)
David Schuster (Stanford University, Applied Physics)
Anushya Chandran (Boston University, Physics)
Kevin Cox (Army Research Laboratory)
Andrew Childs (UMD, Computer Science)
Mohammad Hafezi (UMD, Physics and ECE)

PREVIOUS COLLABORATORS
Steven Flammia (University of Virginia, Computer Science)
Kanupriya Sinha (Arizona State, Mechanical Engineering)
Adrian Chapman (Oxford)
Andrew Houck (Princeton University, Electrical Engineering)
Igor Boettcher (University of Alberta, Physics)
Michael Gullans (JQI, NIST Gaithersberg)

STUDENTS
Kellen O'Brien
Zhiyin Tu (ECE)
Ibukunoluwa Adisa
Won Chan Lee
Qianao "Billy" Yue
Max Neiderbach
David Lane
Tomoki Imura

ALLUMNI
Martin Ritter
Maya Amouzegar
Jeffrey Wack (undergraduate)
Theo Gifford (undergraduate)
Ruthie Vogel (undergraduate)

PUBLICATIONS

30) A. J. Kollár, P. Sarnak, F. Wei, *Spectral Rigidity for Planar Cubic Graphs with Constrained Faces,* In Preparation (2026).

29) I. Adisa, W. C. Lee, Y. Huang, N. Schine, K. Cox, A. J. Kollár, *Robust cavity metrology beyond the limits of Pound-Drever-Hall,* arXiv:2608.21512 (2026).

28) S. Raman, R. Schäfer, A. J. Kollár, A. Chandran, *Dissipative Stabilization of Floquet-Engineered Many-Body Order,* arXiv:2607.16391 (2026).

27) K. O'Brien, W. C. Lee, A. Behne, A. Fahimniya, Y. Wang, A. V. Gorshkov, A. J. Kollár, *In-Situ Characterization of Light-Matter Coupling Strengths in Multimode Circuit-QED Systems,* arXiv:2603.05583 (2026).

26) W. C. Lee, K. O'Brien, A. Fahimniya, Y. Wang, A. Behne, A. V. Gorshkov, A. J. Kollár, *Mulitmode Strong-Coupling Processes in Circuit QED Lattices,* arXiv:2605.00983 (2026).

25) I. Adisa, W. C. Lee, K. Cox, A. J. Kollár, *The Pound-Drever-Hall Method for Superconducting-Qubit Readout,* arXiv:2512.03138 (2025), PRL **136**, 233601 (2026).

24) Z. Tu, V. Workman, G. Bahl, A. J. Kollár, *Realization of pure gyration coupling in an on-chip superconducting microwave device,* arXiv:2506.19912 (2025), Phys. Rev. Research **8**, 013049 (2026).

23) K. O'Brien, M. Amouzegar, W. C. Lee, M. Ritter, A. J. Kollár, *A Circuit-QED Lattice System with Flexible Connectivity and Gapped Flat Bands for Photon-Mediated Spin Models,* arXiv:2502.05559 (2025), PRX Quantum **7**, 010321 (2026).

22) M. Ritter, D. M. Long. Q. Yue, M. Amouzegar, A. Chandran, A. J. Kollár, *A strong-driving toolkit for topological Floquet energy pumps with superconducting qubits,* arXiv:2501.17915 (2025), Physical Review A **112**, 042605 (2025).

21) A. J. Kollár, *Superconducting circuits feel the pull of synthetic magnetism,* Nat. Phys. **20** 1859 (2024).

20) J. Bringewatt, Z. Steffen, M. A. Ritter, A. Ehrenberg, H. Wang, B.S., Palmer, A. J. Kollár, A. V. Gorshkov, L.-P. García-Pintos, *Generalized geometric speed limits for quantum observables,* arXiv:2409.04544 (2024), Physical Review Research **7**, 033222 (2025).

19) M. Ritter, D. M. Long. Q. Yue, A. Chandran, A. J. Kollár, *Autonomous Stabilization of Floquet States using Static Dissipation,* arXiv:2410.12908 (2024), Physical Review X **15**, 031028 (2025).

18) Z. Liu, D. Devulapalli, D. Hangleiter, Y.-K. Liu, A. J. Kollár, A. V. Gorshkov, A. M. Childs, *Efficiently verifiable quantum advantage on near-term analog quantum simulators,* arXiv:2403.08195 (2024), PRX Quantum **6**, 010341 (2025).

17) A. Grankin, A. J. Kollár, M. Hafezi, *Extended Josephson junction qubit system,* arXiv:2309.05212 (2023), Phys. Rev. A **110** 032621 Editor's Suggestion (2024).

16) A. Fahimniya, H. Dehghani, K. Bharti, S. Matthew, A. J. Kollár, A. V. Gorshkov. M. J. Gullans, *Fault-Tolerant hyperbolic Floquet quantum error correcting codes,* arXiv:2309.10033 (2023), Quantum **9**, 1849 (2025).

15) A. Chapman, S. T. Flammia, A. J. Kollár, *Free-Fermion Subsystem Codes,* PRX Quantum **3**, 030321 (2022), arXiv:2201.07254 (2022).

14) D. M. Long, P. J. D. Crowley, A. J. Kollár, A. Chandran, *Boosting the Quantum State of a Cavity with Floquet Driving,* Phys. Rev. Lett., **128**, 183602 (2022), arXiv:2109.11553 (2021).

13) I. Boettcher, A. V. Gorshkov, A. J. Kollár, J. Maciejko, S. Rayan, R. Thomale, *Crystallography of Hyperbolic Lattices,* Phys. Rev. B, **105**, 125118 Editor's Suggestion (2022), arXiv:2105:01087 (2021).

12) P. Bienias, R. Belyansky, I. Boettcher, A. J. Kollár, A. V. Gorshkov, *Circuit Quantum Electrodynamics in Hyperbolic Space: From Photon Bound State to Frustrated Spin Models,* Phys. Rev. Lett., **128**, 013601 (2022), arXiv:2105.06490 (2021).

11) A. J. Kollár, P. Sarnak, *Gap Sets for the Spectra of Cubic Graphs*, Communications of the American Mathematical Society, **1**, 1 (2021), arXiv:2005.05379 (2020).

10) I. Carusotto, A. A. Houck, A. J. Kollár, P. Roushan, D. I. Schuster, J. Simon, *Photonic Materials in Circuit Quantum Electrodynamics,* Nature Physics **16**, 268-279 (2020).

9) E. Altman, K.R, Brown, G. Carleo, L. D. Carr, E. Demler, C. Chin, B. DeMarco, S. E. Economou, M. A. Eriksson, K. C. Fu, M. Greiner, K. R. A. Hazzard, R. G. Hulet, A. J. Kollár, B. L. Lev, M .D. Lukin, R. Ma, X. Mi, S. Misra, C. Monroe, K. Murch, Z. Nazario, K. Ni, A. C. Potter, P. Roushan, M. Saffman, M. Schleier-Smith, I. Siddiqi, R. Simmonds, M. Singh, I. B. Spielman, K. Temme, D. S. Weiss, J. Vockovic, V. Vuletic, J. Ye, M. Zwierlein, *Quantum Simulators: Architectures and Opportunities,* arXiv:1912.0638 (2019), Physical Review X Quantum **2**, 017003 (2021).

8) I. Boettcher, P. Bienias, R. Belyansky, A.J. Kollár, A.V. Gorshkov, *Quantum Simulation of Hyperbolic Space with Circuit Quantum Electrodynamics,* Physical Review A, **102** 032208 (2020, Editor's Suggestion, Featured in Physics)

7) A. J. Kollár, M. Fitzpatrick, P. Sarnak, A.A. Houck, *Line-Graph Lattices: Euclidean and Non-Euclidean Flat Bands and Implementations in Circuit QED, Communications in Mathematical Physics* **44**, 1601 (2020), arXiv:1902.02794v1 (2019).

6) A. J. Kollár, M. Fitzpatrick, A. A. Houck, *Hyperbolic Lattices in Circuit Quantum Electrodynamics, Nature* **571**, 45-49 (2019), arXiv:1802.09549.

5) V. D. Vaidya, Y. Guo, R. M. Kroeze, K. E. Ballantine, A. J. Kollár, J. Keeling, B. L. Lev, *Tunable-range, photon-mediated atomic interactions in multimode cavity QED, Physical Review X, **8***, 011002 (2018), arXiv:1708.08933.

4) F. Yang, A. J. Kollár, S. F. Taylor, R. W. Turner, B. L. Lev, *A Scanning Quantum Cryogenic Atom Microscope, Physical Review Applied,* **7,** 034026 (2017), arXiv:1608.06922.

3) A. J. Kollár, A. T. Papageorge, K. Baumann, V. D. Vaidya, Y. Guo, J. Keeling, B. L. Lev, *Supermode-Density-Wave-Polariton Condensation, Nature Communications,* **8,** 14386 (2017), arXiv:1606.04127.

2) A. T. Papageorge, A. J. Kollár, B. L. Lev, *Coupling to Modes of a Near-Confocal Optical Resonator using a Digital Light Modulator, Optics Express,* **24,** 11447 (2016), arXiv:1603.06900.

1) A. J. Kollár, A. T. Papageorge, K. Baumann, M. A. Armen, B. L. Lev, *An adjustable-length cavity and Bose-Einstein condensate apparatus for multimode cavity QED, New Journal of Physics,* **17,** 043012 (2015), arXiv:1407.3842.

INVITED TALKS

37) *The Pound-Drever-Hall Method for Superconducting Circuits*
Illinois Quantum Circuits Conference, Urbana, IL, May 2026

36) *Autonomous Stabilization and Topological Pumping in Superconducting Floquet Systems*
Quantum Interactive Dynamics, Simons Institute, Berekeley, CA, Apr 2026

35) *Autonomous Stabilization of Floquet States*
Quantum Many-body Physics Through the Lens of Error Correction Conference, Santa Barbara, CA, Sept 2025

34) *Waveguide QED with Unconventional Band Structures and Autonomous Stabilization of Floquet States in Superconducting Circuits*
QuSiED Conference, Obergurgl, Austria, Feb 2025

34) *Waveguide QED and Unconventional Band Structures in Circuit QED Lattices*
KITP Conference on Manybody Quantum Optics, Santa Barbara, CA, Oct 2024

33) *Superconducting Qubits*
Quantum Simulation (QSIM) Summer School, Kingston, RI, Aug 2024

32) *Quantum Simulation with Coplanar-Waveguide Lattices*
Quantum Information Engineering Science and Technology (QUIEST) Center opening workshop, U Penn, PA, May 2024

31) *Quantum Simulation with Coplanar-Waveguide Lattices*
APS March Meeting, Minneapolis, MN, Mar 2024

30) *Fundamental Challenges of Scaling Quantum Systems*
National Academy of Engineering Frontiers of Engineering Symposium, Boulder, Sept 2023

29) *Spatial and Temporal Lattices in Circuit QED*
DeSOEQ Program Meeting, Glasgow, UK, Jul 2023

28) *Engineering Qubit-Qubit Interactions in Circuit QED Lattices*

Waveguide QED 2023 Workshop, Erice, Italy, May 2023

27) *Circuit QED Lattices*
Aspen Winter Conference: Quantum Simulation with Quantum Hardware, Aspen, Feb 2023

26) *Circuit QED Lattices*
Circuit QED: from Quantum Devices to Analogues on Superconducting Circuits, Trento, Oct 2022

25) *Engineering Qubit-Qubit Interactions in Circuit QED Lattices*
Superconducting Quantum Networks, Vienna, Sep 2022

24) *Circuit QED Lattices*
Quantum Systems and Technology Workshop, Monte Veritá, Jun 2022

23) *Engineering Qubit-Qubit Interactions in Circuit QED Lattices*
SPICE Workshop: Non-Equilibrium Emergence in Quantum Design, Mainz, Jun 2022

22) *Band Engineering and Graph Theoretic Connections in Circuit QED*
APS March Meeting, Chicago, Mar 2022

21) *Band Engineering for Quantum Simulation in Circuit QED*
Heraeus Workshop: Lattice-Based Quantum Simulation, Dec 2021

20) *Artificial Photonic Materials in Circuit QED*
ICFO-Weizmann Summer School on the Frontiers of Light, July 2021

19) *Engineering Qubit-Qubit Interactions in Circuit QED Lattices*
SPICE Workshop on Non-Equilibrium Physics, May 2021

18) *Artificial Photonic Materials in Circuit QED*
APS DAMOP Graduate Student Symposium, May 2021

17) *Artificial Photonic Materials: Coplanar Waveguide Lattices.*
APS March Meeting Tutorials, Mar 2021

16) *Band Engineering for Quantum Simulation in Circuit QED*
Many-Body Physics in Open Quantum Systems Workshop, Jan 2021

15) *Hyperbolic Lattices in Circuit QED*
APS March Meeting, Mar 2020

14) *Band Engineering for Quantum Simulation in Circuit QED*
Southwest Quantum Information and Technology Workshop, Feb 2020

13) *Band Engineering for Quantum Simulation in Circuit QED*
IARPA LogiQ Technical Exchange Meeting, Jan 2020

12) *Band Engineering for Quantum Simulation in Circuit QED*

Gordon Research Conference on Quantum Control of Light and Matter, August 2019

11) *Band Engineering for Quantum Simulation in Circuit QED*
DAMOP, Milwaukee, May 2019

10) *Hyperbolic and Flat-Band Lattices in Circuit QED*
The Dynamics of Quantum Information KITP, September 2018

9) *Hyperbolic and Flat-Band Lattices in Circuit QED*
Gordon Research Conference on Quantum Science, Stonehill College, July 2018

8) *Hyperbolic and Flat-Band Lattices in Circuit QED*
Dynamics and Dissipation in Quantum Simulation Workshop, Stanford University, July 2018

7) *Quantum Simulation and Lattices in Circuit QED*
Workshop on 2D Quantum Metamaterials, NIST, Gaithersberg, April 2018

6) *Self-organization in multimode cavity QED and magnetometry with 1D Bose-Einstein condensates*
Quantum Innovators, Waterloo Canada, October 2016

5) *Supermode-density-wave-polariton condensation in a multimode cavity QED-BEC system*
Stanford Photonics Research Center Symposium, Stanford, September 2016

4) *Supermode-polariton condensation in a multimode cavity QED-BEC system*
International Conference on Quantum Optics, Obergurgl Austria, February 2016

3) *Beyond mean-field physics in multimode cavity QED*
POLATOM, Bad Honnef Germany, June, 2015

2) *Exploring strongly correlated matter with multimode cavity QED*
Workshop on the Physics of Quantum Electronics, Snowbird Utah, January 2012

1) *Exploring strongly correlated matter with multimode cavity QED*
Stanford Photonics Research Center Symposium, Stanford, September 2011

SEMINARS AND COLLOQUIA

26) *Autonomous Stabilization and Topological Pumping in Superconducting Floquet Systems*
Quantum seminar, Walter-Meissner Institute, Sept 2026

25) *Modulated Circuit-QED Systems: Non-reciprocal Coupling and Ultra0stable Readout using the Pound-Drever-Hall Method*
Quantum seminar, University of Rochester, Dec 2025

24) *Synthetic Lattice Systems in Circuit QED*
Colloquium, Department of Physics, UMD, Sept 2025

23) *Circuit QED Lattices: Synthetic Quantum Systems on Line Graphs*
RIT on Geometry and Physics, Departments of Mathematics and Physics, UMD, Feb 2025

22) *Lattice Systems in Circuit QED*
Physics Department Colloquium, Weslyan, Nov 2024

21) *Lattice Systems in Circuit QED*
Condensed Matter Seminar, UMN, Nov 2024

20) *Quantum Simulation with Coplanar-Waveguide Lattices*
Quantum Phenomena Seminar, NYU, Apr 2024

19) *Circuit QED Lattices: Synthetic Quantum Systems on Line Graphs*
Nalini Anantharaman Mathematics Seminar, College de France, Dec 2023

18) *Lattices in Circuit QED*
Condensed Matter Seminar, University of Connecticut, Nov 2023

17) *Lattices in Circuit QED*
Special Condensed Matter Seminar, Oxford University, July 2023

16) *Circuit QED Lattices*
AMO and Condensed Matter Seminar, Penn State, Jan 2023

15) *Circuit QED Lattices*
Condensed Matter Theory Seminar, University of Colorado Boulder, Dec 2022

14) *Circuit QED Lattices*
Center for Ultracold Atoms Seminar, Harvard/MIT, Nov 2022

13) *Circuit QED Lattices*
Quantum Materials Center Colloquium, University of Maryland, Sep 2022

12) *Circuit QED Lattices*
Condensed Matter Seminar, Columbia University, Mar 2022

11) *Circuit QED Lattices*
Physics Colloquium, University of Maryland, Feb 2022

10) *Band Engineering for Quantum Simulation in Circuit QED*
Condensed Matter Seminar, Niels Bohr Institute, Oct 2021

9) *Band Engineering for Quantum Simulation in Circuit QED*
IBM Quiskit Seminar Series, July 2021

8) *Band Engineering for Quantum Simulation in Circuit QED*
Colloquium, Dept. of Physics, University of Trento, Apr 2021

7) *Circuit QED Lattices: Synthetic Quantum Systems on Line Graphs*
Tutte Colloquium, Dept. of Combinatorics and Optimization, University of Waterloo, Apr 2021

6) *Band Engineering for Quantum Simulation in Circuit QED*
IQUIST Seminar, University of Illinois Urbana-Champaign, Oct 2020

5) *Band Engineering for Quantum Simulation in Circuit QED*
Condensed Matter Seminar, University of Pittsburgh, October 2019

5) *Hyperbolic and Flat-Band Lattices in Circuit QED*
Condensed Matter Seminar, City University of New York, December 2018

4) *Hyperbolic and Flat-Band Lattices in Circuit QED*
AMO/QI Seminar, University of California Berkeley, October 2018

3) *Hyperbolic and Flat-Band Lattices in Circuit QED*
Seminar, University of Massachusetts, Amherst, March 2018

2) *Hyperbolic and Flat-Band Lattices in Circuit QED*
JQI Seminar, University of Maryland, February 2018

1) *Supermode-polariton condensation in a multimode cavity QED-BEC system*
Applied Physics Optics and Electronics Seminar, Stanford, January 2016

SYNERGISTIC AND OUTREACH ACTIVITIES:

Co-Associate Director for Research: NSF QLCI for Robust Quantum Simulation 2024-2026

Member: APS DAMOP Executive Committee and Nominating Committee 2022-2024

Founder: UMD Undergraduate Pre-Colloquium Tutorial and Undergraduate Guided Lecture Program

Board member of Virtual AMO Seminar (VAMOS) 2020-2021

Organizer of Princeton Quantum Group Meeting student seminar series 2018-2019

Organizer of Aspen Winter Conference “Many-body Cavity QED” 2021

Program Committee Member – SPIE Photonics West 2022, 2023

Undergraduate senior thesis and summer research supervisor

Reviewer for Nature Communications, Optics Letters, Physical Review X, Physical Review Letters, Physical Review A, New Journal of Physics, Nature

Lecturer for Phys 170 Professional Physics Seminar introducing college freshman to modern physics research topics.

Undergraduate research poster contest judge

Chair of PhD Defense Committee (Ana Valdés-Curiel, supervisor: Dr. Ian Spielman)

Member: Graduate Qualifying Exam and Education Requirements Committee

Member: Physics Department Climate Committee 2020-2021

Member: NSF QLCI for Robust Quantum Simulation executive committee

Presenter: NSF “Quantum on the Hill” showcase

Member of Advisory and Planning Committee for interdisciplinary minor in quantum science.

Review of Undergraduate quantum curriculum across natural sciences and engineering colleges. Design of Syllabus for 1-semester quantum for non-physics majors as part of new minor in Quantum Sciences.

Designed lab modules for interdisciplinary quantum teaching laboratory in quantum science and technology. Supervised undergraduates (Summer 2023, 2024) and PhD student (Summer 2024) constructing and testing out 3 separate modules.