# Adam M. Kaufman


CONTACT INFORMATION

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APPOINTMENTS

**JILA, University of Colorado Boulder**, Boulder, CO, USA

*Associate JILA fellow, Assistant professor adjoint* **July 2017 to present**

- Principle investigator in quantum science with ultracold atoms.

**Harvard University**, Cambridge, MA, USA

*Postdoctoral Research Fellow* **July 2015 to July 2017**

- Advisor: Markus Greiner

**JILA and University of Colorado**, Boulder, CO, USA

*Research Associate* **August 2009 to May 2015**

- Advisor: Cindy Regal

**Amherst College**, Amherst, MA, USA

*Research assistant* **June 2007 to June 2009**

- Advisor: David Hall

EDUCATION

**University of Colorado**, Boulder, CO, USA

Ph.D., Physics, May 2015

- Thesis: *Laser cooling to indistinguishability: atomic Hong-Ou-Mandel interference and entanglement through spin exchange.*
- Advisor: Professor Cindy A. Regal
- Thesis committee: Cindy A. Regal, Ana Maria Rey, Deborah S. Jin, David J. Wineland, Juan Restrepo
- Area of Study: Ultracold quantum gases, quantum control, optical tweezers, laser cooling

**Amherst College**, Amherst, MA, USA

B.A., Physics and Computer Science, May 2009

- Thesis: *Radio-frequency dressing of atomic Feshbach resonances.*
- Thesis distinction: nominated for *summa cum laude* by the department of physics.
- Advisor: Professor David S. Hall
- Area of Study: Ultracold quantum gases, ultracold collisions, superfluid vortices

AWARDS

ONR Young Investigator Award, 2020

American Physical Society Division of AMO Physics (DAMOP) thesis prize winner, 2016

Finalist for Harvard Quantum Optics Center fellowship

International Conference on Atomic Physics 2014, poster prize

National Defense Science and Engineering Graduate Fellowship, awarded 2011, funded 2012-2014

Sigma Xi Procter grant-in -aid of research (GIAR) prize, nominated by Deborah S. Jin, 2010

## Referee experience

Science, Nature, Nature Communications, Physical Review Letters, Physical Review X, Physical review A,

## Publications (Most recent first)

M. Zaletel, **A. M. Kaufman**, D. S. Kurn, and N. Yao,*P*reparation of Low Entropy Correlated Many-Body States via Conformal Cooling Quenches*Phys. Rev. Lett.* **126**, 103401 (2021).

J. T. Young, P. Bienias, R. Belyansky, **A. M. Kaufman**, A, V. Gorshkov, *Asymmetric blockade and multi-qubit gates via dipole-dipole interactions*, *arXiv:2006.02486*

A. W. Young, W. J. Eckner, W. R. Milner, D. Kedar, M. A. Norcia, E. Oelker, N. Schine, J. Ye, **A. M. Kaufman**, *A tweezer clock with half-minute atomic coherence at optical frequencies and high relative stability*, *Nature,* **588**, 408 (2020)

R. Belyansky, J. T. Young, P. Bienias, Z. Eldredge, **A. M. Kaufman**, P. Zoller, *Non-destructive cooling of an atomic quantum register via state-insensitive Rydberg interactions*, *Phys. Rev. Lett.* **123**, 213603 (2019).

R. Kaubruegger, P. Silvi, C. Kokail, R. V. Bijnen, A. M. Rey, J. Ye, **A. M. Kaufman**, P. Zoller, *Variational Spin-Squeezing Algorithms on Programmable Quantum Sensors*, *Phys. Rev. Lett.* **123**, 260505 (2019).

M. A. Norcia, A. W. Young, W. Eckner. E. Oelker, J. Ye, **A. M. Kaufman** *Seconds-scale coherence on an optical clock transition in a tweezer array*, *Science,* **366**, 6461 (2019)

R. Swan, A. Safavi-Naini, **A. M. Kaufman**, Ana Maria Rey, *Dynamics of quantum information*, *Nature reviews physics*, 2019

J. Cotler, S. Choi, A. Lukin, H. Gharibyan, T. Grover, M. E. Tai, M. Rispoli, R. Schittko, P. M. Preiss, **A. M. Kaufman**, M. Greiner, H. Pichler, P. Hayden, *Quantum Virtual Cooling*, *Phys. Rev. X* **9**, 031013 (2019).

M. A. Norcia, A. W. Young, **A. M. Kaufman**, Microscopic control and detection of ultracold strontium in optical tweezer arrays, *Phys. Rev. X* **8**, 041054 (2018).
- Physics viewpoint: *Viewpoint: Alkaline Atoms Held with Optical Tweezers*
- Nature news and views: *The next step in making arrays of single atoms*

A. Lukin, M. Rispoli, R. Schittko, M. E. Tai, **A. M. Kaufman**, S. Choi, V. Khemani, J. Lonard, M. Greiner Probing entanglement in a many-body-localized system, *Science,* **364**, 6437 2019

**A. M. Kaufman**, M. C. Tichy, F. Mintert, A. M. Rey, C. A. Regal, *The Hong-Ou-Mandel effect with atoms*, AAMOP Volume 67: Chapter 7, 2018

B. J. Lester, Y. Lin, M. O. Brown, **A. M. Kaufman**, R. J. Ball, E. Knill, A. M. Rey, C. A. Regal, *Measurement-based entanglement of non-interacting bosonic atoms*, *Phys. Rev. Lett.* **120**, 193602 (2017).

L. Isaev, **A. M. Kaufman**, G. Ortiz, A. M. Rey *Topological superfluidity with repulsive alkaline-earth atoms in optical lattices*, arXiv:1710.02768

Y. He, F. Grusdt, **A. M. Kaufman**, M. Greiner, A. Vishwanath, *Realizing and adiabatically preparing bosonic integer and fractional quantum hall states in optical lattices*, Phys. Rev. B. **96**, 201103(R) (2017).

M. E. Tai, A. Lukin, M. Rispoli, R. Schittko, Tim Menke, P. M. Preiss, Fabian Grusdt, **A. M. Kaufman**, and M. Greiner, *Microscopy of the interacting Harper-Hofstadter model in the two-body limit*, *Nature* **546**, 519 (2017).
- Nature news and views: *Quantum physics: interactions propel a magnetic dance*

**A. M. Kaufman**, M. E. Tai, A. Lukin, M. Rispoli, R. Schittko, and M. Greiner, *Quantum thermalization through entanglement in an isolated many-body system*, *Science* **353**, 794 (2016).
- Science perspective: *Thermalization in small quantum systems*

**A. M. Kaufman**, and C. A. Regal, *Viewpoint: Electron model capture by Atom Pair*, *Physics* **8**, 16 (2015).

**A. M. Kaufman**, B. J. Lester, M. Foss-Feig, M. Wall, A. M. Rey, and C. A. Regal, *Entangling two transportable neutral atoms via local spin exchange*, Nature **527**, 208 (2015).

B. J. Lester, N. Luick, **A. M. Kaufman**, C. M. Reynolds, and C. A. Regal, *Rapid Production of Uniformly Filled Arrays of Neutral Atoms*, Phys. Rev. Lett. **115**, 073003 (2015).

B. J. Lester, **A. M. Kaufman**, C. A. Regal, *Raman cooling imaging: Detecting single atoms near their ground state of motion*, *Phys. Rev. A* **90**, 011804(R) (2014).

**A. M. Kaufman**, B. J. Lester, C. M. Reynolds, M. L. Wall, M. Foss-Feig, K. R. A. Hazzard, A. M. Rey, C. A. Regal, *Two-particle quantum interference in tunnel-coupled optical tweezers*, *Science* **345**, 306 (2014).
- Science perspective: *Quantum systems under control*

**A. M. Kaufman**, B. J. Lester, C. A. Regal, *Cooling a Single Atom in an Optical Tweezer to Its Quantum Ground State*, *Phys. Rev. X* **2**, 041014 (2014).
- Nature research highlight: *Atom cooled to ground state*
- Science Editors Choice: *A single-atom lasso*

D. V. Freilich, D. M. Bianchi, **A. M. Kaufman**, T. K. Langin, D. S. Hall, *Real-Time Dynamics of Single Vortex Lines and Vortex Dipoles in a Bose-Einstein Condensate*, *Science* **329**, 1182 (2010).

**A. M. Kaufman**, R. P. Anderson, T. Hanna, E. Tiesinga, P. S. Julienne, D. S. Hall, *Radio-frequency dressing of multiple Feshbach resonances*, *Phys. Rev. A* **80**, 050701(R) (2009).

## Presentations (Most recent first)

Invited Colloquium, Heidelberg University, January 2021: *Quantum metrology in optical tweezer arrays*

Invited presentation,Israel Quantum Computing Community (Qubit), January 2021: *Atoms arrays of ultracold strontium: new tools for many-body physics and metrology*

Invited presentation, OSA Quantum 2.0, September 2020: *Atoms arrays of ultracold strontium: new tools for many-body physics and metrology*

Invited Colloquium, CQT Singapore, June 2020: *Atoms arrays of ultracold strontium: new tools for many-body physics and metrology*

Invited talk, Virtual AMO Seminar, April 2020: *Atoms arrays of ultracold strontium: new tools for many-body physics and metrology*

Invited talk, Stanford University, QFARM, April 2020: *Atoms arrays of ultracold strontium: new tools for many-body physics and metrology*

Invited talk, March Meeting, March 2020: *Atoms arrays of ultracold strontium: new tools for many-body physics and metrology* Cancelled - COVID-19

Invited talk, PQE, January 2020: *Atoms arrays of ultracold strontium: new tools for many-body physics and metrology*

Invited seminar, Hamburg University, Dec. 2019: *Atoms arrays of ultracold strontium: new tools for many-body physics and metrology*

Invited colloquium, University Nevada Reno, Sept 2019: *Atoms arrays of ultracold strontium: new tools for many-body physics and metrology*

Invited talk, FiO/Ls conference, Sept. 2019: *Frontiers in Optical Atomic Clocks: Challenges, New Platforms, and Entanglement*

Invited talk, BEC conference, Sept. 2019: *Atom arrays of ultracold strontium: new tools for many-body physics and metrology*

Invited talk, DAMOP, June 2019: *Microscopic control and detection of ultracold strontium in optical arrays: new tools in quantum information science and metrology*

Invited talk, CQuIC seminar UNM, 2019: *Microscopic control and detection of ultracold strontium in optical arrays: new tools in quantum information science and metrology*

Invited talk, 13th Japan-US Joint Seminar on Quantum Electronics and Laser Spectroscopy, October 2018: *Microscopic control of ultracold strontium*

Invited talk, MPQ, Seminar, May 2018: *Studies in entanglement with ultracold neutral atoms*

Invited talk, ETH, May 2018: Colloquium *Synthesizing, controlling, and probing quantum states through microscopy*

Invited talk, KITP Frontiers of Quantum information, 2017: *Studies in entanglement through microscopy of ultracold neutral atoms*

Invited talk, March meeting, 2017: *Quantum thermalization through entanglement*

Invited colloquium, Columbia, 2017: *Synthesizing and probing quantum states of low-entropy atomic systems*

Invited colloquium, BU, 2017: *Synthesizing and probing quantum states of low-entropy atomic systems*

Invited colloquium, JILA, 2017: *Synthesizing and probing quantum states of low-entropy atomic systems*

Invited colloquium, Princeton, 2017: *Synthesizing and probing quantum states of low-entropy atomic systems*

Invited colloquium, Harvard, 2016: *Synthesizing and probing quantum states of low-entropy atomic systems*

Invited colloquium, UCSB, 2016: *Synthesizing and probing quantum states of low-entropy atomic systems*

Invited seminar, Stanford, 2016: *Quantum thermalization through entanglement*
Invited, QCMC, Singapore, 2016: *Atomic to generalized Hong-Ou-Mandel interference: probing entanglement in the dynamics of many-body systems*
Invited, Quantum Lunch, Los Alamos, 2016: *Quantum thermalization through entanglement*
Invited, DAMOP thesis prize session, 2016: *Laser cooling atoms to indistinguishability*
Contributed talk, SQUINT, 2016: *A self-thermalizing quantum many-body state*
Invited Talk, Snowbird, 2016: *Measuring entanglement entropy in a thermalizing many-body state*
Seminar, Yale University, 2015: *Interfering and entangling single neutral atoms*
Invited seminar, Amherst College, 2015: *Two-particle quantum interference in tunnel coupled optical tweezers*
Contributed talk, SQUINT, 2015: *Interfering and entangling single neutral atoms*
Invited talk, Harvard, 2015: *Interfering and entangling single neutral atoms*
Poster, International Conference on Atomic Physics, Washington DC, 2014: *Two-particle quantum interference in tunnel coupled optical tweezers*
Invited seminar, Harvard, Boston MA (2014): *Two-particle quantum interference in tunnel coupled optical tweezers*
Invited seminar, ETH, Zurich (2014): *Two-particle quantum interference in tunnel coupled optical tweezers*
Invited seminar, Heidelberg University, Germany, 2014: *Two-particle quantum interference in tunnel coupled optical tweezers*
Invited seminar, Hamburg University, Hamburg Germany (2014): *Two-particle quantum interference in tunnel coupled optical tweezers*
Contributed talk, APS March Meeting, Denver CO (2014): *Hong-Ou-Mandel effect in tunnel-coupled optical tweezers*
Poster, Bose-Einstein Condensation - Frontiers in Quantum Gases, Sant Feliu De Guixols, Spain 2013: *Laser-cooled atoms in optical tweezers: Coherent tunneling Bose Statistics*
Contributed talk, DAMOP, Quebec City, Canada, 2013: *Experiments with laser cooled, ground-state atoms in optical tweezers*
Contributed talk, DAMOP, Orange County, California, 2012: *Raman sideband cooling of a single neutral atom in a micro scale dipole trap*
Seminar, JQI, University of Maryland (2012): *Cooling a single atom to its quantum ground state*
Invited seminar, NIST, Boulder CO, 2012: *Raman sideband cooling of a single neutral atom in an optical tweezer*
Poster, QIPC, ETH Zurich, 2011: *Towards ultracold single neutral atoms in microscale optical dipole traps*
Poster, ICAP, Cairns Australia, 2010: *Radio-frequency dressing of multiple Feshbach Resonances*