

# Alexey V. Gorshkov

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## Education

- Mar '10 **Ph.D. Physics**, *Harvard University*, Thesis: Novel Systems and Methods for Quantum Communication, Quantum Computation, and Quantum Simulation, Advisor: Mikhail D. Lukin.
- Jun '06 **A.M. (Master of Arts) Physics**, *Harvard University*.
- Jun '04 **A.B. (Bachelor of Arts) Physics and Mathematics**, *Harvard University*.  
Summa Cum Laude

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## Appointments

- Oct '14– **Fellow**, *Joint Center for Quantum Information and Computer Science (QIICS)*.
- Aug '13– **Fellow**, *Joint Quantum Institute (JQI)*.
- Aug '13– **Physicist**, *Quantum Measurement Division, National Institute of Standards and Technology (NIST)*.
- Oct '23– **Adjunct Professor**, *University of Maryland Institute for Advanced Computer Studies (UMIACS)*.
- Sep '23– **Adjunct Professor**, *University of Maryland Department of Physics*.
- Oct '20–Oct '23 **Adjunct Associate Professor**, *University of Maryland Institute for Advanced Computer Studies (UMIACS)*.
- Jan '19–Sep '23 **Adjunct Associate Professor**, *University of Maryland Department of Physics*.
- Aug '13–Dec '18 **Adjunct Assistant Professor**, *University of Maryland Department of Physics*.
- Sep '10–Aug '13 **Lee A. DuBridge Postdoctoral Scholar in Theoretical Physics**, *Institute for Quantum Information and Matter (IQIM) at the California Institute of Technology*.
- Jan '10–Aug '10 **Postdoctoral Fellow in Physics**, *Harvard University Physics Department*.

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## Teaching Experience

- Fall 2015 **Atomic and Optical Physics I**.  
Co-teaching with Ian Spielman at the University of Maryland Department of Physics
- Fall 2014 **Atomic and Optical Physics I**.  
Co-teaching with Ian Spielman at the University of Maryland Department of Physics

- Fall 2008 **Topics in the Physics of Quantum Information.**  
Teaching fellow (unofficial) at the Harvard University Department of Physics
- Fall 2007 **Modern Atomic and Optical Physics.**  
Teaching fellow at the Harvard University Department of Physics  
Earned a Certificate of Distinction in Teaching
- Spring 2002 **Multivariable Calculus.**  
Course assistant at the Harvard University Department of Mathematics
- Fall 2001 **Linear Algebra.**  
Course assistant at the Harvard University Department of Mathematics

## Honors and Awards

- '23 Samuel Wesley Stratton Award, considered to be NIST's highest award for fundamental research. *Citation: For original, fundamental contributions to the understanding, design, and control of large interacting quantum systems, with applications that include quantum computers, quantum sensors, and quantum networks.*
- '22 Optica Fellow. *Citation: For fundamental contributions to the understanding and control of large, interacting quantum systems, with applications including quantum-computing, sensing, and networks.*
- '22 Washington Academy of Sciences Excellence in Research Award in Physical and Information Sciences. *Citation: In recognition for pioneering, fundamental contributions to the understanding, design, and control of large, interacting quantum systems, with applications including quantum computers, quantum sensors, and quantum networks.*
- '20 Arthur S. Flemming Award
- '20 Fellow of the American Physical Society. *Citation: For contributions to the understanding, design, and control of quantum many-body atomic, molecular, and optical systems and their applications to phase transitions, entanglement generation and propagation, synthetic magnetism, and quantum memory and simulation.*
- '19 Presidential Early Career Award for Scientists and Engineers (PECASE). *Citation: For pushing the frontiers of quantum science through groundbreaking research, including manipulating individual light particles to strongly interact—something they do not naturally do, and which was recognized by "Physics World" as one of the top ten breakthroughs of 2013.*
- '18 IUPAP (International Union of Pure and Applied Physics) Young Scientist Prize in Atomic, Molecular, and Optical Physics. *Citation: For his outstanding contributions on quantum properties of interacting cold atoms, cold dipolar matter, quantum optics, quantum transduction, and quantum simulations.*
- '21 Nominated for the Graduate Faculty Mentor of the Year Award at the University of Maryland (one of 22 nominees out of more than 1500 faculty members)
- '22 Fellow of the Washington Academy of Sciences
- '10-'13 Lee A. DuBridge Postdoctoral Fellowship from the California Institute of Technology
- '11 One of four finalists for the 2011 Thesis Prize from the APS Division of AMO Physics
- '08 Graduate Society Merit Fellowship (John Parker Bequest Scholarship)

- '08 Gertrude and Maurice Goldhaber Prize to an outstanding graduate student
- '07 Certificate of Distinction in Teaching
- '04-'07 National Science Foundation Graduate Research Fellowship
- '05 Robbins Prize from the Harvard University Physics Department
- '04 Dr. Jack T. Sanderson Memorial Prize from Harvard College for excellence in the study of physics
- '03 Elected to Harvard's chapter of Phi Beta Kappa in the fall of senior year (one of the top 72 students out of the senior class of about 2000)
- '02-'03 Harvard College Scholarship for superior academic achievement
- '00-'02 John Harvard Scholarship for academic achievement of the highest distinction
- '01 Detur Prize from Harvard College for very high academic standing
- '97 2nd place in the All-Russian Mathematics Olympiad

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### Press (reference number corresponds to the publications list below)

- '13 Our work on the realization of attractive and massive photons was chosen by Physics World as one of ten breakthroughs of 2013. It was also featured by CNN, the Guardian, and numerous other news media [41].
- '17 Our work on the observation of a dynamical phase transition with a 53-qubit quantum simulator was featured by Gizmodo, International Business Times, Discover Magazine, Science Daily, and numerous other news media [83].
- '18 Our work on the observation of three-photon bound states in a quantum nonlinear medium was featured by Newsweek and numerous other news media [84].
- '13 Our work on the use of an optical clock to study spin models was featured by the New Scientist, ElectronicsWeekly.com, Science World Report, and other news media [38].
- '21 Our work on domain-wall confinement was featured in Nature Physics News & Views [120].
- '20 Our work on simulating hyperbolic space was selected as an Editors' Suggestion and was featured in a Physics Synopsis and by Phys.org, SciTechDaily, and numerous other news media [116].
- '20 Our work on symmetry breaking and error correction in open quantum systems was featured by theregister.com, qubitreport.com, medium.com and numerous other news media [137].
- '23 Our work [179] on complexity phase transitions generated by entanglement was briefly discussed in the Quanta magazine: <https://www.quantamagazine.org/the-quest-to-quantify-quantumness-20231019/>
- '21 Our work on optimal state transfer and entanglement generation in power-law interacting systems was featured by phys.org, insidequantumtechnology.com, acm.org and numerous other news media [139].

- '14 Our experimental work [44] on the non-local propagation of correlations and our theoretical work [45] on the persistence of locality in systems with power-law interactions were featured by Science Daily, Newswise, Nanowerk, and other news media.
- '15 Our work on nearly linear light cones in long-range interacting quantum systems was featured by Science Daily, Nanotechnology Now, Phys.org, Scientific Computing, R&D Magazine, the ECN Magazine, and other news media [49].
- '19 Our work on a fluctuation-induced torque on a topological insulator out of thermal equilibrium was selected as an Editors' Suggestion and featured in a Physics Synopsis and by Phys.org and the Science Bulletin [103].
- '20 Our work on the hierarchy of linear light cones with long-range interactions was featured in a Physics Viewpoint and by opli.net [121].
- '15 Our work on Coulomb bound states of strongly interacting photons was selected as an Editors' Suggestion and was featured by Optics & Photonics News (OPN), photonics.com, and numerous other news media [52].
- '21 Our work on quench dynamics of a fermi gas with strong long-range interactions was featured in a Physics Viewpoint [140].
- '18 Our work on photon subtraction by many-body decoherence was selected as an Editors' Suggestion and featured by Science Daily [90].
- '18 Our work on realizing a dark state optical lattice with sub-wavelength spatial structure was featured in a Physics Viewpoint and selected as an Editors' Suggestion [91].
- '11 Our work on simulating a generalized  $t$ - $J$  model with ultracold polar molecules was featured in a Physics Synopsis [25,26].
- '13 Our work on realizing fractional Chern insulators with dipolar spins was featured in a Physics Viewpoint and selected as an Editors' Suggestion [37].

## Patents and Patent Applications

- 18. A. V. Gorshkov, Y.-A. Chen, Y. Xu,  
*Error-correcting Codes for Fermionic Quantum Simulation*,  
U.S. Provisional Patent Application 63/589409, filed October 11, 2023.  
Based on publication [176] below.
- 17. A. V. Gorshkov, M. J. Gullans, J. V. Porto, C. Fechin, K. Sharma, P. Bienias, S. L. Rolston,  
*Systems, Devices, and Methods for a Non-Demolition Photon Counter using a 2D Rydberg Atom Array*,  
U.S. Provisional Patent Application 63/520087, filed August 16, 2023.  
Based on publication [177] below.
- 16. S. Lieu, Y.-J. Liu, A. V. Gorshkov,  
*Passive quantum memory*,  
U.S. Provisional Patent Application 63/467705, filed May 19, 2023.  
Based on publication [168] below.

15. A. Guo, J. T. Young, R. Belyansky, P. Bienias, A. V. Gorshkov,  
*Experimental Roadmap for Optimal State Transfer and Entanglement Generation in Power-Law Systems*,  
U.S. Provisional Patent Application 63/378210, filed Oct 3, 2022.
14. K. C. Cox, P. Bienias, D. H. Meyer, D. P. Fahey, P. D. Kunz, A. V. Gorshkov,  
*Spin wave quantum computer*,  
U.S. Patent Application 18370411, filed Sep 20, 2023.  
Based on publications [160,161] below.
13. A. Ehrenberg, J. Bringewatt, A. V. Gorshkov,  
*Minimum Entanglement Protocols for Function Estimation*,  
U.S. Patent Application 18232890, filed Aug 11, 2023.  
Based on publication [162] below.  
Nominated as a finalist for University of Maryland's Invention of the Year awards for 2022.
12. J. Bringewatt, I. Boettcher, P. Niroula, P. Bienias, A. V. Gorshkov,  
*Measurement of Multiple Functions with Quantum Sensor Networks*,  
U.S. Patent Application 18136257, filed Apr 18, 2023.  
Based on publication [151] below.
11. A. Bapat, A. M. Childs, A. V. Gorshkov, S. King, E. Schoute, H. Shastri,  
*Quantum routing with fast reversals*,  
U.S. Patent Application 18178491, filed Mar 3, 2023.  
Based on publication [147] below.
10. J. Bringewatt, P. Bienias, T. Qian, I. Boettcher, A. V. Gorshkov,  
*System and Method for Measurement of Field Properties Using Quantum Sensor Networks*,  
U.S. Patent Application 17978420, filed Nov 1, 2022.  
Based on publication [142] below.
9. M. C. Tran, A. Deshpande, A. Y. Guo, A. Lucas, A. V. Gorshkov,  
*Systems and Methods for Optimal State Transfer and Entanglement Generation in Power-Law Interacting Systems*,  
U.S. Patent Application 17959901, filed Oct 4, 2022.  
Based on publication [139] below.
8. L. T. Brady, L. Kocia, P. Bienias, A. Bapat, Y. Kharkov, A. V. Gorshkov,  
*Performing Bang-Anneal-Bang Quantum Optimization*,  
International Patent Application PCT/US22/29038, filed May 12, 2022.  
U.S. Patent Application 18560591, filed Nov 13, 2023.  
Based on publication [156] below.
7. A. Bapat, E. Schoute, A. V. Gorshkov, A. M. Childs,  
*Performing State Reversal on a Quantum Spin Chain*,  
U.S. Patent Application 17669946, filed Feb 11, 2022.  
Based on publication [123] below.

6. A. Lucas, M. C. Tran, A. Ehrenberg, A. Y. Guo, A. Deshpande, A. V. Gorshkov, Z.-X. Gong, C.-F. Chen, Y. Hong,  
*Quantum State Transfer*,  
U.S. Patent Application 17574301, filed Jan 12, 2022.  
Based on publication [121] below.
5. J. T. Young, P. Bienias, R. Belyansky, A. M. Kaufman, A. V. Gorshkov,  
*Qubit gate and producing a generalized controlled-not gate*,  
U.S. Patent Application 17531652, filed Nov 19, 2021.  
Based on publication [129] below.
4. K. Qian, Z. Eldredge, W. Ge, G. Pagano, C. Monroe, J. V. Porto, A. V. Gorshkov,  
*Heisenberg Scaler*,  
U.S. Patent 11,562,049, filed Nov 8, 2019, issued Jan 24, 2023.  
Based on publication [104] below.
3. A. V. Gorshkov, M. Foss-Feig, Z. Eldredge, S. L. Rolston,  
*Determining a Modal Amplitude of an Inhomogeneous Field with a Quantum Sensor*,  
U.S. Patent 10,007,885, filed Jul 14, 2017, issued Jun 26, 2018.  
Based on publication [73] below.
2. A. V. Gorshkov, M. Foss-Feig, Z. Eldredge, Z.-X. Gong, A. Hamed Moosavian, J. T. Young,  
*Fast Entangled State Generation and Quantum Information Transfer in Quantum Systems with Long-Range Interactions*,  
U.S. Patent 10,432,320, filed Nov 2, 2017, issued Oct 1, 2019;  
World Intellectual Property Organization Patent WO/2018/106506, publication date Jun 14, 2018.  
Based on publication [76] below.
1. N. Y. Yao, L. Jiang, A. V. Gorshkov, P. C. Maurer, G. Giedke, J. I. Cirac, M. D. Lukin,  
*Scalable Room Temperature Quantum Information Processor*,  
U.S. Patent 9,317,473, filed Dec 14, 2011, issued Apr 19, 2016;  
World Intellectual Property Organization Patent WO/2012/082938, publication date Jun 21, 2012.  
Based on publication [29] below.

## Students and Postdocs

- Sep '13–Dec '16 Mohammad Maghrebi, postdoc; currently Assistant Professor at Michigan State University
- Jun '13–Dec '17 Zhexuan Gong, postdoc and research currently Assistant Professor at the Colorado School of Mines
- Sep '16–Sep '17 Sergey Syzranov, postdoc, co-advised; currently Assistant Professor at the University of California, Santa Cruz
- Aug '16–Apr '19 Paraj Titum Bhattacharjee, postdoc and NRC postdoc; currently Quantum Information Scientist at The Johns Hopkins University Applied Physics Laboratory

- Sep '16–Jan '21 Rex Lundgren, NRC postdoc, postdoc, and research scientist; currently Engineering and Physics Sciences Researcher at the NSA Laboratory for Physical Sciences
- Oct '18–Jan '21 Igor Boettcher, postdoc; currently Assistant Professor at the University of Alberta, Canada
- Sep '19–Jun '21 Oles Shtanko, Theoretical Quantum Optics Postdoctoral Fellow, co-advised; currently postdoctoral researcher at IBM
- Aug '16–Oct '21 James Garrison, NRC postdoc, postdoc, and research scientist; currently quantum developer at IBM
- Oct '16–Nov '21 Przemyslaw Bienias, postdoc and research scientist; currently Quantum Research Scientist at AWS
- Sep '18–Feb '22 Lucas Brady, NRC postdoc, co-advised; currently Sr. Research Scientist at the NASA QuAIL group
- July '21–Jan '22 Kunal Sharma, Hartree Postdoctoral Fellow, co-advised; currently Research Staff Member at IBM
- July '19–Apr '22 Yaroslav Kharkov, postdoc and research scientist; currently Senior Applied Scientist at AWS
- Aug' 19–Jun '22 Zhicheng Yang, postdoc, co-advised; currently Assistant Professor at Peking University
- Sep '19–Oct '22 Simon Lieu, NRC postdoc; currently Research Scientist at AWS
- Nov '21–Sep '22 Kishor Bharti, postdoc; currently Scientist at the Institute of High Performance Computing (IHPC) in Singapore
- Sept '19–Nov '22 Luis Pedro García-Pintos, postdoc, co-advised; currently Staff Scientist at Los Alamos National Laboratory
- Sep '18–Mar' 23 Seth Whitsitt, NRC postdoc and research scientist, currently Sr. Principal Transformational Quantum Physicist at Northrop Grumman
- Dec '18–Jul '23 Chris Baldwin, NRC postdoc and research scientist, co-advised; currently Assistant Professor at Michigan State University
- May '22 – Sep '23 Eleanor “Ella” Crane, postdoc, co-advised; currently postdoc at MIT
- Aug '21– Ali Fahimniya, postdoc
- Aug '21– Brayden Ware, NRC postdoc
- Jan '22 – Alex Cojocaru, postdoc, co-advised
- May '22 – Alexander Schuckert, Theoretical Quantum Optics Postdoctoral Fellow, co-advised
- Sep '23 – Emil Khabiboulline, NRC postdoc
- Sep '14–May '19 Zachary Eldredge, Ph.D. student; currently Technology Manager at the Department of Energy’s Solar Energy Technologies Office
- Jun '14–May '20 Jeremy Young, Ph.D. student; currently NRC postdoc at JILA
- Sep '15–Jul '21 Fangli Liu, Ph.D. student; currently Research Scientist at QuEra
- Sep '15–Aug '21 Abhinav Deshpande, Ph.D. student; currently IQIM Postdoctoral Scholar at Caltech
- Sep '16–Aug '21 Minh Tran, Ph.D. student, co-advised; currently postdoc at the MIT Center for Theoretical Physics

- Jun '14–Aug '21 Yidan Wang, Ph.D. student; currently postdoc at Harvard University
- Sep '16–Aug '21 Aniruddha Bapat, Ph.D. student, co-advised; currently postdoc at the Lawrence Berkeley National Laboratory
- Sep '16–Mar '23 Andrew Guo, Ph.D. student, co-advised; currently postdoc at Sandia National Laboratory
- Jan '18–Jul '23 Ron Belyansky, Ph.D. student; currently Chicago Prize Postdoctoral Fellow in Theoretical Quantum Science
- Sep '19–Jul '23 Pradeep Niroula, Ph.D. student, co-advised; currently Applied Research Associate at J.P. Morgan
- Sep '16– Su-Kuan Chu, Ph.D. student
- Sep '18– Adam Ehrenberg, Ph.D. student
- Sep '18– Jacob Bringewatt, Ph.D. student
- Sep '19– Dhruv Devulapalli, Ph.D. student, co-advised
- Sep '20– Joseph Iosue, Ph.D. student, co-advised
- Jun '21– Sharoon Austin, Ph.D. student
- Jun '21– Jeet Girish Shah, Ph.D. student, co-advised
- Jun '21– Christopher Fechisin, Ph.D. student, co-advised
- Aug '21– Elizabeth Bennewitz, Ph.D. student
- Aug '21– Daniel Spencer, Ph.D. student
- Aug '22– Timothy “Connor” Mooney, Ph.D. student, co-advised
- Aug '22– Jeffery Yu, Ph.D. student, co-advised
- Aug '23– Thomas Steckmann, Ph.D. student, co-advised
- Aug '23– Alexandra Behne, Ph.D. student
- Jun–Oct '11 Kevin Kuns, undergraduate summer student (California Institute of Technology), currently postdoc at MIT
- May–Aug '16 Pradeep Niroula, Harvard undergraduate spent summer at the University of Maryland, currently graduate student at the University of Maryland
- Jun–Aug '17 Joseph Iosue, MIT undergraduate spent summer at the University of Maryland, currently graduate student at the University of Maryland
- Jun–Sep '18 Nishad Maskara, Caltech undergraduate spent summer at the University of Maryland, currently graduate student at Harvard
- Jun–Sep '18 Kevin Wang, Stanford undergraduate spent summer at the University of Maryland, currently MSc candidate at the University of Oxford
- Jul–Sep '19 Marcin Kalinowski, University of Warsaw undergraduate student spent summer at the University of Maryland, currently graduate student at Harvard
- Jun–Aug '20 Hrishee Shastri, Reed College undergraduate spent time at the University of Maryland, co-advised
- Jun–Aug '20 Samuel King, University of Rochester undergraduate spent time at the University of Maryland, co-advised



- Jun–Aug '21 Nicole Dong, UC Boulder undergraduate spent time (virtually) at the University of Maryland, co-advised
- Jun–Aug '21 Sam DeCoster, Georgia Tech undergraduate spent time (virtually) at the University of Maryland, co-advised
- Jun–Aug '21 Mason Wittman, Kansas State University undergraduate spent time (virtually) at the University of Maryland, co-advised
- Jun–Aug '22 Akshita Gorti, Cornell undergraduate spent time at the University of Maryland
- Jun '22–Aug '22 Ruozhen Gong, Mount Holyoke College undergraduate spent time at the University of Maryland
- Jun '22–Aug '22 Wentai Deng, Peking University undergraduate spent time (virtually) at the University of Maryland
- Apr '21–Aug '23 Weiyuan Gong, Tsinghua University undergraduate spent time (virtually) at the University of Maryland
  - Jun '23– Tianhao Liu, Peking University undergraduate spent time (virtually) at the University of Maryland
  - Aug '23– Dong Yuan, Tsinghua University graduate student spent time (virtually) at the University of Maryland
- Jan '18–Jan '19 Kevin Qian, Montgomery Blair high school student spent time at the University of Maryland, currently undergraduate at MIT
- Jun–Aug '20 Timothy Qian, Montgomery Blair high school student spent time at the University of Maryland; currently undergraduate at MIT
- Jun–Aug '20 Ivy Liang, Montgomery Blair high school student spent time at the University of Maryland; currently undergraduate at an Ivy League school
- Jun–Aug '21 Akshita Gorti, Freedom High School student spent time (virtually) at the University of Maryland; currently undergraduate at Cornell
- Jun–Aug '22 Tarushii Goel, Thomas Jefferson High School for Science and Technology student spent time at the University of Maryland; currently undergraduate at MIT
- Jun '23– Jason Youm, Montgomery Blair high school student spent time at the University of Maryland

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## Professional and Outreach Activities

- '05– Referee for the following journals: Nature, Nature Physics, Nature Photonics, Nature Communications, Physical Review Letters, Physical Review X, Nature Reviews Physics, Science Advances, Physical Review B, Reports on Progress in Physics, Physical Review A, New Journal of Physics, Optics Communications, Optics Letters, Applied Physics B, and EPL (Europhysics Letters).
- '15– Reviewer and review panel member for NSF (QIS, TAMOP, CMP, CMMT).
- '17– Reviewer for AFOSR, ARO, DoE.
- '18– External referee for promotions to tenure and other faculty appointments.
- '16 Review panel member for reviewing the work of ARL employees.
- '20– Fellow of The American Physical Society (APS).

- '18-'21 Member of the APS DAMOP (Division of Atomic, Molecular, and Optical Physics) program committee.
- '08- Member of The American Physical Society (APS).
- '20- Member of The Optical Society (OSA).
- '21- Amazon Scholar at Amazon Web Services.
- '18-'21 Scientific Advisory Board member at Atom Computing.
  - '23 Together with Nicolo Defenu, Giovanna Morigi, and Lea Santos, organizing a KITP program "Out-of-equilibrium dynamics and quantum information of many-body systems with long-range interactions" and the associated conference.
  - '23 Together with Niklas Mueller, Nicole Yunger Halpern, and Raju Venugopalan, organizing an IQuS workshop "Bridging the gap: Thermalization, from Cold Atoms to Hot Quantum Chromodynamics".
  - '16 Led the organization (with the help of Jason Alicea, Dima Abanin, Frank Verstraete, and Leo Radzihovsky) of a 13-week KITP program on Synthetic Quantum Matter
  - '16 Together with Dima Abanin, Ehud Altman, and Victor Galitski, organized a KITP conference "Designer Quantum Systems out of Equilibrium"
  - '19 Together with Kang-Kuen Ni, Tanya Zelevinsky, and Immanuel Bloch, organized an ITAMP workshop on cold molecules
  - '19 Chair of the Noisy Intermediate-Scale Quantum (NISQ) Technologies workshop at the University of Maryland
  - '19 Talk at Howard University, which is a historically black university (HBCU)
  - '23 Talk at the University of the District of Columbia, which is a historically black university (HBCU)
- '15-'20 Volunteer judge for the Buck Lodge Middle School Virtual Science Fair (annually).
  - '23 Outreach to the public about quantum: three Career Day presentations at Wayside Elementary School in Potomac, MD focused on playing with liquid nitrogen and talking about what physicists do.
  - '18 Outreach to the public about quantum: the Science News for Students piece "Harry Potter can apparate. Can you?" is based, in part, on an hour-long interview with me.
  - '20 Outreach to the public about quantum: as part of Kids-Ask-NIST, shot a one-minute video response to the question "Could it be possible to power cities with quantum energy?".
  - '21- Volunteered to teach exciting beyond-school-program math to a small group of elementary school students. About 7 times in '21-'22, and about 10 times in '23
  - '15- Volunteer at Maryland Day on the University of Maryland campus, annually. Canceled in 2020 due to the pandemic.
- '16, '18 Volunteer at the USA Science and Engineering Festival
  - '14- Launched and oversee the operation of a weekly quantum seminar at the University of Maryland, during which local students and postdocs from all various quantum centers at the University of Maryland give talks about their research.

- '16 Gave a presentation to and chatted with the University of Maryland Society of Physics Students.
- '11– Advised or co-advised 15 undergraduates and 5 high school students on summer research projects.
- '13– Regularly serve on JQI and QuICS committees, such as visitor program committee, seminar committee, postdoc fellowship committee, and graduate fellowship committee.

## Papers Published in or Submitted to Peer-Reviewed Journals

- 197. J. Bringewatt, A. Ehrenberg, T. Goel, A. V. Gorshkov, *Optimal function estimation with photonic quantum sensor networks*, arXiv:2401.16472 [quant-ph].
- 196. L. P. García-Pintos, K. Bharti, J. Bringewatt, H. Dehghani, A. Ehrenberg, N. Yunger Halpern, A. V. Gorshkov, *Estimation of Hamiltonian parameters from thermal states*, arXiv:2401.10343 [quant-ph].
- 195. L. Xiang, W. Jiang, Z. Bao, Z. Song, S. Xu, K. Wang, J. Chen, F. Jin, X. Zhu, Z. Zhu, F. Shen, N. Wang, C. Zhang, Y. Wu, Y. Zou, J. Zhong, Z. Cui, A. Zhang, Z. Tan, T. Li, Y. Gao, J. Deng, X. Zhang, H. Dong, P. Zhang, S. Jiang, W. Li, Z. Lu, Z.-Z. Sun, H. Li, Z. Wang, C. Song, Q. Guo, F. Liu, Z.-X. Gong, A. V. Gorshkov, N. Y. Yao, T. Iadecola, F. Machado, H. Wang, D.-L. Deng, *Long-lived topological time-crystalline order on a quantum processor*, arXiv:2401.04333 [quant-ph].
- 194. A. Ehrenberg, J. T. Iosue, A. Deshpande, D. Hangleiter, A. V. Gorshkov, *Transition of Anticoncentration in Gaussian Boson Sampling*, arXiv:2312.08433 [quant-ph].
- 193. J. D. Watson, J. Bringewatt, A. F. Shaw, A. M. Childs, A. V. Gorshkov, Z. Davoudi, *Quantum Algorithms for Simulating Nuclear Effective Field Theories*, arXiv:2312.05344 [quant-ph].
- 192. J. T. Iosue, T. C. Mooney, A. Ehrenberg, A. V. Gorshkov, *Projective toric designs, difference sets, and quantum state designs*, arXiv:2311.13479 [quant-ph].
- 191. A. Schuckert, O. Katz, L. Feng, E. Crane, A. De, M. Hafezi, A. V. Gorshkov, C. Monroe, *Observation of a finite-energy phase transition in a one-dimensional quantum simulator*, arXiv:2310.19869 [quant-ph].
- 190. P. Niroula, J. Dolde, X. Zheng, J. Bringewatt, A. Ehrenberg, K. C. Cox, J. Thompson, M. J. Gullans, S. Kolkowitz, and A. V. Gorshkov, *Quantum Sensing with Erasure Qubits*, arXiv:2310.01512 [quant-ph].

189. A. De, P. Cook, K. Collins, W. Morong, D. Paz, P. Titum, G. Pagano, A. V. Gorshkov, M. Maghrebi, C. Monroe,  
*Non-equilibrium critical scaling and universality in a quantum simulator*,  
arXiv:2309.10856 [quant-ph].
188. A. Fahimniya, H. Dehghani, K. Bharti, S. Mathew, A. J. Kollár, A. V. Gorshkov, M. J. Gullans,  
*Fault-tolerant hyperbolic Floquet quantum error correcting codes*,  
arXiv:2309.10033 [quant-ph].
187. O. Shtanko, Y.-J. Liu, S. Lieu, A. V. Gorshkov, V. V. Albert,  
*Bounds on Autonomous Quantum Error Correction*,  
arXiv:2308.16233 [quant-ph].
186. W. Gong, Y. Kharkov, M. C. Tran, P. Bienias, A. V. Gorshkov,  
*Improved Digital Quantum Simulation by Non-Unitary Channels*,  
arXiv:2307.13028 [quant-ph].
185. R. Belyansky, S. Whitsitt, N. Mueller, A. Fahimniya, E. R. Bennewitz, Z. Davoudi, A. V. Gorshkov,  
*High-Energy Collision of Quarks and Mesons in the Schwinger Model: From Tensor Networks to Circuit QED*,  
Phys. Rev. Lett. (in press); arXiv:2307.02522 [quant-ph].
184. I. Zuk, D. Cohen, A. V. Gorshkov, A. Retzker,  
*Robust gates with spin-locked superconducting qubits*,  
Phys. Rev. Research (in press); arXiv:2306.09149 [quant-ph].
183. J. Kwan, P. Segura, Y. Li, S. Kim, A. V. Gorshkov, A. Eckardt, B. Bakkali-Hassani, M. Greiner,  
*Realization of 1D Anyons with Arbitrary Statistical Phase*,  
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10. A. V. Gorshkov, P. Rabl, G. Pupillo, A. Micheli, M. D. Lukin, P. Zoller, and H. P. Büchler,  
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8. A. V. Gorshkov, T. Calarco, M. D. Lukin, and A. S. Sørensen,  
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7. A. V. Gorshkov, L. Jiang, M. Greiner, P. Zoller, and M. D. Lukin,  
*Coherent Quantum Optical Control with Sub-wavelength Resolution*,  
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6. M. K. Henry, A. V. Gorshkov, Y. S. Weinstein, P. Cappellaro, J. Emerson, N. Boulant, J. S. Hodges, C. Ramanathan, T. F. Havel, R. Martinez, and D. G. Cory,  
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5. I. Novikova, A. V. Gorshkov, D. F. Phillips, A. S. Sørensen, M. D. Lukin, and R. L. Walsworth,  
*Optimal Control of Light Pulse Storage and Retrieval*,  
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4. A. V. Gorshkov, A. André, M. D. Lukin, and A. S. Sørensen,  
*Photon Storage in  $\Lambda$ -Type Optically Dense Atomic Media. III. Effects of Inhomogeneous Broadening*,  
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3. A. V. Gorshkov, A. André, M. D. Lukin, and A. S. Sørensen,  
*Photon Storage in  $\Lambda$ -Type Optically Dense Atomic Media. II. Free-Space Model*,  
Phys. Rev. A 76, 033805 (2007); quant-ph/0612083.
2. A. V. Gorshkov, A. André, M. D. Lukin, and A. S. Sørensen,  
*Photon Storage in  $\Lambda$ -Type Optically Dense Atomic Media. I. Cavity Model*,  
Phys. Rev. A 76, 033804 (2007); quant-ph/0612082.
1. A. V. Gorshkov, A. André, M. Fleischhauer, A. S. Sørensen, and M. D. Lukin,  
*Universal Approach to Optimal Photon Storage in Atomic Media*,  
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## Other Publications

6. I. C. Cloët *et al.*,  
*Opportunities for Nuclear Physics & Quantum Information Science*,  
arXiv:1903.05453 [nucl-th].
5. A.V. Gorshkov,  
*Quantum gases: The high-symmetry switch*,  
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4. O. Firstenberg, M.D. Lukin, T. Peyronel, Q.-Y. Liang, V. Vuletic, A.V. Gorshkov, S. Hofferberth, and T. Pohl, *Quantum Nonlinear Optics: Strongly Interacting Photons*, Opt. Photonics News 24, 48 (2013).
3. M. Klein, Y. Xiao, A. V. Gorshkov, M. Hohensee, C. D. Leung, M. R. Browning, D. F. Phillips, I. Novikova, and R. L. Walsworth, *Optimizing Slow and Stored Light for Multidisciplinary Applications*, Proc. SPIE 6904, 69040C (2008); arXiv:0807.4941 [quant-ph].
2. P. Walther, M. D. Eisaman, A. Nemiroski, A. V. Gorshkov, A. S. Zibrov, A. Zeilinger, and M. D. Lukin, *Multi-photon Entanglement: From Quantum Curiosity to Quantum Computing and Quantum Repeaters*, Proc. SPIE 6664, 66640G (2007).
1. I. Novikova, A. V. Gorshkov, D. F. Phillips, Y. Xiao, M. Klein, and R. L. Walsworth, *Optimization of Slow and Stored Light in Atomic Vapor*, Proc. SPIE 6482, 64820M (2007).

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## Invited Talks

189. *Bound states in photonic and atomic crystals*, Quantum Innovators Workshop, Institute for Quantum Computing, Waterloo, Canada, November 2023.
188. *Passive error correction and sensing with erasure qubits*, CIFAR's Quantum Information Science Program Meeting, Banff Centre for Arts and Creativity, Banff, Canada, October 2023.
187. *Passive error correction and distributed sensing*, JQI Seminar, Joint Quantum Institute, University of Maryland, College Park, MD, October 2023.
186. *Passive error correction and distributed sensing*, 2nd International Conference on Emerging Quantum Technology (ICEQT 2023), Hefei, China, September 2023.
185. *An Overview of Applications of Quantum Networks*, Quantum Networks Workshop (QuNeW), The Wylie Center, Beverly, MA, July 2023.
184. *Speed Limits on the Propagation of Quantum Information, Part 2*, The 3rd Condensed Matter Summer School "Dynamics and Quantum Information in Many-body Systems," University of Minnesota, June 2023.
183. *Speed Limits on the Propagation of Quantum Information, Part 1*, The 3rd Condensed Matter Summer School "Dynamics and Quantum Information in Many-body Systems," University of Minnesota, June 2023.
182. *Quantum Sensing and Quantum Computing*, NIST Frontiers, NIST Gaithersburg, June 2023.
181. *Quantum optics with photonic and atomic crystals*, 3rd Workshop on Waveguide QED (WQED23), Erice, Italy, May 2023.
180. *Quantum Sensor Networks*, "Quantum Networks" Workshop, CUNY Graduate Center, May 2023.

179. *Quantum Technology*, Center for Nanotechnology Research and Education Seminar, University of the District of Columbia, April 2023.
178. *Quantum Sensor Networks*, Physics Colloquium, Virginia Commonwealth University, March 2023.
177. *Quantum and Classical Complexity of Learning Hydrodynamics*, DARPA Turbulence Workshop (virtual), March 2023.
176. *Quantum Sensor Networks*, ECE Colloquium, University of Washington, Seattle, WA, USA, January 2023.
175. *Quantum Sensor Networks*, The 53rd Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, USA, January 2023.
174. *Candidate for a passively protected quantum memory in two dimensions*, Theory Colloquium, CU Boulder, October 2022.
173. *Quantum Sensor Networks*, Workshop on Secure Networks of Quantum Sensors, Sorbonne Université, October 2022.
172. *Candidate for a passively protected quantum memory in two dimensions*, Quantum Computing Seminar, George Mason University, October 2022.
171. *Candidate for a passively protected quantum memory in two dimensions*, QuIST (Quantum Information, Spacetime, and Topological Matter) Webinar Series, September 2022.
170. *Rydberg mediated photon-photon interactions*, Advanced SRitp and GiRYD School on Giant Interactions in Rydberg Systems, Weizmann Institute of Science, Rehovot, Israel, September 2022.
169. *Candidate for a passively protected quantum memory in two dimensions*, NSF Workshop on Quantum Advantage and Next Steps, University of Chicago, August 2022.
168. *Candidate for a passively protected quantum memory in two dimensions*, IBM-Qiskit Quantum Information Science Seminar (virtual), July 2022.
167. *Can error-prone quantum bits correct themselves*, Science Foo Camp (“Sci Foo”) 2022, X (formerly Google X), Mountain View, CA, USA, June 2022.
166. *Quantum Sensor Networks*, TechConnect World 2022, Washington, DC, USA, June 2022.
165. *Quantum Sensor Networks*, Quantum Engineering Workshop (virtual), California Institute of Technology, Pasadena, CA, USA, May 2022.
164. *Dynamics of quantum systems with long-range interactions*, NTML(BRL)-APCTP Seminar Series: Topological Matter out of Equilibrium (virtual), POSTECH, Pohang, Korea, May 2022.
163. *A Brief Tour of Many Applications of Quantum Networking*, Mini-Symposium: A Discussion of Applications of Quantum Networks (virtual), NIST, January 2022.

162. *Efficient Quantum Computation with Long-Range Interactions*, ASCR Quantum Computing Testbeds Stakeholder Workshop (virtual), December 2021.
161. *Many-body physics with Rydberg atoms*, IQuS Workshop “Scientific Quantum Computing and Simulation on Near-Term Devices: Quantum Simulations of Strongly Correlated Systems” (virtual), November 2021.
160. *Quantum Sensor Networks*, IEEE Quantum Week (virtual), October 2021.
159. *Quantum Optics and Information III*, 2021 Boulder Summer School “Ultracold Matter” (virtual), July 2021.
158. *Quantum Optics and Information II*, 2021 Boulder Summer School “Ultracold Matter” (virtual), July 2021.
157. *Quantum Optics and Information I*, 2021 Boulder Summer School “Ultracold Matter” (virtual), July 2021.
156. *Universality in one-dimensional scattering with general dispersion relations*, 2nd Workshop on Waveguide QED (virtual), June 2021.
155. *Dynamics of many-body quantum systems*, CMT Seminar, Technical University of Munich, June 2021.
154. *QIS-AMO-CM Interface: Lessons for High-energy and Nuclear Physics in the Quantum Simulation Era*, Second Quantum Simulation for Strong Interactions (QuaSi) workshop, May 2021.
153. *A New Quantum Technology Revolution*, Sci Foo Alumni Lighting Talk series, May 2021.
152. *Driven-dissipative stabilization of cat qubits and symmetry breaking*, Spin Phenomena Interdisciplinary Center (SPICE) Workshop “Dissipative Phases of Entangled Quantum Matter”, May 2021.
151. *Dynamics of quantum systems with long-range interactions*, Benasque Center for Sciences online meeting “Entanglement in Strongly Correlated Systems”, February 2021.
150. *Optimal protocols in quantum annealing and QAOA problems*, Q2B conference on “Practical Quantum Computing” (virtual), December 2020.
149. *Quantum Sensor Networks*, Quantum Network Grand Challenge Seminar, NIST Gaithersburg (virtual), December 2020.
148. *Dynamics of quantum systems with long-range interactions*, Seminar, Helen Diller Quantum Center, Technion, Israel (virtual), November 2020.
147. *Dynamics of quantum systems with long-range interactions*, Colloquium, Department of Physics and Astronomy, University of Oklahoma, Norman, OK (virtual), September 2020.
146. *Dynamics of quantum systems with long-range interactions*, Virtual AMO Seminar, August 2020.



145. *Dynamics of quantum systems with long-range interactions*, 51st meeting of the APS Division of AMO Physics (DAMOP), Portland, OR (virtual), June 2020.
144. *Dynamics of quantum systems with long-range interactions*, ICFO Online Seminar, Institute of Photonic Sciences (ICFO), Castelldefels, Spain (virtual), May 2020.
143. *Sensing, Entanglement, and Scrambling*, Aspen Winter Conference “Quantum Information Science for Fundamental Physics”, Aspen, CO, USA, February 2020.
142. *Dynamics of quantum systems with long-range interactions*, PML Seminar, NIST Boulder, CO, USA, February 2020.
141. *Dynamics of quantum systems with long-range interactions*, PML Seminar, NIST Gaithersburg, MD, USA, February 2020.
140. *Nondestructive cooling of an atomic quantum register via state-insensitive Rydberg Interactions*, The 50th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, USA, January 2020.
139. *Dynamics and quantum supremacy with long-range interactions*, International Workshop on Quantum Computing, Information Processing, and Machine Learning, National Taiwan University, Taipei, Taiwan, December 2019.
138. *Dynamics of quantum systems with long-range interactions*, Atomic Physics Seminar, University of Virginia, Charlottesville, VA, USA, October 2019.
137. *Confined Dynamics in Long-Range-Interacting Quantum Spin Chains*, Joint ITAMP/Aarhus collaborative workshop: Many-body Physics with Cold Ions, ITAMP, Harvard University, Cambridge, MA, USA, October 2019.
136. *Dynamics of quantum systems with long-range interactions*, CUA Seminar, Harvard-MIT Center for Ultracold Atoms, Harvard University, Cambridge, MA, USA, September 2019.
135. *Synthetic Topological Matter*, KITP program “Topological Quantum Matter: Concepts and Realizations”, Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA, September 2019.
134. *Information Propagation and entanglement generation with long-range interactions*, Condensed Matter Seminar, Duke University, Durham, NC, USA, August 2019.
133. *Quantum information propagation with long-range interactions*, Workshop “Quantum and Classical Systems with Long-Range Interactions”, International Institute of Physics, Natal, Brazil, July 2019.
132. *Nondestructive Rydberg-interaction-mediated cooling of neutral atoms*, KITS program for ultracold atoms: “Emergent phenomena in ultracold atoms: merging topology, interaction, and dynamics”, Beijing, China, June 2019.
131. *Nondestructive Rydberg-interaction-mediated cooling of neutral atoms*, 50th meeting of the APS Division of AMO Physics (DAMOP), Milwaukee, WI, USA, May 2019.
130. *Optimal Quantum Sensing*, Colloquium, Department of Mathematics, Howard University, Washington, DC, USA, April 2019.

129. *Confined Dynamics in Long-Range-Interacting Quantum Spin Chains*, International Workshop “Constrained Many-body Dynamics”, MPIPKS, Dresden, Germany, March 2019.
128. *Nondestructive Rydberg-interaction-mediated cooling of neutral atoms*, “Giant Interactions in Rydberg Systems” Status Workshop, TU Kaiserslautern, Kaiserslautern, Germany, March 2019.
127. *Optimal Quantum Sensing*, Applied and Computational Mathematics Division Seminar, NIST, Gaithersburg, MD, USA, October 2018.
126. *Distributed Quantum Sensing*, INQNET Quantum Transduction Workshop, Caltech, Pasadena, CA, USA, September 2018.
125. *Information Propagation and Entanglement Generation with Long-Range Interactions*, KITP program “The Dynamics of Quantum Information”, Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA, September 2018.
124. *Few-Body and Many-Body Physics with Photons*, Workshop on Quantum Simulations with Atoms and Light, Aarhus Institute of Advanced Studies at Aarhus University, Denmark, August 2018.
123. *Information Propagation and Entanglement Generation with Long-Range Interactions*, 26th International Conference on Atomic Physics (ICAP), Barcelona, Spain, July 2018.
122. *Quantum Sensor Networks*, IEEE Photonics Society Summer Topicals Meeting “Quantum Networks,” Hilton Waikoloa Village, New Town Hall in Hannover, Waikaloa, Hawaii, USA, July 2018.
121. *Information Propagation and Entanglement Generation with Long-Range Interactions*, Workshop “From Few to Many-Body Physics with Dipolar Quantum Gases,” New Town Hall in Hannover, Hannover, Germany, June 2018.
120. *Quantum Technology*, Science Foo Camp (“Sci Foo”) 2018, X (formerly Google X), Mountain View, CA, USA, June 2018.
119. *Few-Body and Many-Body Physics with Photons*, 1st Workshop on Waveguide QED, Centro Polivalente, Mazara del Vallo, Sicily, Italy, June 2018.
118. *Optimal and Secure Measurement Protocols for Quantum Sensor Networks*, Conference on Lasers and Electro-Optics (CLEO), San Jose Convention Center, San Jose, CA, May 2018.
117. *Dynamics of Synthetic Quantum Matter*, Institute for Condensed Matter Theory Seminar, University of Illinois at Urbana-Champaign, IL, USA, April 2018.
116. *Harnessing Synthetic Quantum Matter*, Center for the Theory of Quantum Matter Seminar, University of Colorado, Boulder, CO, USA, April 2018.
115. *Quantum Sensing with Atoms and Photons*, Workshop on Intersections between Nuclear Physics and Quantum Information, Physics Division, Argonne National Laboratory, March 2018.
114. *Complexity of Sampling as an Order Parameter*, International Workshop on Chaos and Dynamics in Correlated Quantum Matter, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, March 2018.

113. *Harnessing Synthetic Quantum Matter*, Electrical Engineering Department Seminar, Princeton University, Princeton, NJ, USA, February 2018.
112. *Complexity of Sampling as an Order Parameter*, The 48th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, USA, January 2018.
111. *Complexity of Sampling as an Order Parameter*, KITP program "Quantum Physics of Information", Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA, November 2017.
110. *Optimal Quantum Sensing*, Canadian Institute for Advanced Research (CIFAR) Quantum Information Science Meeting, Niagara-on-the-Lake, ON, Canada, October 2017.
109. *Optimal and Secure Measurement Protocols for Quantum Sensor Networks*, International Workshop on Quantum Sensing with Quantum Correlated Systems, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, September 2017.
108. *Complexity of Sampling as an Order Parameter*, Workshop "The many facets of non-equilibrium physics: from many body theory to quantum thermodynamics," Mazara del Vallo, Sicily, Italy, September 2017.
107. *Optimal Quantum Sensing*, CQuIC Seminar, University of New Mexico, Albuquerque, NM, USA, August 2017.
106. *Quantum Computers, Quantum Internet, and Quantum Sensors*, Science Foo Camp ("Sci Foo") 2017, Googleplex, Mountain View, CA, USA, August 2017.
105. *Entanglement Generation and Area Law with Long-Range Interactions*, Workshop "Frontiers of Interacting Systems of Rydberg Atoms," ITAMP, Cambridge, MA, USA, June 2017.
104. *Few-Body and Many-Body Physics with Rydberg Polaritons*, 2017 Conference "Quantum Fluids of Light and Matter" (QFLM), Cargèse, Corsica, France, May 2017.
103. *Few-Body and Many-Body Physics with Rydberg Polaritons*, Workshop on quantum light-matter interactions in low dimensions, Institute of Photonic Sciences (ICFO), Castelldefels, Spain, May 2017.
102. *Entanglement Generation and Area Law with Long-Range Interactions*, APS March Meeting, New Orleans, LA, USA, March 2017.
101. *Optimal Quantum Sensing*, Electrical Engineering Department Seminar, Princeton University, Princeton, NJ, USA, February 2017.
100. *Few-Body and Many-Body Physics with Rydberg Polaritons*, The 47th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, USA, January 2017.
99. *Entanglement renormalization and area law with long-range interactions*, Conference on Topological Orders and Emergent Spacetime on Quantum Simulators, Fudan University, Shanghai, China, December 2016.
98. *Applications of Quantum Communication*, Future Directions of Quantum Information Processing Workshop, Basic Research Innovation and Collaboration Center (BRICC), Arlington, VA, USA, August 2016.

97. *Harnessing Quantum Systems with Long-Range Interactions*, Canadian Institute for Advanced Research (CIFAR) Quantum Information Science Program Meeting, University of Maryland, College Park, MD, USA, April 2016.
96. *Harnessing Quantum Systems with Long-Range Interactions*, Atomic Physics Seminar, University of California, Berkeley, CA, USA, March 2016.
95. *Harnessing Quantum Systems with Long-Range Interactions*, James Franck Institute Seminar, University of Chicago, Chicago, IL, USA, February 2016.
94. *Interacting photons*, Meeting of UMD Society of Physics Students, University of Maryland, College Park, MD, USA, February 2016.
93. *Harnessing Quantum Systems with Long-Range Interactions*, Physics and Astronomy Colloquium, Dartmouth College, Hanover, NH, USA, February 2016.
92. *Harnessing Quantum Systems with Long-Range Interactions*, Solid State Seminar, Technion, Haifa, Israel, January 2016.
91. *Topological Phases in Atomic, Molecular, and Optical Systems*, Optics and Atomic Physics Seminar, Weizmann Institute, Rehovot, Israel, January 2016.
90. *Topological Phases in Atomic, Molecular, and Optical Systems*, Physics Colloquium, Bar-Ilan University, Ramat Gan, Israel, January 2016.
89. *Harnessing Quantum Systems with Long-Range Interactions*, The 46th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, USA, January 2016.
88. *Topological Phases in Atomic, Molecular, and Optical Systems*, IQI Seminar, Institute for Quantum Information, IQIM, Caltech, Pasadena, CA, USA, October 2015.
87. *Few-Body and Many-Body Physics with Rydberg Polaritons*, KITP conference "Non-equilibrium dynamics of strongly interacting photons," Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA, October 2015.
86. *Topological Phases in Atomic, Molecular, and Optical Systems*, BIRS workshop on Strongly Interacting Topological Phases, Banff, Canada, September 2015.
85. *Few-Body and Many-Body Physics with Rydberg Polaritons*, Workshop "Light-matter interactions in low dimensions," ITAMP, Cambridge, MA, USA, July 2015.
84. *Harnessing Quantum Systems with Long-Range Interactions*, Atomic Physics Gordon Research Conference, Salve Regina University, Newport, RI, USA, June 2015.
83. *Propagation of information in quantum systems with long-range interactions*, Workshop "Quantum Many-Body Systems Far from Equilibrium," Stellenbosch, South Africa, March 2015.
82. *Abelian and non-Abelian topological phases with dipoles*, APS March Meeting, San Antonio, TX, USA, March 2015.
81. *Optimal Spectrum Estimation of Density Operators with Alkaline-Earth Atoms*, APS March Meeting, San Antonio, TX, USA, March 2015.

80. *Few-Body and Many-Body Physics with Rydberg Polaritons*, Workshop on Polariton blockade effects in Rydberg atoms and Semiconductors (POLARYS), Institut d'Optique, Palaiseau, France, December 2014.
79. *Propagation of information in systems with power-law interactions (focus on ion chains)*, Workshop "Quantum Science: Implementations," Centro de Ciencias de Benasque Pedro Pascual, Benasque, Spain, July 2014.
78. *Harnessing Quantum Systems with Long-Range Interactions*, Colloquium, Heidelberg Center for Quantum Dynamics, Heidelberg, Germany, July 2014.
77. *Harnessing Quantum Systems with Long-Range Interactions*, Seminar, Institute of Photonic Sciences (ICFO), Castelldefels, Spain, June 2014.
76. *Harnessing Quantum Systems with Long-Range Interactions*, Quantum Lunch, Los Alamos National Laboratory, Los Alamos, NM, USA, June 2014.
75. *Harnessing Quantum Systems with Long-Range Interactions*, IQI Seminar, Institute for Quantum Information, IQIM, Caltech, Pasadena, CA, USA, April 2014.
74. *Dynamics of Quantum Systems with Long-Range Interactions*, APS March Meeting, Denver, USA, March 2014.
73. *Persistence of locality in systems with power-law interactions*, Workshop "What do we do with a small quantum computer?," IBM T.J. Watson Research Center, Yorktown Heights, NY, USA, December 2013.
72. *Lightsabers in the Making: Quantum Nonlinear Optics at the Single-Photon Level*, Physics Colloquium, Georgetown University, Washington, DC, USA, December 2013.
71. *Propagation of information in systems with long-range interactions*, Workshop on Quantum Dynamics of Low-Dimensional Systems in memory of Adilet Imambekov, Harvard University, Cambridge, MA, USA, September 2013.
70. *Quantum Nonlinear Optics at the Single-Photon Level*, CAMP Seminar, Penn State University, University Park, PA, USA, September 2013.
69. *Quantum Nonlinear Optics at the Single-Photon Level*, Second International Conference on Quantum Technologies, Russian Quantum Center, Moscow, Russia, July 2013.
68. *Dissipative Many-body Quantum Optics in Rydberg Media*, International workshop on Ultracold Rydberg Physics, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, July 2013.
67. *Quantum Nonlinear Optics at the Single-Photon Level*, International Conference on Quantum Information Processing and Communication (QIPC), Florence, Italy, July 2013.
66. *Realizing Topological Phases with Dipolar Spins*, 44th meeting of the APS Division of AMO Physics (DAMOP), Quebec City, Quebec, Canada, June 2013.
65. *Realizing Topological Phases with Dipolar Spins*, KITP conference "New Science with Ultracold Molecules," Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA, March 2013.

64. *Realizing Topological Phases with Dipolar Spins*, BIRS workshop on Topological Phenomena in Quantum Dynamics and Disordered Systems, Banff, Canada, February 2013.
63. *Harnessing Quantum Systems with Long-Range Interactions*, JQI Seminar, Joint Quantum Institute, University of Maryland, College Park, MD, USA, January 2013.
62. *Topological Phases in Polar-Molecule Quantum Magnets*, KITP program Fundamental Science and Applications of Ultra-cold Polar Molecules, Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA, January 2013.
61. *Topological Phases in Polar-Molecule Quantum Magnets*, The 43rd Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, USA, January 2013.
60. *Quantum gases with long-range interactions: from topological phases to interacting photons*, AMO Seminar, JILA, University of Colorado, Boulder, CO, USA, December 2012.
59. *Topological Phases in Polar-Molecule Quantum Magnets*, Seminar, Joint Quantum Institute, NIST, and the University of Maryland, College Park, MD, USA, December 2012.
58. *Topological Phases in Polar-Molecule Quantum Magnets*, AMO Physics Seminar, Department of Physics & Astronomy, University of California, Los Angeles, CA, USA, November 2012.
57. *Quantum Nonlinear Optics with Single Photons*, COHERENCE workshop on Rydberg atoms, CNRS, Gif-sur-Yvette, France, July 2012.
56. *Many-Body Physics with Atomic, Molecular and Optical Systems*, Guest lecture in *Physics 135c - Quantum Mechanics: elementary particles and the universe*, California Institute of Technology, Pasadena, CA, USA, April 2012.
55. *Quantum Magnetism with Polar Molecules: Tunable Generalized  $t$ - $J$  Model*, Seminar, Institute for Quantum Information and Matter, California Institute of Technology, Pasadena, CA, USA, March 2012.
54. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, Department of Electrical & Computer Engineering, Boston University, Boston, MA, USA, March 2012.
53. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, Department of Physics, University of Cambridge, Cambridge, UK, February 2012.
52. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, Imperial College London, London, UK, February 2012.
51. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, Department of Physics & Astronomy, University of Pittsburgh, Pittsburgh, PA, USA, February 2012.
50. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, Department of Applied Physics, Yale University, New Haven, CT, USA, February 2012.

49. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, CQuIC seminar, University of New Mexico, Albuquerque, NM, USA, January 2012.
48. *Many-Body Physics with Atomic, Molecular and Optical Systems*, Seminar, Physics Department, University of Michigan, Ann Arbor, MI, USA, January 2012.
47. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, Perimeter Institute, Waterloo, Canada, January 2012.
46. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, University of Waterloo, Waterloo, Canada, January 2012.
45. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, Applied Physics Department, Stanford University, Stanford, CA, USA, January 2012.
44. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, IQOQI, University of Innsbruck, Innsbruck, Austria, December 2011.
43. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, University College London, London, UK, November 2011.
42. *Ultracold Polar Molecules to the Rescue*, PMA Chair's Council Meeting, California Institute of Technology, Pasadena, CA, USA, November 2011.
41. *Photon-Photon Interactions via Rydberg Blockade*, Seminar, Institut d'Optique, Palaiseau, France, October 2011.
40. *Photon-Photon Interactions via Rydberg Blockade*, Workshop on Engineering and Control of Quantum Systems, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, October 2011.
39. *Quantum Magnetism with Polar Molecules: Tunable Generalized  $t$ - $J$  Model*, Quantum Dynamics Seminar, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, October 2011.
38. *Subwavelength Lattices*, Topical Group: Fundamental Science with Ultracold Molecules, Institute for Theoretical AMO Physics, Harvard University, Cambridge, MA, USA, September 2011.
37. *Quantum Magnetism with Polar Molecules: Tunable Generalized  $t$ - $J$  Model*, Topical Group: Fundamental Science with Ultracold Molecules, Institute for Theoretical AMO Physics, Harvard University, Cambridge, MA, USA, September 2011.
36. *Photon-Photon Interactions via Rydberg Blockade*, International Conference on Quantum Technologies, Russian Quantum Center, Moscow, Russia, July 2011.
35. *Novel Systems and Methods for Quantum Communication, Quantum Computation, and Quantum Simulation*, Meeting of the APS Division of AMO Physics, Atlanta, GA, USA, June 2011.
34. *Photon-Photon Interactions via Rydberg Blockade*, Seminar, Center for Exotic Quantum Systems, California Institute of Technology, Pasadena, CA, USA, May 2011.

33. *Two-Orbital  $SU(N)$  Magnetism with Ultracold Alkaline-Earth Atoms in Optical Lattices*, Condensed Matter Seminar, Department of Physics & Astronomy, University of California, Irvine, CA, USA, April 2011.
32. *Two-Orbital  $SU(N)$  Magnetism with Ultracold Alkaline-Earth Atoms*, APS March Meeting, Dallas, TX, USA, March 2011.
31. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, Seminar, Center for Macroscopic Quantum Control & Department of Physics and Astronomy, Seoul National University, Seoul, Korea, January 2011.
30. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, KITP program Beyond Standard Optical Lattices, Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA, November 2010.
29. *Photonic Phase Gate via an Exchange of Fermionic Spin Waves in a Spin Chain*, Informal AMO Theory Seminar, JILA, University of Colorado, Boulder, CO, USA, July 2010.
28. *Photonic Phase Gate via an Exchange of Fermionic Spin Waves in a Spin Chain*, Seminar, College of William & Mary, Williamsburg, VA, USA, June 2010.
27. *Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, NSF site visit, Institute for Theoretical AMO Physics, Harvard University, Cambridge, MA, USA, May 2010.
26. *Photonic Phase Gate via an Exchange of Fermionic Spin Waves in a Spin Chain*, 10-minute talk, Harvard-MIT Center for Ultracold Atoms, Cambridge, MA, USA, February 2010.
25. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, Special Condensed Matter Seminar, KITP, Santa Barbara, CA, USA, January 2010.
24. *Quantum Information Processing and Quantum Simulation with Alkaline-Earth Atoms*, IQI Group Meeting, Institute for Quantum Information, California Institute of Technology, Pasadena, CA, USA, January 2010.
23. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, Seminar, Joint Quantum Institute, NIST, and the University of Maryland, Gaithersburg, MD, USA, December 2009.
22. *Optimal Photon Storage in Atomic Ensembles and Photonic Phase Gate via an Exchange of Fermionic Spin Waves in a Spin Chain*, CQulC Seminar, Physics Department, University of New Mexico, Albuquerque, NM, USA, December 2009.
21. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, CQulC Seminar, Physics Department, University of New Mexico, Albuquerque, NM, USA, December 2009.
20. *Many-body physics (quantum simulation) with ultracold alkaline-earth atoms*, Guest Lecture in *Physics 284: Strongly Correlated Systems in Atomic and Condensed Matter Physics*, Physics Department, Harvard University, Cambridge, MA, USA, October 2009.



19. *Two-Orbital  $SU(N)$  Magnetism with Ultracold Alkaline Earth Atoms*, Wilhelm und Else Heraeus Seminar on Quantum Simulators, Physikzentrum Bad Honnef, Bad Honnef, Germany, October 2009.
18. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, Advisory Board Meeting, Institute for Theoretical AMO Physics, Harvard University, Cambridge, MA, USA, October 2009.
17. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, CUA Seminar, Harvard-MIT Center for Ultracold Atoms, Cambridge, MA, USA, September 2009.
16. *Quantum Zeno effect and its application to room-temperature NV-based quantum computing*, Walsworth Group Seminar, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA, September 2009.
15. *Alkaline-Earth Atoms as Few-Qubit Quantum Registers*, Workshop on Ultracold Group II Atoms: Quantum Metrology and Information, Joint Quantum Institute, NIST, and the University of Maryland, College Park, MD, USA, September 2009.
14. *Quantum simulation with ultracold alkaline-earth atoms in optical lattices: two-orbital  $SU(N)$  magnetism*, Seminar, Institute for Quantum Optics and Quantum Information, Innsbruck, Austria, June 2009.
13. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, Seminar, Max-Planck-Institut für Quantenoptik, Garching, Germany, April 2009.
12. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, Joint Atomic Physics Colloquium, Institute for Theoretical AMO Physics and Department of Physics, Harvard University, Cambridge, MA, USA, April 2009.
11. *Quantum Information Processing and Two-Orbital  $SU(N)$  Magnetism with Alkaline-Earth Atoms in Optical Lattices*, CMT Kids Seminar, Physics Department, Harvard University, Cambridge, MA, USA, March 2009.
10. *Quantum Simulation with Alkaline-Earth Atoms in Optical Lattices: Two-Orbital  $SU(N)$  Magnetism*, CMT/AMO Seminar, Physics Department, Harvard University, Cambridge, MA, USA, February 2009.
9. *Suppression of Inelastic Collisions between Polar Molecules with a Repulsive Shield and Alkaline-Earth-Like Atoms as Few-Qubit Quantum Registers*, Walsworth Group Seminar, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA, September 2008.
8. *Repulsive Shield Between Polar Molecules*, 10-minute talk, Harvard-MIT Center for Ultracold Atoms, MIT, Cambridge, MA, USA, May 2008.
7. *"Blue Shield" for Polar Molecules*, Seminar, Physics Department, Harvard University, Cambridge, MA, USA, February 2008.
6. *Coherent Quantum Optical Control with Sub-Wavelength Resolution*, Seminar, Physics Department, Stuttgart University, Stuttgart, Germany, December 2007.

5. *Coherent Quantum Optical Control with Sub-Wavelength Resolution*, Seminar, Institute for Quantum Optics and Quantum Information, Innsbruck, Austria, December 2007.
4. *Optimal Control of Photon Storage in Atomic Ensembles*, Princeton-TAMU Symposium on Quantum Coherence and Laser Spectroscopy, Princeton University, Princeton, NJ, USA, March 2007.
3. *Time Reversal as an Experimental Tool for Optimizing Quantum Light-Matter Interfaces*, 10-minute Talk, Harvard-MIT Center for Ultracold Atoms, Cambridge, MA, USA, February 2007.
2. *Optimal Storage of Photon States in Atomic Ensembles*, Advisory Board Meeting, Institute for Theoretical AMO Physics, Cambridge, MA, USA, May 2006.
1. *Optimal Storage of Photon States in Atomic Ensembles*, Seminar, Niels Bohr Institute, Copenhagen, Denmark, March 2006.