September 2024

Ian B. Spielman

Fellow, Joint Quantum Institute
National Institute of Standards and Technology
100 Bureau Drive, Stop 8424
Gaithersburg, MD 20899-8424

email: ian.spielman@nist.gov
tel: (301) 975-8664
fax: (301) 975-8272

Current research program

Spielman's current experiments lie at the intersection of condensed matter and atomic physics, realizing many-body systems with systems of ultra-cold atoms.

Current research interests: (1) creating magnetic/optical configurations leading to synthetic gauge fields, for example, making the charge *neutral* bosons or fermions move like charged particles in a magnetic field, or act as if they experience the classic Rashba and Dresselhaus spin-orbit couplings; (2) studying ultracold ^{87}Rb in an optical lattice – with spin-orbit couplings, realizing extended 2D Bose-Hubbard model; (3) applying contemporary machine learning to cold atom experiments; and (4) creating engineered open quantum systems using weak measurement and classical feedback.

Education and background

Ph.D. in Physics June 1998 – June 2004
California Institute of Technology; Pasadena, California
Thesis: "Evidence for the Josephson Effect in Quantum Hall Bilayers"

B.S. in Physics and Mathematics (Suma Cum Laude) Aug. 1994 – May 1998
University of Oklahoma; Norman, Oklahoma

Early background
Born on Feb. 24, 1976 in Sacramento, CA USA

Five most significant publications

1. *A rapidly expanding Bose-Einstein condensate: an expanding universe in the lab*; S. Eckel, A. Kumar, T. Jacobson, I.B. Spielman, G.K. Campbell; Phys. Rev. X **8** 021021 (2018).
2. *Visualizing edge states with an atomic Bose gas in the quantum Hall regime*; B. K. Stuhl, H.-I Lu, L. M. Aycock, D. Genkina, and I. B. Spielman; Science **349**, 1514–1518 (2015).
3. *Spin-orbit-coupled Bose-Einstein condensates*; Y.-J. Lin, K. Jiménez-García, and I. B. Spielman; Nature **471** 83-86 (2011).
4. *Synthetic magnetic fields for ultracold neutral atoms*; Y.-J. Lin, R. L. Compton, K. Jiménez-García, J. V. Porto and I. B. Spielman; Nature **462** 628-632 (2009).
5. *Resonantly Enhanced Tunneling in a Double Layer Quantum Hall Ferromagnet*; I. B. Spielman, J. P. Eisenstein, L. N. Pfeiffer, and K. W. West; Phys. Rev. Lett. **84** 5808 (2000).

Research experience

NIST Fellow Nov. 2014 – Present
National Institute of Standards and Technology; Gaithersburg, MD

Physicist Oct. 2006 – Nov. 2014
National Institute of Standards and Technology; Gaithersburg, MD

Postdoctoral Researcher Aug. 2004 – Oct. 2006
National Institute of Standards and Technology; Gaithersburg, MD

Research on ultra-cold atoms in optical lattices, focusing on condensed matter model systems. We focused very carefully on the superfluid to insulator transition in the realized 2D Bose-Hubbard model.

Postdoctoral Researcher July 2004
California Institute of Technology; Pasadena, CA

Studied the connection between coherent tunneling in quantum Hall bilayers and the local GaAs nuclear spin polarization.

Graduate Research Assistant Aug. 1998 – June 2004
California Institute of Technology; Pasadena, CA

Found evidence for an excitonic condensate via electron tunneling in GaAs heterostructures with large magnetic fields and at milli-Kelvin temperatures.

Undergraduate Research Assistant May 1997 – June 1998
University of Oklahoma; Norman, OK

Studied a possible metal insulator transition in 2d electron systems. Constructed gated IbSb samples. Work done for Dr. S. Q. Murphy.

Undergraduate Research Assistant Aug. 1995 – May 1997
University of Oklahoma; Norman, OK

Tested silicon micro-strip detectors for the CLEO and ATLAS projects.

Summer student June 1996 – Aug. 1996
University of Texas Science and Technology Center; Austin, TX

Calculations and design of a cylindrical RF plasma source for use in a GaN MBE system.

Summer student June 1995 – Aug. 1995
Indiana University Cyclotron Facility; Bloomington, IN

Analyzed the data for the MEGA project, an experiment aimed at detecting non-conservation of lepton family number.

Teaching experience

Adjunct Professor Aug. 2015 – Dec. 2015
Aug. 2014 – Dec. 2014
Aug. 2008 – Dec. 2008
Aug. 2007 – Dec. 2007

University of Maryland; College Park, MD
Co-taught the graduate level Atomic, molecular and optical physics class.

Graduate Teaching Assistant March 2000 – June 2000

California Institute of Technology; Pasadena, CA
Graded for Ph103, an upper division class on mesoscopic physics.

Graduate Teaching Assistant Aug. 1998 – June 1999

California Institute of Technology; Pasadena, CA
Taught the freshman computational physics series: Ph20a, b and c.

Peer-reviewed publications

1. *Stationary solitary waves in F=1 spin-orbit-coupled Bose-Einstein condensates*; T. Mithun, A. R. Fritsch, G. N. Koutsokostas, D. J. Frantzeskakis, I. B. Spielman, and P. G. Kevrekidis; Phys. Rev. A **109** 023328 (2024). doi:10.1103/PhysRevA.109.023328
2. *Observation of Anisotropic Superfluid Density in an Artificial Crystal*; J. Tao, M. Zhao, and I. B. Spielman; Phys. Rev. Lett. **131** 163401 (2023). doi:10.1103/PhysRevLett.131.163401; **Featured in *Physics*** https://link.aps.org/doi/10.1103/Physics.16.s134
3. *Weak-measurement-induced heating in Bose-Einstein condensates*; E. Altuntaş and I. B. Spielman; Phys. Rev. Res. **5** 023185 (2023). doi:10.1103/PhysRevResearch.5.023185
4. *Feedback-cooled Bose-Einstein condensation: Near and far from equilibrium*; E. P. Yamaguchi, H. M. Hurst, and I. B. Spielman; Phys. Rev. A **107** 063306 (2023). doi:10.1103/PhysRevA.107.063306
5. *A 20 A bipolar current source with 140 μA noise over 100 kHz bandwidth*; M. Zhao, A. Restelli, J. Tao, Q. Liang, and I. B. Spielman; AIP Advances **13** (2023). doi:10.1063/5.0138145. **Featured in AIP Kudos.** https://www.growkudos.com/publications/10.1063%25252F5.0138145
6. *Direct calibration of laser intensity via Ramsey interferometry for cold atom imaging*; E. Altuntaş and I. B. Spielman; Opt. Express **31** 17893--17908 (2023). doi:10.1364/OE.488710
7. *Quantum back-action limits in dispersively measured Bose-Einstein condensates*; E. Altuntaş and I. B. Spielman; Communications Physics **6** 66 (2023). doi:10.1038/s42005-023-01181-5
8. *Interference-induced anisotropy in a two-dimensional dark-state optical lattice*; E. Gvozdiovas, I. B. Spielman, and G. Juzeliūnas; Phys. Rev. A **107** 033328 (2023). doi:10.1103/PhysRevA.107.033328
9. *Topological charge pumping with subwavelength Raman lattices*; D. Burba, M. Račiūnas, I. B. Spielman, and G. J. Juzeliūnas; Phys. Rev. A **107** 023309 (2023). doi:10.1103/PhysRevA.107.023309
10. *Dynamical instability of 3D stationary and traveling planar dark solitons*; T. Mithun, A. R. Fritsch, I. B. Spielman, and P. G. Kevrekidis; Journal of Physics: Condensed Matter **51** 014004 (2022). doi:10.1088/1361-648X/ac9e36
11. *Dark solitons in Bose–Einstein condensates: a dataset for many-body physics research*; A. R. Fritsch, S. Guo, S. M. Koh, I. B. Spielman, and J. P. Zwolak; Machine Learning: Science and Technology **3** 047001 (2022). doi:10.1088/2632-2153/ac9454
12. *Dynamically Induced Symmetry Breaking and Out-of-Equilibrium Topology in a 1D Quantum System*; G. H. Reid, M. Lu, A. R. Fritsch, A. M. Piñeiro, and I. B. Spielman; Phys. Rev. Lett. **129** 123202 (2022). doi:10.1103/PhysRevLett.129.123202
13. *Floquet Engineering Topological Dirac Bands*; M. Lu, G. H. Reid, A. R. Fritsch, A. M. Piñeiro, and I. B. Spielman; Phys. Rev. Lett. **129** 040402 (2022). doi:10.1103/PhysRevLett.129.040402

14. *Combining machine learning with physics: A framework for tracking and sorting multiple dark solitons.* S. Guo, S. M. Koh, A. R. Fritsch, I. B. Spielman, and J. P. Zwolak. Phys. Rev. Research, **4** 023163 (2022). doi: 10.1103/PhysRevResearch.4.023163

15. *Accurate Determination of Hubble Attenuation and Amplification in Expanding and Contracting Cold-Atom Universes*; S. Banik, M. G. Galan, H. Sosa-Martinez, M. Anderson, S. Eckel, I. B. Spielman, and G. K. Campbell; Phys. Rev. Lett. **128** 090401 (2022). doi:10.1103/PhysRevLett.128.090401. **Featured as an Editors' Suggestion.**

16. *Self-Bayesian aberration removal via constraints for ultracold atom microscopy*; E. Altuntaş and I. B. Spielman; Phys. Rev. Research **3** 043087 (2021). doi:10.1103/PhysRevResearch.3.043087

17. *Feedback-stabilized dynamical steady states in the Bose-Hubbard model*; J. T. Young, A. V. Gorshkov, and I. B. Spielman; Phys. Rev. Research **3** 043075 (2021). doi:10.1103/PhysRevResearch.3.043075

18. *Wilson loop and Wilczek-Zee phase from a non-Abelian gauge field*; S. Sugawa, F. Salces-Carcoba, Y. Yue, A. Putra, and I. B. Spielman; npj Quantum Information **7** 144 (2021). doi:10.1038/s41534-021-00483-2

19. *Machine-learning enhanced dark soliton detection in Bose-Einstein condensates*; S. Guo, A. R. Fritsch, C. Greenberg, I. B. Spielman, and J. P. Zwolak; Machine Learning: Science and Technology **2** 035020 (2021). doi:10.1088/2632-2153/abed1e

20. *Multiple-camera defocus imaging of ultracold atomic gases*; A. R. Perry, S. Sugawa, F. Salces-Carcoba, Y. Yue, and I. B. Spielman; Opt. Express **29** 17029--17041 (2021). doi: 10.1364/OE.422981 **Featured as an Editors' pick in Optics Express.**

21. *Coherence and decoherence in the Harper-Hofstadter model*; Q.-Y. Liang, D. Trypogeorgos, A. Valdés-Curiel, J. Tao, M. Zhao, and I. B. Spielman; Phys. Rev. Research **3** 023058 (2021). doi:10.1103/PhysRevResearch.3.023058

22. *Topological features without a lattice in Rashba spin-orbit coupled atoms*; A. Valdés-Curiel, D. Trypogeorgos, Q.-Y. Liang, R. P. Anderson, and I. B. Spielman; Nature Communications **12** 593 (2021). doi:10.1038/s41467-020-20762-4

23. *Feedback induced magnetic phases in binary Bose-Einstein condensates*; H. M. Hurst, S. Guo, and I. B. Spielman; Phys. Rev. Research **2** 043325 (2020). doi:10.1103/PhysRevResearch.2.043325

24. *Enhanced transport of spin-orbit-coupled Bose gases in disordered potentials*; Y. Yue, C. A. R. Sá de Melo, and I. B. Spielman; Phys. Rev. A **102** 033325 (2020). doi:10.1103/PhysRevA.102.033325

25. *Creating solitons with controllable and near-zero velocity in Bose-Einstein condensates*; A. R. Fritsch, M. Lu, G. H. Reid, A. M. Piñeiro, and I. B. Spielman; Phys. Rev. A **101** 053629 (2020). doi:10.1103/PhysRevA.101.053629 **Featured as an Editors' selection in Phys. Rev. A. Written up in Physics.**

26. *Realization of a deeply subwavelength adiabatic optical lattice*; R. P. Anderson, D. Trypogeorgos, A. Valdés-Curiel, Q.-Y. Liang, J. Tao, M. Zhao, T. Andrijauskas, G. Juzeliūnas, and I. B. Spielman; Phys. Rev. Research **2** 013149 (2020).

doi:10.1103/PhysRevResearch.2.013149

27. *Spatial Coherence of Spin-Orbit-Coupled Bose Gases*; A. Putra, F. Salces-Cárcoba, Y. Yue, S. Sugawa, and I. B. Spielman; Phys. Rev. Lett. **124** 053605 (2020). doi:10.1103/PhysRevLett.124.053605

28. *Repeated measurements with minimally destructive partial-transfer absorption imaging*; E. M. Seroka, A. Valdés-Curiel, D. Trypogeorgos, N. Lundblad, and I. B. Spielman; Opt. Express **27** 36611--36624 (2019). doi:10.1364/OE.27.036611

29. *Sauter-Schwinger effect with a quantum gas*; A. M. Piñero, D. Genkina, M. Lu, and I. B. Spielman; New Journal of Physics **21** 083035 (2019). doi:10.1088/1367-2630/ab3840

30. *Emergent gauge field and the Lifshitz transition of spin-orbit coupled bosons in one dimension*; W. S. Cole, J. Lee, K. W. Mahmud, Y. Alavirad, I. B. Spielman, and J. D. Sau; Scientific Reports **9** 7471 (2019). doi:10.1038/s41598-019-43929-6

31. *Measurement-induced dynamics and stabilization of spinor-condensate domain walls*; H. M. Hurst and I. B. Spielman; Phys. Rev. A **99** 053612 (2019). doi:10.1103/PhysRevA.99.053612

32. *Imaging topology of Hofstadter ribbons*; D. Genkina, L. M. Aycock, H.-I. Lu, M. Lu, A. M. Pineiro, and I. B. Spielman; New Journal of Physics **21** 053021 (2019). doi:10.1088/1367-2630/ab165b

33. *Scale-Invariant Continuous Entanglement Renormalization of a Chern Insulator*; S.-K. Chu, G. Zhu, J. R. Garrison, Z. Eldredge, A. V. Curiel, P. Bienias, I. B. Spielman, and A. V. Gorshkov; Phys. Rev. Lett. **122** 120502 (2019). doi:10.1103/PhysRevLett.122.120502

34. *Topological bands for ultracold atoms*; N. R. Cooper, J. Dalibard, and I. B. Spielman; Rev. Mod. Phys. **91** 015005 (2019). doi:10.1103/RevModPhys.91.015005

35. *Equations of state from individual one-dimensional Bose gases*; F. Salces-Carcoba, C. J. Billington, A. Putra, Y. Yue, S. Sugawa, and I. B. Spielman; New Journal of Physics **20** 113032 (2018). doi: 10.1088/1367-2630/aaef9b

36. *Perpetual emulation threshold of PT-symmetric Hamiltonians*; D. Trypogeorgos, A. Valdés-Curiel, I. B. Spielman, and C. Emary; Journal of Physics A: Mathematical and Theoretical **51** 325302 (2018). doi:10.1088/1751-8121/aacc5e

37. *Second Chern number of a quantum-simulated non-Abelian Yang monopole*; S. Sugawa, F. Salces-Carcoba, A. R. Perry, Y. Yue, and I. B. Spielman; Science **360** 1429 (2018). doi:10.1126/science.aam9031

38. *Topological lattice using multi-frequency radiation*; T. Andrijauskas, I. B. Spielman, and G. Juzeliūnas; New Journal of Physics **20** 055001 (2018). doi:10.1088/1367-2630/aab7a3

39. *A rapidly expanding Bose-Einstein condensate: an expanding universe in the lab*; S. Eckel, A. Kumar, T. Jacobson, I.B. Spielman, G.K. Campbell; Phys. Rev. X **8** 021021 (2018). doi:10.1103/PhysRevX.8.021021

40. *Synthetic clock transitions via continuous dynamical decoupling*; D. Trypogeorgos, A. Valdés-Curiel, N. Lundblad, and I. B. Spielman; Phys. Rev. A **97** 013407 (2018). doi:10.1103/PhysRevA.97.013407

41. *Quantum Phases of Two-Component Bosons with Spin-Orbit Coupling in Optical Lattices*; D. Yamamoto, I. B. Spielman, C. A. R. Sá de Melo; Phys. Rev. A **96** 061603(R) (2017). doi:10.1103/PhysRevA.96.061603

42. *Strong-coupling phases of the spin-orbit-coupled spin-1 Bose-Hubbard chain: Odd-integer Mott lobes and helical magnetic phases*; J. H. Pixley, W. S. Cole, I. B. Spielman, M. Rizzi, and S. Das Sarma; Phys. Rev. A **96** 043622 (2017). doi:10.1103/PhysRevA.96.043622

43. *Kinetic theory of dark solitons with tunable friction*; H. M. Hurst, D. K. Efimkin, I. B. Spielman, and V. Galitski; Phys. Rev. A **95** 053604 (2017). doi:10.1103/PhysRevA.95.053604

44. *Fourier transform spectroscopy of a spin–orbit coupled Bose gas*; A. Valdés-Curiel, D. Trypogeorgos, E. E. Marshall, and I. B. Spielman; New Journal of Physics **19** 033025 (2017). doi:10.1088/1367-2630/aa6279

45. *Brownian motion of solitons in a Bose–Einstein condensate*; L. M. Aycock, H. M. Hurst, D. K. Efimkin, D. Genkina, H.-I. Lu, V. M. Galitski, and I. B. Spielman; Proceedings of the National Academy of Sciences (2017). doi:10.1073/pnas.1615004114

46. *Semisynthetic zigzag optical lattice for ultracold bosons*; E. Anisimovas, M. Račiūnas, C. Sträter, A. Eckardt, I. B. Spielman, and G. Juzeliūnas; Phys. Rev. A **94** 063632 (2016). doi:10.1103/PhysRevA.94.063632

47. *Real-space mean-field theory of a spin-1 Bose gas in synthetic dimensions*; H. M. Hurst, J. H. Wilson, J. H. Pixley, I. B. Spielman, and S. S. Natu; Phys. Rev. A **94** 063613 (2016). doi:10.1103/PhysRevA.94.063613

48. *Vortex nucleation in a Bose–Einstein condensate: from the inside out*; R. M. Price, D. Trypogeorgos, D. L. Campbell, A. Putra, A. Valdés-Curiel, and I. B. Spielman; New Journal of Physics **18** 113009 (2016). doi:

49. *Synthetic gauge potentials for ultracold neutral atoms*; Y.-J. Lin and I. B. Spielman; Journal of Physics B: Atomic, Molecular and Optical Physics **49** 183001 (2016). doi:10.1088/0953-4075/49/18/183001

50. *Geometrical Pumping with a Bose-Einstein Condensate*; H.-I. Lu, M. Schemmer, L. M. Aycock, D. Genkina, S. Sugawa, and I. B. Spielman; Phys. Rev. Lett. **116** 200402 (2016). doi:10.1103/PhysRevLett.116.200402

51. *Rashba realization: Raman with RF*; D. L. Campbell and I. B. Spielman; New Journal of Physics **18** 033035 (2016). doi:10.1088/1367-2630/18/3/033035

52. *Magnetic phases of spin-1 spin-orbit-coupled Bose gases*; D. L. Campbell, R. M. Price, A. Putra, A. Valdés-Curiel, D. Trypogeorgos, and I. B. Spielman; Nat Commun **7** (2016). doi: 10.1038/ncomms10897

53. *Interaction-driven exotic quantum phases in spin-orbit-coupled spin-1 bosons*; J. H. Pixley, S. S. Natu, I. B. Spielman, and S. Das Sarma; Phys. Rev. B **93** 081101 (2016). doi:10.1103/PhysRevB.93.081101

54. *Feshbach enhanced s-wave scattering of fermions: direct observation with optimized absorption imaging*; D. Genkina, L. M. Aycock, B. K. Stuhl, H.-I. Lu, R. A. Williams, and I. B. Spielman; New Journal of Physics **18** 013001 (2016). doi:10.1088/1367-

2630/18/1/013001

55. *Dynamical Detection of Topological Phase Transitions in Short-Lived Atomic Systems*; F. Setiawan, K. Sengupta, I. B. Spielman, and J. D. Sau; Phys. Rev. Lett. **115** 190401 (2015). doi:10.1103/PhysRevLett.115.190401

56. *Visualizing edge states with an atomic Bose gas in the quantum Hall regime*; B. K. Stuhl, H.-I Lu, L. M. Aycock, D. Genkina, and I. B. Spielman; Science **349**, 1514–1518 (2015). doi:10.1126/science.aaa8515

57. *Three-level Haldane-like model on a dice optical lattice*; T. Andrijauskas, E. Anisimovas, M. Račiūnas, A. Mekys, V. Kudriašov, I. B. Spielman, and G. Juzeliūnas; Phys. Rev. A **92**, 033617 (2015). doi:10.1103/PhysRevA.92.033617. **Featured in PRA Kaleidoscope Images.**

58. *Gauge matters: observing the vortex-nucleation transition in a Bose condensate;* L. J. LeBlanc, K. Jiménez-García, R. A. Williams, M. C. Beeler, A. R. Perry, and I. B Spielman; New J. Phys. **17** 065016 (2015). doi:10.1088/1367-2630/17/6/065016. **Topological materials special issue**.

59. *Position-dependent spin-orbit coupling for ultracold atoms*; S.-W. Su, S.-C. Gou, I.-K. Liu, I. B. Spielman, L. Santos, A. Acus, A. Mekys, J. Ruseckas and G. Juzeliunas; New J. Phys. **17,** 033045 (2015). doi:10.1088/1367-2630/17/3/033045

60. *Tunable Spin-Orbit Coupling via Strong Driving in Ultracold-Atom Systems*; K. Jiménez-García, L.J. LeBlanc, R.A. Williams, M.C. Beeler, C. Qu, M. Gong, C. Zhang, and I.B. Spielman; Phys. Rev. Lett. **114** 125301 (2015). doi:10.1103/PhysRevLett.114.125301 **Featured as an Editors' selection in Phys. Rev. Lett.**

61. *Light-induced gauge fields for ultracold atoms*; N. Goldman, G. Juzeliunas, P. Ohberg, I. B. Spielman; Rep. Progr. Phys. **77**, 126401 (2014). doi:10.1088/0034-4885/77/12/126401 **Review Article.**

62. *Quenched binary Bose-Einstein condensates: spin domain formation and coarsening*; S. De, D. L. Campbell, R. M. Price, A. Putra, B. M. Anderson, and I. B. Spielman; Phys. Rev. A **89**, 033631 (2014). DOI: 10.1103/PhysRevA.89.033631

63. *Synthetic gauge fields in synthetic dimensions*; A. Celi, P. Massignan, J. Ruseckas, N. Goldman, I. B. Spielman, G. Juzeliūnas, and M. Lewenstein; Phys. Rev. Lett. **112**, 043001 (2014). doi: 10.1103/PhysRevLett.112.043001. **Featured as an Editors' Suggestion in Science!**

64. *Optimally focused cold atom systems obtained using density-density correlations*; A. Putra, D. L. Campbell, R. M. Price, S. De, I. B. Spielman; Rev. Sci. Inst. **85**, 013110 (2014). doi: 10.1063/1.4862046

65. *Magnetically generated spin-orbit coupling for ultracold atoms*; B. M. Anderson, I. B. Spielman, and G. Juzeliūnas; Phys. Rev. Lett. **111**, 125301 (2013). doi: 10.1103/PhysRevLett.111.125301

66. *Raman-Induced Interactions in a Single-Component Fermi Gas Near an s-Wave Feshbach Resonance*; R. A. Williams, M. C. Beeler, L. J. LeBlanc, K. Jiménez-García, and I. B. Spielman; Phys. Rev. Lett. **111**, 095301 (2013). doi: 10.1103/PhysRevLett.111.095301

67. *Detection of topological matter with quantum gases;* I. B. Spielman; Annalen der Physik (2013). doi: 10.1002/andp.201300110

68. *Fermion mediated interactions between ultracold bosons*; S. De and I. B. Spielman; App. Phys. B (2013). doi:10.1007/s00340-013-5556-5

69. *Direct observation of Zitterbewegung in a Bose-Einstein condensate*; L. J. LeBlanc, R. A. Williams, M. C. Beeler, K. Jiménez-García, A. R. Perry, and I. B Spielman; NJP **15** 073011 (2013). doi:10.1088/1367-2630/15/7/073011. **Featured in a *Nature Physics* news brief. Featured as a Highlighted article of 2013 by NJP.**

70. *The spin Hall effect in a quantum gas*; M. C. Beeler, K. Jiménez-García, L. J. LeBlanc, R. A. Williams, A. R. Perry, and I. B. Spielman; Nature **498** 201 (2013). doi:10.1038/nature12185

71. *Direct imaging of topological edge states with cold atoms*; N. Goldman, J. Dalibard, A. Dauphin, F. Gerbier, M. Lewenstein, P. Zoller, and I. B. Spielman; PNAS (2013). doi:10.1073/pnas.1300170110

72. *Spin-orbit coupling in atomic gases*; V. Galitski and I. B. Spielman; Nature **495** 49 (2013). doi:10.1038/nature11841

73. *Measuring topology in a laser-coupled honeycomb lattice: From Chern insulators to topological semi-metals;* N. Goldman, E. Anisimovas, F. Gerbier, P. Ohberg, I. B. Spielman, G. Juzeliūnas; NJP **15** 013025 (2013). doi:10.1088/1367-2630/15/1/013025. **Featured as a Highlighted article of 2013 by NJP.**

74. *Flux lattices reformulated*; G. Juzeliūnas and I. B. Spielman; NJP **14** 123022 (2012). doi:10.1088/1367-2630/14/12/123022

75. *Dynamically Slowed Collapse of a Bose-Einstein Condensate with Negative Scattering Length;* R. L. Compton, Y.-J. Lin, K. Jiménez-García, J. V. Porto, and I. B. Spielman; PRA **86** 063601 (2012). doi: 10.1103/PhysRevA.86.063601

76. *Observation of a superfluid Hall effect;* L. J. LeBlanc, K. Jiménez-García, R. A. Williams, M. C. Beeler, A. R. Perry, W. D. Phillips, and I. B Spielman; PNAS **109** *10811-10814* (2012). doi: 10.1073/pnas.1202579109

77. *Synthetic 3D Spin-Orbit Coupling;* B. M. Anderson, G. Juzeliūnas, V. M. Galitski, and I. B. Spielman; Phys. Rev. Lett. **108**, 235301 (2012). **Featured as an Editors' Suggestion.**

78. *The Peierls substitution in an engineered lattice potential;* K. Jiménez-García, L. J. LeBlanc, R. A. Williams, M. C. Beeler, A. R. Perry, and I. B. Spielman; Phys. Rev. Lett. **108** 225303 (2012). **Featured as an Editors' Suggestion** and **in an APS Physics Viewpoint.**

79. *Synthetic Partial Waves in Ultracold Atomic Collisions;* R. A. Williams, L. J. LeBlanc, K. Jiménez-García, M. C. Beeler, A. R. Perry, W. D. Phillips, and I. B. Spielman; Science **335** 314-317 (2012).

80. *Spin-charge-density wave in a rounded-square Fermi surface for ultracold atoms*; D. Makogon, I. B. Spielman, and C. Morais Smith; Euro. Phys. Lett. **97** 33002 (2012). **Selected as an editor's choice. Featured in Europhysics News.**

81. *Vortices in spin-orbit-coupled Bose-Einstein condensates;* J. Radic, T. Sedrakyan, I. B. Spielman, and V. Galitski; Phys. Rev. A **84** 063604 (2011). **Featured in PRA Kaleidoscope Images.**

82. *Chern numbers hiding in time-of-flight images;* E. Zhao, N. Bray-Ali, C. J. Williams, I. B. Spielman, and I. I. Satija; Phys. Rev. A **84** 063629 (2011).

83. *Spin-orbit-coupled Bose-Einstein condensates*; Y.-J. Lin, K. Jiménez-García, and I. B. Spielman; Nature **471** 83-86 (2011); Featured in: **Physics Today Search and Discovery, Physics world, and the online "Journal club for condensed matter physics."**

84. *A synthetic electric force acting on neutral atoms*; Y.-J. Lin, R. L. Compton, K. Jiménez-García, W. D. Phillips, J. V. Porto and I. B. Spielman; Nature Physics **7** 531–534 (2011); **Featured in: Nature "Research Highlights" March 24, 2011.**

85. *Realistic Rashba and Dresselhaus spin-orbit coupling for neutral atoms*; D. L. Campbell, G. Juzeliūnas, and I. B. Spielman; Phys. Rev. A **84** 025602 (2011).

86. *Chiral Rashba spin textures in ultracold Fermi gases*; J. D. Sau, R. Sensarma, S. Powell, I. B. Spielman, and S. Das Sarma; Phys. Rev. B. Rapid **83** 140510 (2011); **Featured as an Editors' Suggestion**.

87. *Realistic Time-Reversal Invariant Topological Insulators with Neutral Atoms*; N. Goldman, I. Satija, P. Nikolic, A. Bermudez, M.A. Martin-Delgado, M. Lewenstein, and I. B. Spielman; Phys. Rev. Lett. **105** 255302 (2010).

88. *Phases of a 2D Bose Gas in an Optical Lattice;* K. Jiménez-García, R. L. Compton, Y.-J. Lin, W. D. Phillips, J. V. Porto and I. B. Spielman; Phys. Rev. Lett. **105** 110401 (2010).

89. *A slow atom source using a collimated effusive oven and a single-layer variable pitch coil Zeeman slower*; S. C. Bell, M. Junker, M. Jasperse, L. D. Turner, Y.-J. Lin, I. B. Spielman, and R. E. Scholten; Review of Scientific Instruments **81** 013105 (2010).

90. *Synthetic magnetic fields for ultracold neutral atoms*; Y.-J. Lin, R. L. Compton, K. Jiménez-García, J. V. Porto and I. B. Spielman; Nature **462** 628-632 (2009); **Featured in the online "Journal club for condensed matter physics."**

91. *Field-sensitive addressing and control of field-insensitive neutral-atom qubits*; N. Lundblad, J. M. Obrecht, I. B. Spielman, and J. V. Porto; Nature Physics **5** 575 (2009).

92. *Raman Processes and effective gauge fields*; I. B. Spielman; Phys. Rev. A **79** 063613 (2009).

93. *Quantum and Classical Dynamics of a BEC in a Large-Period Optical Lattice*; J. H. Huckans, I. B. Spielman, B. Laburthe Tolra, W. D. Phillips, and J. V. Porto; Phys. Rev. A **90** 043609 (2009); **Featured in PRA Kaleidoscope Images.**

94. *Rapid production of* ^{87}Rb *Bose-Einstein condensates in a combined magnetic and optical potential*; Y.-J. Lin, A. R. Perry, R. L. Compton, I. B. Spielman, and J. V. Porto; Phys. Rev. A **79** 063631 (2009).

95. *A Bose-Einstein Condensate in a Uniform Light-induced Vector Potential*; Y.-J. Lin, R. L. Compton, A. R. Perry, W. D. Phillips, J. V. Porto and I. B. Spielman; Phys. Rev. Lett. **102** 130401 (2009); **Featured in APS Physics Viewpoint.**

96. *Condensate fraction in a 2D Bose gas measured across the Mott-insulator transition*; I. B. Spielman, W. D. Phillips, and J. V. Porto; Phys. Rev. Lett. **100** 120402 (2008).

97. *Atoms in a radiofrequency-dressed optical lattice*; N. Lundblad, P. J. Lee, I. B. Spielman, B. L. Brown, W. D. Phillips, and J. V. Porto; Phys. Rev. Lett. **100** 150401 (2008).

98. *The Mott insulator transition in a 2D atomic Bose gas*; I. B. Spielman, W. D. Phillips, and J. V. Porto; Phys. Rev. Lett. **98** 080404 (2007).

99. *Collisional de-excitation in a quasi-2D degenerate Bose gas*; I. B. Spielman, P. R. Johnson, J. H. Huckans, C. D. Fertig, S. L. Rolston, W. D. Phillips, and J. V. Porto; Phys. Rev. A **73** 020702(R) (2006).

100. *Spin Transition in Strongly Correlated Bilayer Two Dimensional Electron Systems*; I. B. Spielman, L. A. Tracy, J. P. Eisenstein, L. N. Pfeiffer and K. W. West; Phys. Rev. Lett. **94** 076803 (2005).

101. *Onset of Interlayer Phase Coherence in a Bilayer Two-Dimensional Electron System: Effect of Layer Density Imbalance*; I. B. Spielman, M. Kellogg, J. P. Eisenstein, L. N. Pfeiffer and K. W. West; Phys. Rev. B **70** 081303 (2004).

102. *Resistivity of dilute 2D electrons in an undoped GaAs heterostructure*; M. P. Lilly, J. L. Reno, J. A. Simmons, I. B. Spielman, J. P. Eisenstein, L. N. Pfeiffer, K. W. West, E. H. Hwang, and S. Das Sarma; Phys. Rev. Lett. **90** 056806 (2003).

103. *Observation of Quantized Hall Drag in a Strongly Correlated Bilayer Electron System*; M. Kellogg, I. B. Spielman, J. P. Eisenstein, L. N. Pfeiffer and K. W. West; Phys. Rev. Lett. **88** 126804 (2002).

104. *Observation of a Linearly Dispersing Goldstone Mode in a Quantum Hall Ferromagnet*; I. B. Spielman, J. P. Eisenstein, L. N. Pfeiffer, and K. W. West; Phys. Rev. Lett. **87** 036803 (2001).

105. *Resonantly Enhanced Tunneling in a Double Layer Quantum Hall Ferromagnet*; I. B. Spielman, J. P. Eisenstein, L. N. Pfeiffer, and K. W. West; Phys. Rev. Lett. **84** 5808 (2000).

106. *Kinetic Inductance of the Two-Dimensional Electron Gas;* P. J. Burke, I. B. Spielman, J. P. Eisenstein, L. N. Pfeiffer, and K. W. West; Appl. Phys. Lett. **76** 745 (2000).

Books and chapters

---

107. *Bose-Einstein condensates in artificial gauge fields*; L. J. LeBlanc and I. B. Spielman; "Universal Themes of Bose-Einstein Condensation"; Chapter 15; pages 299-321; Cambridge University Press (2017).

108. *The Mott Transition in a Bose Gas Measured Through Time of Flight*; K. Jiménez-García and I. B. Spielman; "Annual review of cold atoms and molecules: Volume 2"; pages 145-191; World Scientific; (2013). doi:10.1142/9789814590174_0003

109. *Light induced gauge fields for ultracold neutral atoms*; I. B. Spielman; "Annual review of cold atoms and molecules"; chapter 5; pages 145-188; World Scientific (2013).

Invited publications

110. *Artificial gauge fields with ultracold atoms*; V. Galitski, G. Juzeliūnas, and I. B. Spielman; Physics Today **72** 28 (2019). doi:10.1063/PT.3.4111

111. *Atomic physics: Quantum theory verified by experiment*; I. B. Spielman; Nature **545** 293-294 (2017). doi:10.1038/545293a

112. *Assembling a complex quantum ensemble*; I. B. Spielman; Science **348** 185-186 (2015).

113. C*ontrolling Atomic Interactions with Light*; R. A. Williams, L. J. LeBlanc, K. Jiménez-García, M. C. Beeler, A. R. Perry, W. D. Phillips, and I. B. Spielman; Optics & Photonics News **23**, 45–45 (2012).

114. *Seeing topological order*; G. Juzeliūnas and I. B. Spielman; Physics **4** 99 (2011).

115. *An optical Lattice of Flux*; I. B. Spielman; Physics **4** 35 (2011).

116. *Atomic physics: A route to quantum magnetism*; I. B. Spielman; Nature **472** 301-302 (2011, News and Views article).

Other publications

117. *Quantum Simulators: Architectures and Opportunities*; E. Altman, et al; PRX Quantum **2** 017003 (2021). doi:10.1103/PRXQuantum.2.017003

118. *Formation of optical flux lattices for ultracold atoms*; G. Juzeliunas and I. B. Spielman; Proc. SPIE **8274** 82740H (2012).

119. *Engineering Dresselhaus spin-orbit coupling for cold atoms in a double tripod configuration;* G. Juzeliūnas, J. Ruseckas, D. L. Campbell, I. B. Spielman; Proc. SPIE **7950** 79500M (2011).

120. *Synthetic electric and magnetic fields for ultracold neutral atoms*; W. D. Phillips, Y.-J. Lin, R. L. Compton, K Jiménez-García, A. R. Perry, J. V. Porto, and I. B. Spielman; J. Phys.: Conf. Ser. **264** 012002 (2011).

121. *Bilayer 2D electron systems at ν_T=1: phase boundary between weak and strong coupling;* J. P. Eisenstein, M. Kellogg, I. B. Spielman, L. N. Pfeiffer, and K. W. West*;* Physica E **20** 111 (2003).

122. *Evidence of superfluidity in double layer 2D electron systems;* J. P. Eisenstein, I. B. Spielman, M. Kellogg, L. N. Pfeiffer, and K. W. West*;* Physica E **18** 103 (2003).

123. *Tunneling in a quantum Hall excitonic condensate;* J. P. Eisenstein, I. B. Spielman, L. N. Pfeiffer, and K. W. West*;* Int. J. of Mod. Phys. B **16** 2923 (2002).

Talks and posters

1. *Topology in time-dependent systems;* Research seminar, Swinburne University, Australia (Sep. 2024).
2. *The Rayleigh-Taylor instability in a binary quantum fluid*; Research seminar, University of Otago, New Zealand (Sep. 2024).
3. *Topology in time-dependent systems;* Research seminar, University of Otago, New Zealand (Sep. 2024).
4. *The Rayleigh-Taylor instability in a binary quantum fluid*; Research seminar, University of Queensland, Australia (Sep. 2024).
5. *Imaginary gauge potentials in a quantum gas;* Invited talk, FINESS 2024, Australia (Sep. 2024).
6. *Imaginary gauge potentials in a quantum gas;* Research seminar, Vilnius University, Lithuania (July 2024).
7. *Anisotropic superfluids;* Invited talk, Ultracold Atomic Gases: Thirty Years of Activities and Looking Forward, Hong Kong (Dec. 2023).
8. *Topology in time-dependent systems;* Keynote presentation, FLEET Annual meeting, Australia (Dec. 2023).
9. *Quantum simulation of relativistic physics with atomic Bose-Einstein condensates*; Invited public lecture, Chico State University (Nov. 2023).
10. *Topology in time-dependent systems;* Invited research seminar, ICTS-TIFR, Bengaluru, India (July 2023).
11. *Limits to analogue quantum simulation;* Summer school lectures (invited), ICTS-TIFR, Bengaluru, India (July 2023).
12. *Topology in time-dependent systems;* DAMOP 2023 invited talk, Spokane, WA (June 2023).
13. *Topology in time-dependent systems;* Topology and Physics on Mount Carmel, Israel (May 2023).
14. *Topology in time-dependent systems;* CQT Colloquium, Singapore (Apr. 2023).
15. *Accurate Determination of Hubble Attenuation and Amplification in Expanding and Contracting Cold-Atom Universes*; QSimFP FVD Online Seminar (Mar. 2023).
16. *Topology in time-dependent systems;* Rochester Physics Colloquium, Rochester NY (Mar. 2023).
17. *Topology in time-dependent systems*; Chico State University Physics Seminar, virtual (Feb. 2023).
18. *Measurement Limits on Bose-Einstein Condensates*; Invited talk at the Aspen Center for Physics program "Quantum Simulation with Quantum Hardware;" Aspen, CO (Feb. 2023).
19. *Topology in time-dependent systems;* Invited talk at Ultracold Quantum Matter: Basic Research and Applications, Bad Honnef Germany (Dec. 2022)

20. *Dynamically symmetry breaking in a bipartite optical lattice;* LSU Colloquium, Baton Rouge, LA (Nov. 2022).
21. *Dynamically symmetry breaking in a bipartite optical lattice;* Max Planck Institute for complex systems Colloquium, Dresden Germany (Oct. 2022).
22. *Quantum Back-action Limits in Dispersively Measured Bose-Einstein Condensates*; Research Seminar, Strathclyde University, Glasgow Scotland (Oct. 2022).
23. *Dynamically symmetry breaking in a bipartite optical lattice;* Plenary Talk. ECAMP, Vilnius Lithuania (June 2022).
24. *Dynamically symmetry breaking in a bipartite optical lattice;* Seminar. Trento (June 2022).
25. *Floquet engineering topological Dirac bands* Invited Talk. OIST, Japan [virtual] (April 2022).
26. *Floquet engineering topological Dirac bands* APS March Meeting Invited Talk. Chicago, IL (March 2022).
27. *Dynamically symmetry breaking in a bipartite optical lattice*; ICFO Colloquium, Barcelona Spain (Feb. 2022).
28. *Quantum simulation of relativistic physics*; Aspen Center for Physics public lecture (Jan. 2022).
29. *Floquet-engineering topological Dirac bands in an optical lattice*; Colloquium at the University of Virginia (Dec. 2021).
30. *Floquet-engineering topological Dirac bands in an optical lattice*; Invited talk at CoOLMe 2021, virtual (Nov. 2021).
31. *Floquet-engineering topological Dirac bands in an optical lattice*; Colloquium at Ohio State University (Oct. 2021).
32. *Quantum simulation of materials*; CIQC/QF joint meeting, virtual (Aug. 2021).
33. *Gauge fields for cold atoms*; 2021 Boulder summer school, virtual (Jul. 2021).
34. *Floquet-engineering near-perfect Dirac bands in an optical lattice*; Materials for Humanity, virtual (Jul. 2021).
35. *Dirac dispersion from non-adiabatic charge pumps*; Colloquium at Vilnius University, Lithuania, virtual (Jun. 2021).
36. *Dirac dispersion from non-adiabatic charge pumps*; Interacting Topological Matter: Atomic, Molecular and Optical Systems. KITP Santa Barbara, virtual (Jun. 2021).
37. *Chaos and coherence in a Hofstadter lattice*: Colloquium at the Technion, Haifa Israel, virtual (Feb. 2020).
38. *Chaos and coherence in a Hofstadter lattice*: Colloquium at Heidelberg University, Heidelberg Germany, virtual (Dec. 2020).
39. *Chaos and coherence in a Hofstadter lattice*: NIST Quantum measurement division seminar, virtual (Sep. 2020).
40. *Chaos and coherence in a Hofstadter lattice*; FOR-2414 student retreat, Hamburg Germany,

Virtual (Sep. 2020)

41. *Cold atom cosmology: how to expand more*; New Horizons in Analogue Gravity, Rutgers University, Virtual (Jun. 2020)
42. *Rashba SOC*; Colloquium Purdue University, Indiana (Feb. 2020)
43. *Quantum Chaos in the Harper Model*; Seminar at Vilnius University, Lithuania (Feb. 2020)
44. *Quantum Chaos in the Harper Model*; Seminar at Strathclyde University, UK (Dec. 2019)
45. *Expanding universe in the lab*; Royal Society; London, UK (Dec. 2019)
46. *Rashba SOC*; Special Seminar JILA; CO (June, 2019)
47. *Rashba SOC*; Seminar at Max Plank Institute for complex systems; Dresden, Germany (May, 2019)
48. *Rashba SOC and quantum feedback*; Seminar at Open Quantum System Dynamics: Quantum Simulators. KITP Santa Barbara (Mar. 2019)
49. *Rashba SOC and quantum feedback*; Solvay Workshop on Quantum Simulation; Brussels, Belgium (Feb. 2019)
50. *1D Geometric and topological charge pump*; Annual workshop of FLEET collaboration. Sydney Australia (Dec. 2018)
51. *Chern numbers in a quantum Hall strip*; University of Texas at Dallas (Sept. 2018)
52. *Chern numbers in a quantum Hall strip;* DAMOP invited talk. Ft. Lauderdale, FL (June 2018).
53. *Chern numbers in a quantum Hall strip;* Colloquium Max Planck Institute. Dresden (Feb. 2018).
54. *Spin orbit coupling and gauge fields*: Atomic physics seminar. San Luis Potosi, Mexico (Oct. 2017)
55. *Synthetic electromagnetism with neutral atoms*: Physics colloquium. San Luis Potosi, Mexico (Oct. 2017)
56. *1D Geometric and topological charge pumps*: Atomic physics seminar. San Luis Potosi, Mexico (Oct. 2017)
57. *Chern numbers in synthetic dimensions*: BEC Conference. Sant Feliu, Spain (Sep. 2017)
58. *Ultracold atom experiments: Chern numbers in synthetic dimensions*: Joint seminar of Vilnius University & Center of Physical and Technological Sciences. Vilnius Lithuania (April 2017).
59. *Introduction to gauge fields*: APS March meeting tutorial session. New Orleans LA (March 2017).
60. *Experimental non-abelian topology*: Artificial Gauge Fields and Interacting Topological Phases in Ultracold Atoms kickoff meeting. Munich Germany (February 2017)
61. *Topological transition from a non-Abelian Yang-Mills monopole*: APPC/AIP meeting. Brisbane Australia (December 2016)

62. *Topological effects in ultra-cold atoms*: International Institute of Physics. Natal Brazil (November 2016)
63. *Gauge fields in multi-level atoms: magnetism and non-abelian gauge fields*: Kavli institute for theoretical physics (KITP). Santa Barbara California (October 2016)
64. *Generalized topological forces*: Institute for Advanced Studies special seminar. Beijing, China (August 2016).
65. *Brownian motion of solitons in a BEC*: KITPC program on spin orbit coupled systems. Beijing, China (August 2016).
66. *Generalized topological forces*: ITAMP Program on topological matter. Boston, MA (July 2016).
67. *Geometric charge pumping with BECs*: Rice AMO Seminar. Houston, TX (April 2016).
68. *Large fields in synthetic dimensions*: Rice Physics colloquium. Houston, TX (April 2016)
69. *Geometric charge pumping with BECs*: UNM Foundations of Quantum Mechanics Seminar. Albuquerque, NM (April 2016).
70. *Geometric charge pumping with BECs*: APS March Meeting Invited Talk. Baltimore, MD (March 2016).
71. *Geometric charge pumping with BECs*: UMD CMTC Seminar. College Park, MD (March 2016).
72. *Geometric charge pumping with BECs*: GPG Student originated session. Hannover, Germany (February 2016).
73. *Large fields in synthetic dimensions*: Solvay workshop. Brussels, Belgium (February 2016)
74. *Lectures on artificial gauge fields:* New Zealand Summer School. Dunedin, New Zealand (2015).
75. *Geometric charge pumping with BECs*: JILA Theory seminar. Boulder, CO (2015).
76. *A taste of "1D topology" with Bosons*: CUA seminar. Boston, MA (2015).
77. *A taste of "1D topology" with Bosons*: Invited talk at biannual BEC Meeting. Sant Feliu, Spain (2015).
78. *Gauge fields meet Bose-Einstein condensates*: Aspen center for Physics Public Lecture, Aspen CO (2015).
79. *Artificial magnetic fields in synthetic dimensions*: APS DAMOP prize session Rabi Prize talk, Columbus OH (2015).
80. *Introduction to gauge fields*: APS DAMOP meeting tutorial session, Columbus OH (2015).
81. *Artificial magnetic fields in synthetic dimensions*: PCTS program "Topological and Strongly Correlated Phases in Cold Atoms", Princeton, NJ (2015).
82. *How to think like an experimentalist (not a theorist)*: PCTS tutorial, Princeton, NJ (2015).
83. *Spin obit coupling and gauge fields*: Bloomsburg University Physics Colloquium, Bloomsburg PA (2015).

84. *Spin obit coupling and gauge fields*: Cornell University Physics Colloquium, Ithica NY (2015).
85. *Spin-1:" The difference one spin state makes*: INT 15-1 conference, invited talk, Seattle WA (2015).
86. *Introduction to gauge fields*: APS March meeting tutorial session, San Antonio TX (2015).
87. *Gauge fields with cold atoms*: Bad Honnef workshop, Bad Honnef, Germany (2014).
88. *Gauge fields with cold atoms*: FiOLS invited talk, Tucson AZ (2014).
89. *Gauge Fields with cold atoms*: University of Washington physics colloquium (2014).
90. *Artificial gauge fields for cold atoms*: KITPC Workshop on quantum simulation, Beijing China (2014).
91. *Altered interactions in cold-atom systems*: Invited talk, APS DAMOP meeting, Madison, WI (2014)
92. *Spin-Hall effect in an atomic Bose gas*: Johns Hopkins Physics Colloquium, Baltimore, MD (2014).
93. *Magnetic physics with spin-orbit coupling*: University of Heidelberg Colloquium, Heidelberg Germany (2014).
94. *Artificial gauge fields for cold atoms*: APS editorial office Colloquium, Long Island, NY (2014).
95. *Dispersion engineering with cold aotms:* Vienna atom-institute, Vienna Austria (2014)
96. *Gauge fields with cold atoms*: JILA Colloquium, Boulder, CO (2014).
97. *Spin orbit coupling with cold atoms*: APS March meeting invited talk, Denver, CO (2014).
98. *Gauge fields with cold atoms*: MPQ Colloquium, Garching, Germany (2014).
99. *Gauge fields with cold atoms*: Moore workshop on CMP/AMO interface, Carmel, CA (2014).
100. *Gauge fields with cold atoms*: Argonne National Labs, Lemont, IL (2014).
101. *Spin-Hall effect in an atomic Bose gas*: UIUC Physics Colloquium, Urbana-Champagne, IL (2013).
102. *Spin-Hall effect in an atomic Bose gas*: Dartmouth University Physics Colloquium (2013).
103. *Spin-Hall effect in an atomic Bose gas*: Closing workship for FOR801, Munich Germany (2013).
104. *Spin-Hall effect in an atomic Bose gas*: KITP spintronics conference, Santa Barbara, CA (2013).
105. *Artificial gauge fields: a primer*: UMD CNAM Colloquium, UMD, MD (2013).
106. *Artificial gauge fields with cold atoms*: Atomic physics Gordon research conference, Newport, RI (2013).
107. *Spin-orbit physics with cold atomic gases*: New magnetic field frontiers in atomic/molecular

and solid-state physics, Les Houches, France (2013).

108. *Gauge fields with cold atoms: from Hall to spin Hall effects*: University of California, Riverside Physics colloquium (2013).

109. *Gauge fields with cold atoms: from Hall to spin Hall effects*: University of Massachusetts Condensed matter seminar (2013).

110. *Gauge fields with cold atoms: from Hall to spin Hall effects*: University of Kentucky Physics colloquium (2013).

111. *Spin-orbit physics with cold atomic gases*: Institute für Laserphysik special seminar, Hamburg, Germany (2013).

112. *Spin-Hall effect with a cold atomic* gas: NewSpin3 conference, Mainz, Germany (2013).

113. *Bose-Einstein condensates subject to synthetic gauge fields*: Lorentz center workshop "Universal themes in Bose-Einstein condensation," Leiden, Netherlands (2013).

114. *Gauge fields with cold atoms: from Hall to spin Hall effects*: Symposium on novel topological quantum matter, Dallas, TX (2013).

115. *Bose-Einstein condensates subject to synthetic gauge fields*: NORDITA conference "pushing the boundaries with cold atoms," Stockholm, Sweden (2013).

116. *Observation of zitterbewegung in a degenerate quantum gas*: Simon Fraser University Physics colloquium, Vancouver, Canada (2013).

117. *Observation of zitterbewegung in a degenerate quantum gas*: TRIUMF colloquium, Vancouver, Canada (2013).

118. *Observation of zitterbewegung in a degenerate quantum gas*: University of Victoria physics colloquium, Victoria, Canada (2013).

119. *Bose-Einstein condensates subject to synthetic gauge fields*: Mid-Atlantic senior physicists group seminar (2012).

120. *Gauge fields: progress report:* DARPA OLE Meeting, Miami (2012, programmatic).

121. *Bose-Einstein condensates subject to synthetic gauge fields*: Pennsylvania State University Physics colloquium (2012).

122. *Observation of zitterbewegung in a degenerate quantum gas*: Louisiana State University Physics colloquium (2012).

123. *Good times with artificial gauge fields*: KITP seminar (2012).

124. *Bose-Einstein condensates subject to synthetic gauge fields*: Princeton University Physics colloquium (2012).

125. *Zitterbewegung in a BEC*: Institute of Theoretical Physics and Astronomy of Vilnius University, special seminar (2012, invited).

126. *The Hall and the spin-Hall effects in a BEC*: Georgia Tech atomic physics seminar (2012, invited).

127. *The Hall and the spin-Hall effects in a BEC*: at ICAP Ecole polytechnique (2012, invited).

128. *Gauge fields with cold atoms*: at the "The frontiers of quantum matter symposium" hosted at George Mason University (2012, invited).
129. *Ultracold atoms: spin orbit coupling and engineered interactions*: APS DAMOP meeting (2012, invited).
130. *Spin-Orbit coupled atomic gases*: DARPA OLE Meeting (2012, programmatic).
131. *Bose-Einstein condensates in synthetic gauge fields*: International Workshop on Ultracold atoms/molecules", hold by NCTS in Taiwan (2012, invited).
132. *The Hall and the spin-Hall effects in a BEC*: international conference in Hong Kong on "Frontiers of Cold Atoms and Related Topics" (2012, invited).
133. *Artificial magnetic fields in systems of ultracold atoms*: MIT physics department colloquium (2012, invited).
134. *Artificial magnetic fields in systems of ultracold atoms*: University of Maryland physics department colloquium (2012, invited).
135. *Artificial gauges fields and interactions with cold atoms*: APS March Meeting (2012, invited).
136. *Artificial gauges fields and interactions with cold atoms*: Aspen winter conference 2012: New Directions in Ultracold Atoms (2012, invited).
137. *Artificial gauge fields and interactions with cold*: Newspin winter school lecture, Texas A&M University (2011, invited).
138. *Majorana fermions with ultracold atoms: progress*: Microsoft Station Q meeting (2011, invited)
139. *Bose-Einstein condensates in synthetic gauge fields*: George Mason University physics department colloquium (2011, invited).
140. *Bose-Einstein condensates in synthetic gauge fields* or *Complexity from simplicity and back again*: U. of Pittsburgh physics department colloquium (2011, invited).
141. *Ultracold atoms: a new class of materials*: CIFAR meeting in Quebec (2011, invited).
142. *Bose-Einstein condensates in synthetic gauge fields* or *Complexity from simplicity and back again*: U. of Connecticut physics department colloquium (2011, invited).
143. *Bose-Einstein condensates in synthetic gauge fields*: Institute of Theoretical Physics and Astronomy of Vilnius University, special seminar (2011, invited).
144. Gauge-field fun with ultracold atoms: BEC 2011 Conference, Sant Feliu (2011, Invited, Prize session)
145. *Modified interactions: A tale of two colliding BEC's*: ICPEAC Meeting, Belfast Northern Ireland (2011, IUPAP prize talk).
146. *Complexity from simplicity and back again:* NIST SAA talk (2011, invited).
147. *Modified atomic interactions via laser dressing:* DARPA OLE Meeting, Vail (2011, programmatic).
148. *Bose-Einstein condensates in synthetic gauge fields*: Yale University condensed matter

seminar (2011, invited).

149. *Gauge fields with cold atoms*: DPG School on quantum gases (2011, invited)

150. *Ultracold atoms: understanding complex systems through simplicity*: Rowan University Deans Lecture (2011, invited).

151. *Bose-Einstein condensates in synthetic gauge fields*: NIST Atomic Physics division seminar (2011, invited).

152. *Synthetic electromagnetism for cold atoms*: AAAS Annual Meeting, Matter-Wave Magic session (2011, invited).

153. *Artificial gauge fields for neutral atoms:* University of Texas, Austin, complex systems seminar (2011, invited).

154. *Gauge fields: progress report:* DARPA OLE Meeting, Miami (2010, programmatic).

155. *Artificial gauge fields for neutral atoms:* Caltech, colloquia (2010, invited).

156. *Practical prospects for non-abelian gauge fields*: KITP workshop (2010, invited).

157. *Gauge fields for ultracold atoms: abelian and otherwise*: UMD CMTC seminar (2010, invited).

158. *Artificial gauge fields for neutral atoms:* KITP conference (2010, invited).

159. *Artificial gauge fields for neutral atoms:* Princeton, condensed matter seminar (2010, invited).

160. *A Bose-Einstein condensate subject to synthetic gauge fields:* Special seminar, University of Oklahoma (2010, invited).

161. *A Bose-Einstein condensate subject to synthetic gauge fields:* Departmental colloquia, Oklahoma State (2010, invited).

162. *A Bose-Einstein condensate subject to synthetic gauge fields:* Workshop at Tsinghua University, Beijing (2010, invited).

163. *Gauge fields: abelian and otherwise*: L'PHYS 2010 Brazil (2010, Invited).

164. *Artificial fields: progress report:* DARPA OLE Meeting, Houston (2010, programmatic).

165. *Synthetic electromagnetism for Neutral atoms*: Center for Ultracold Atoms, Harvard/MIT (2010, invited).

166. *Good times with quantum physics*: Chicago "Pumping station one" (2010, public lecture).

167. *Synthetic electromagnetism for Neutral atoms*: University of Chicago, James Frank Institute seminar (2010, invited).

168. *Synthetic electromagnetism for Neutral atoms*: Yale University, condensed matter seminar (2010, invited).

169. *Synthetic electromagnetism for Neutral atoms*: Rice University, condensed matter seminar (2010, invited).

170. *Synthetic electromagnetism for Neutral atoms*: Virginia Tech departmental Colloquium (2010, invited).

171. *Ultracold atoms: engineered many-body systems*: IISER seminar, Kolkata India (2010, invited).
172. *Synthetic electromagnetism*: ICCIA10 meeting, Sankapur, India (2010, invited).
173. *Synthetic electromagnetism*: Exotic insulating states of matter, Johns Hopkins University (2010, invited).
174. *Synthetic electromagnetism*: Sigma Xi Young Scientist award seminar, NIST (2009, invited).
175. *Optical lattice emulator phase II:* DARPA OLE Kickoff, Miami (2009, programmatic).
176. *A synthetic magnetic field for neutral atoms:* KITPC focus session, Beijing (2009, invited).
177. *A synthetic magnetic field for neutral atoms:* JQI seminar (2009, invited).
178. *A synthetic magnetic field for neutral atoms:* ICREA meeting Sant Benet, Spain (2009, invited).
179. *A synthetic magnetic field for neutral atoms:* CIFAR meeting in Nova Scotia, Canada (2009, invited).
180. *Generation of a synthetic vector potential and an E field*: DAMOP (2009, invited).
181. *Measured phase diagram of the 2D Bose-Hubbard Hamiltonian:* DARPA Program review (2009, programmatic).
182. *Generation of a synthetic vector potential and an E field*: University of Utrecht, Netherlands condensed matter theory seminar (2009, invited).
183. *Generation of a synthetic vector potential and an E field*; Trieste, Italy conference (2009, invited).
184. *Control of the energy-momentum relation in cold atom systems: effective vector potentials*, and *2D Bosons in an optical lattice, T >0;* KITP conference and program two (2009, invited – two talks).
185. *Control of the energy-momentum relation in cold atom systems: effective vector potentials;* ITAMP workshop (2009, invited).
186. *Realization of the Bose-Hubbard model in non-standard lattice potentials: tools, experiments, and a simple model;* PQE at Snowbird (2009, invited).
187. *Bose Hubbard in Rb at JQI;* DARPA Program review (2008, programmatic).
188. *Designing the Hamiltonian;* Fundamentals in Optics meeting: young laser scientists session (2008, invited).
189. *2D Bosons in an optical lattice;* Georgetown University physics colloquia (2008, invited).
190. *Control of the energy-momentum relation in cold atom systems: effective vector potentials;* University of Illinois AMO/CMP seminar (2008, invited).
191. *Control of the energy-momentum relation in cold atom systems: effective vector potentials;* University of Maryland CMP symposium (2008, invited).
192. *2D Bosons in an optical lattice;* LPHYS'08 quantum information seminar (2008, invited).

193. *Generation of effective magnetic fields in Raman-dressed states;* APS DAMOP meeting (2008, contributed).
194. *Engineering Hamiltonians in position and momentum;* Max Planck Institute, Dresden (2008, invited).
195. *Control of the energy-momentum relation in systems of ultra-cold atom;* Quantum Information Sciences meeting at NIST Boulder (2008, programmatic).
196. *2D Bosons in an optical lattice;* Millersville University physics colloquia (2008, invited).
197. *2D Bosons in an optical lattice;* University of Texas at Austin physics colloquia (2007, invited).
198. *Cold atoms and the 2D Bose-Hubbard mode;* APS DAMOP meeting (2007, invited).
199. *Measurements in a 2D Bose-Hubbard system;* NIST Atomic physics division seminar (2007).
200. *Mott Insulator - Superfluid Transition in a 2D Bose Gas;* Kavli Institute for Theoretical physics (2007, invited).
201. *Phases of 2D Bose-Hubbard systems;* APS March Meeting (2007, contributed).
202. *Bose-Hubbard model in an optical lattice;* DARPA OLE presentation day (2006, poster).
203. *Size of Mott domains measured by noise correlations;* APS March Meeting (2006, contributed) .
204. *Bosons in a 2D optical lattice: an experimental study;* Sandia National Labs Condensed Matter Physics Seminar (2006).
205. *2D Bosons in an optical lattice;* Caltech CMP and AMO seminar (2006).
206. *2D Bosons in an optical lattice;* JQI seminar (2006).
207. *Bosons in a 2D optical lattice: an experimental study;* Boston College Condensed Matter Physics Seminar (2006).
208. *The onset of the ν = 1 bilayer quantum Hall effect;* Boston College Special Condensed Matter Physics Lecture (2006).
209. *Size of Mott domains measured by noise correlations;* APS March Meeting (2006, contributed).
210. *Bosons in a 2D optical lattice: an experimental study*; Yale Solid State and Optics Seminar Series (2006).
211. *Bosons in a 2D optical lattice: an experimental study*; JILA Seminar (2006).
212. *Bosons in a 2D optical lattice: an experimental study*; MIT Seminar (2006).
213. *Bosons in a 2D optical lattice: an experimental study*; Princeton Solid State Seminar (2006).
214. *Lifetimes of excited quantum-mechanical states in a 2D BEC;* Towson University Physics Seminar (2005).
215. *Vibrational lifetimes in a 2D BEC*; Virginia Tech Condensed Matter Seminar (2005).

216. *Vibrational state lifetimes in a 1D optical lattice;* APS March Meeting (2005, contributed).

217. *Emergent Phenomena in Quantum Hall Systems* (2005, invited); PCCM Workshop on Strongly Correlated Electronic Materials (2005, invited).

218. *Indications of excitonic superfluidity in a quantum Hall bilayer*; 20th EPS CMD General Conference (2004, invited).

219. *Incomplete electronic spin polarization in the $\nu_T = 1$ bilayer quantum Hall state*; APS March Meeting (2004, contributed).

220. *New observations in a quantum Hall ferromagnet via tunneling spectroscopy*; NATO ASI at Windsor (2001, poster).

221. *Observation of a linearly dispersive Goldstone mode in a quantum Hall ferromagnet via tunneling spectroscopy*; APS March Meeting (2001, invited).

222. *Tunneling in a bilayer quantum Hall ferromagnet*; APS March Meeting (2000, contributed).

Outreach

1. Presented a series of demos on electricity and magnetism at Rockville Science Day (2024).
2. States of matter for Elementary school students at Dufief ES Science Night (2018)
3. Presented a series of demos on superconductivity at Rockville Science Day (2016).
4. Presented a series of demos on laser light at Rockville Science Day (2012, 2013, 2014).
5. Presented a series of demos on electromagnetism and sound at Rockville Science Day (2011).
6. Presented a series of demos on electromagnetism at Rockville Science Day (2010).
7. Gave a demo "Understanding magnetism" to 4-8 graders (Technology Day at Shady Grove Campus, Nov. 2010).

Mentored high school students in the lab (Summer 2009, Summer 2013, Summer 2015); mentored numerous undergraduate students through NIST SURF program.

Service

1. Faculty advisor for 2024 student-organized quantum simulation (QSIM) summer school at the University of Rhode Island.
2. Co-advisor for 2023 student-organized quantum simulation (QSIM) summer school in Telluride, CO.
3. Organized March Meeting 2022 tutorial on quantum many body physics with ultracold neutral atoms.
4. Organizer of 2020 March meeting focus session "Precision Many-Body Physics."
5. Member of organizing committee and lecturer for 2020 (postponed to 2021) Boulder

summer school on atomic physics.

6. Member of organizing committee for Summer 2015 Max Plank Institute at Dresden workshop on ultracold atoms.
7. Member of organizing committee for Summer 2015 Aspen workshop on ultracold atoms.
8. Organized March Meeting 2015 tutorial on quantum simulation with ultracold neutral atoms.
9. With Jake Taylor, organized ICAP 2014 Summer school in Williamsburg, VA.
10. Member of organizing committee for Summer 2014 Aspen workshop on artificial gauge fields.
11. Member of scientific advisory committee for Moore Foundation on emergent physics (Sep. 2012)
12. Served on organizing committee for NewSpin2 winter school at Texas A&M (Dec. 2011)

Local committee work
Graduate admissions committee (2022-2023); JQI executive committee (2012-2014); JQI seminar series committee (2011-2012); JQI infrastructure committee (2008-present, Chairman from 2008-2010); JQI graduate fellowship committee (2009, 2010, 2016-2020, 2023).

Reviewed for:
Nature, Science, Physical Review Letters, Physical Review A, New Journal of Physics, and Nature Physics.

Participated in review panels for granting agencies (specifics are confidential).

Review proposals for domestic and international granting agencies.

Honors

Professional

1. 2020 Honorary Doctorate, Vilnius University
2. 2019 Presidential Rank Award
3. 2019 Elected as Full member in Sigma Xi, The Scientific Research Honor Society
4. 2017, 2018, 2019 Clarivate Analytics Highly Cited Researcher
5. 2015 APS Rabi Award
6. 2014 Selected as a NIST Fellow
7. 2014 NIST Stratton Award
8. 2012 Elected as a Fellow of the American Physical Society.
9. 2012 Kavli Fellow.

10. 2011 Junior BEC Award: For the first experimental realization of synthetic magnetic fields and spin-orbit couplings in atomic Bose-Einstein condensates.
11. 2011 IUPAP prize: the IUPAP Prize rewards a young researcher who has a leading personal role in the achievement of original and outstanding contributions to the field of AMO physics.
12. 2011 Arthur S. Flemming Award, recognizing distinguished service in the federal government. Citation: "For pioneering research in quantum physics, particularly the novel use of controlled quantum systems, specifically ultracold atomic gases, to model quantum phenomena that are difficult to observe in other settings."
13. 2010 PECASE Award: Presidential Early Career Awards for Scientists and Engineers, the highest honor bestowed by the United States government on young professionals in the early stages of their independent research careers.
14. 2010 Maryland Academy of Sciences: Young scientist of the year award.
15. 2010 Popular Science Brilliant 10. Citation: "his manipulation of atoms chilled to near-absolute zero could help create high-temperature superconductors."
16. 2009 NIST Bronze Metal. Citation: "For the development of methods to simulate condensed matter models by creating simple experimental realizations using ultra-cold atomic gases"
17. 2009 NIST Sigma Xi Young Scientist Award. Citation: "In recognition for your highly innovative studies of Bose-Einstein condensates in two-dimensional lattices."
18. 2009 Finalist for "Call to Service Medal". Citation: "Pioneered a new area of research that is helping scientists understand crucial, but currently intractable, mysteries of physics like the explanation of high-temperature superconductivity."

Postdoctoral Honors (National Institute of Standards and Technology)
National Research Council Postdoctoral Associate: 2004-2006

Graduate Honors (California Institute of Technology)
National Defense Science and Engineering Graduate Fellowship: 1999-2002

Undergraduate Honors (University of Oklahoma)
Fowler Prize for the outstanding senior in physics and astronomy: 1998
Barry M. Goldwater scholar: 1997-1998
Phi Kappa Phi honors society: 1998
Clarence Kaucher award for outstanding achievement in physics: 1996
University of Oklahoma Physics Kaucher scholarship: 1995-1997

Community

1. Scoutmaster, Scouts BSA Troop 1097G (2022-present)
2. Guitarist in Church rock band "Gracenotes" (2020-present)
3. Scoutmaster, Boy Scout Troop 1097 (2017-2022)
4. Assistant Scoutmaster, Boy Scout Troop 1097 (2014-2017)

5. Cubmaster, Cub Scout Pack 221 (2015-2017)
6. Boys Scouts of America SOUSA award for Adult Leadership in Boy Scout Troop 1097 (2015)
7. Boys Scouts of America SOUSA award for Adult Leadership in Cub Scout Pack 221 (2015)
8. Caltech karate club captain (2001-2003)