

Gaurav Bahl

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1206 W Green St., 4413 Mechanical Engineering Laboratory, Urbana, Illinois 61822

CURRENT AFFILIATIONS

George B. Grim Professor and Kritzer Faculty Scholar

Mechanical Science and Engineering, University of Illinois at Urbana-Champaign Aug 2022 – present

Affiliate appointments (0%)

Department of Electrical and Computer Engineering Aug 2012 – present

Department of Physics Sept 2020 – present

Illinois Quantum Information Science and Technology Center (IQUIST) Dec 2018 – present

Illinois Technology Entrepreneur Center Nov 2017 – present

Micro and Nanotechnology Laboratory Aug 2012 – present

EDUCATION

PhD, Electrical Engineering, Stanford University, California, USA September 2010

MS, Electrical Engineering, Stanford University, California, USA June 2008

B.Eng, *Summa cum laude*, Electrical Engineering, McMaster University, ON, Canada June 2005

PROFESSIONAL POSITIONS HELD

Associate Professor, Mechanical Science and Engineering, UIUC Aug 2018 – Aug 2022

Assistant Professor, Mechanical Science and Engineering, UIUC Aug 2012 – Aug 2018

Optics and Photonics Laboratory Sept 2010 – July 2012

Postdoctoral Research Fellow, EECS, University of Michigan, Ann Arbor

- Research focus: Investigating fundamental light-matter interactions in resonant micro-cavities for optomechanical oscillators (OMOs). Modeling and experimental demonstration towards understanding phase noise, frequency tuning, stability, fabrication, reliability, and packaging of OMOs.
- Mentor: Prof. Tal Carmon

Stanford Micro-Structures and Sensors Laboratory Apr 2006 – Aug 2010

Research Assistant/PhD Candidate, Mechanical Engineering, Stanford University

- Research focus: Modeling charging phenomena in dielectrics in MEMS, specifically SiO₂ – Si composite resonators; Silicon microresonator design and fabrication; Resonator-based thermometry and sensing; Circuit design for frequency references with active and passive temperature compensation; Developing systems-level techniques for circumventing charge-drift in resonant electrostatic MEMS.
- Primary advisor: Prof. Thomas W. Kenny; Co-advisor: Prof. Roger T. Howe

Information and Quantum Systems Laboratory June 2008 – Sept 2008

MEMS Research Group Intern, HP Labs, Palo Alto, California

HONORS AND AWARDS

- **Appointed as George B. Grim Professor in Mechanical Science and Engineering, 2023**
- **Elected as Fellow of Optica, 2022**
- **Kritzer Faculty Scholar in The Grainger College of Engineering, 2020**

- **Presidential Early Career Award for Scientists and Engineers (PECASE), 2019**
Nominated by the Department of Defense via the Office of Naval Research
- **UIUC Dean’s Award for Excellence in Research, 2018**
- **Office of Naval Research, Director of Research Early Career Grant, 2017**
- **Air Force Office of Scientific Research Young Investigator Award, 2015**
- Elevation to Senior Member of the Optical Society of America (OSA), 2020
- “Lithium niobate isolators that outperform magneto-optics,” featured as a top-30 development in optics in the “Optics in 2022” special issue of Optica’s (formerly OSA) Optics and Photonics News, Dec 2022.
- “Breaking optical symmetry with sound,” featured as a top-30 development in optics in the “Optics in 2018” special issue of Optical Society of America (OSA) Optics and Photonics News, Dec 2018.
- List of Teachers Ranked Excellent by their Students at UIUC, Fall 2012, Spring 2018, Spring 2021, Fall 2022
- UIUC Engineering Council Award for Excellence in Advising, 2017
- Elevation to Senior Member of the Institute of Electrical and Electronics Engineers (IEEE), Feb 2016
- “Bridging Two Worlds: Microfluidic Optomechanics” featured as a top-30 development in optics in the “Optics in 2013” special issue of Optical Society of America (OSA) Optics and Photonics News, Dec 2013.
- “Experimental Observation of Brillouin Cooling” featured as a top-30 development in optics in the “Optics in 2012” special issue of Optical Society of America (OSA) Optics and Photonics News, Dec 2012.
- Ontario Professional Engineers Foundation for Education Gold Medal, 2005
- Provost’s Honor Roll, McMaster University, 2003 – 2004
- Dean’s Honor List, McMaster University, 2002 – 2005
- Dr. H. L. Hooker Scholarship, McMaster University, 2003 and 2004
- Finalist, Computer Science, 50th Intel International Science and Engineering Fair, Philadelphia, 1999. Member of the first team representing India at the competition.

PROFESSIONAL MEMBERSHIPS

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| • Fellow, Optica (formerly OSA) | M’10, S’20, F’22 |
| • Senior Member, Institute of Electrical and Electronics Engineers (IEEE) | M’09, S’16 |
| • Member, SPIE | M’10 |
| • Member, American Society of Mechanical Engineers (ASME) | M’16 |

PUBLICATIONS AND CREATIVE WORKS

ARCHIVAL JOURNAL PUBLICATIONS

1. O.E. Orsel, J. Noh, G. Bahl, "Electrically-controlled suppression of Rayleigh backscattering in an integrated photonic circuit," **Nanophotonics**, doi:10.1515/nanoph-2023-0431, 2024.
2. J. Jing, G. Bahl, "Simultaneous maximization of voltage and power efficiencies in magneto-mechanical transmitters," **IEEE Transactions on Antennas and Propagation**, doi:10.1109/TAP.2023.3333956, 2023.
3. O.E. Orsel, G. Bahl, "Electro-optic non-reciprocal polarization rotation in lithium niobate," **APL Photonics** 8, 096107, 2023.
4. P. Zhu, X.Q. Sun, T.L. Hughes, G. Bahl, "Higher rank chirality and non-Hermitian skin effect in a topoelectrical circuit," **Nature Communications**, 14, 720, doi: 10.1038/s41467-023-36130-x, 2023.

5. J. Jing, S. Tawfick, G. Bahl, "Frequency response and eddy current power loss in magneto-mechanical transmitters," **IEEE Transactions on Antennas and Propagation**, doi: 10.1109/TAP.2023.3242121, 2023.
6. J. Schulz[‡], J. Noh[‡], W.A. Benalcazar, G. Bahl, G. von Freymann, "Photonic quadrupole topological insulator using orbital-induced synthetic flux," **Nature Communications** 13, 6597, 2022. [[‡] equal contribution]
7. G. Liu, J. Noh, J. Zhao, G. Bahl, "Self-Induced Dirac Boundary State and Digitization in a Nonlinear Resonator Chain," **Phys Rev Lett** 129, 135501, 2022.
8. A. Kanj, R.P. Thanalakshme, C. Li, J. Kulikowski, G. Bahl, S. Tawfick, "Design, Dynamics, and Dissipation of a Torsional-Magnetic Spring Oscillator," (accepted) **Mechanical Systems and Signal Processing**, vol. 179, 109307, 2022.
9. S.S. Yamada, T. Li, M. Lin, C.W. Peterson, T.L. Hughes, G. Bahl, "Experimental observation of bound states at partial dislocation defects in multipole higher-order topological insulators," **Nature Communications** 13, 2035, 10.1038/s41467-022-29785-5, 2022.
10. R.P. Thanalakshme, A. Kanj, J. Kim, E. Wilken-Resman, J. Jing, I.H. Grinberg, J.T. Bernhard, S. Tawfick, G. Bahl, "Magneto-Mechanical Transmitters for Ultra-Low Frequency Near-field Communication," **IEEE Transactions on Antennas and Propagation**, IEEE Transactions on Antennas and Propagation, doi:10.1109/TAP.2021.3137244, 2021.
11. D.B. Sohn[‡], O.E. Orsel[‡], G. Bahl, "Electrically driven linear optical isolation through phonon mediated Autler-Townes splitting," **Nature Photonics** 15, pp.822–827, doi:10.1038/s41566-021-00884-x, 2021. [[‡] equal contribution] * *Hero image for Nov 2021*. * *Selected as a Top-30 Development in Optics for 2022 by Optica*.
12. S. Kim, G. Bahl, "Exceptional behaviour without exceptional effort," **Nature Photonics** 15, pp.556–557, 2021.
13. C. W. Peterson, T. Li, W. Jiang, T.L. Hughes, G. Bahl, "Trapped fractional charges at bulk defects in topological insulators," **Nature** 589, pp.376-380, 2021.
14. S. Kim, D.B. Sohn, C.W. Peterson, G. Bahl, "On-chip optical non-reciprocity through a synthetic Hall effect for photons," **APL Photonics** 6, 011301, 2021. * *Editor's Pick*
15. I.H. Grinberg, M. Lin, W.A. Benalcazar, T.L. Hughes, G. Bahl, "Trapped state at a dislocation in a weak magneto-mechanical topological insulator," **Phys Rev Applied** 14, 064042, 2020. * *Editor's Suggestion*
16. C. W. Peterson, T. Li, W. A. Benalcazar, T.L. Hughes, G. Bahl, "A fractional corner anomaly reveals higher-order topology," **Science** 368, 6495, pp.1114-1118, 2020.
17. I. H. Grinberg, M. Lin, C. Harris, W. A. Benalcazar, C. W. Peterson, T. L. Hughes, G. Bahl, "Robust temporal pumping in a magneto-mechanical topological insulator," **Nature Communications** 11:974, doi:10.1038/s41467-020-14804-0, 2020.
18. D.B. Sohn, G. Bahl, "Direction reconfigurable non-reciprocal acousto-optic modulator on chip," **APL Photonics** 4, 126103, 2019.
19. B. J. Eggleton, C. G. Poulton, P. T. Rakich, M. J. Steel, G. Bahl, "Brillouin integrated photonics," **Nature Photonics** 13, pp. 664-677, doi:10.1038/s41566-019-0498-z, 2019. * *Featured in Popular Mechanics*.
20. S. Kim, J.M. Taylor, G. Bahl, "Dynamic suppression of Rayleigh light scattering in dielectric resonators," **Optica** 6(8), pp. 1016-1022, 2019.
21. C. W. Peterson, W. A. Benalcazar, M. Lin, T. L. Hughes, G. Bahl, "Strong nonreciprocity in modulated resonator chains through synthetic electric and magnetic fields," **Physical Review Letters**, 123, 063901, 2019.
22. I.H. Grinberg, A. Mangu, C.W. Peterson, E. Wilken-Resman, J.T. Bernhard, G. Bahl, "Magnetostatic spring softening and stiffening in magneto-mechanical resonator systems," **IEEE Transactions on Magnetics**, 55(8), 4003505, doi:10.1109/TMAG.2019.2906864, 2019.
23. K. Han, J. Suh, G. Bahl, "Optomechanical non-contact measurement of microparticle compressibility in liquids," **Optics Express** 26(24), pp. 31908-31916, 2018.
24. C.W. Peterson, S. Kim, J.T. Bernhard, G. Bahl, "Reconfigurable arbitrary nonreciprocal transfer functions through nonreciprocal coupling," **Science Advances** 4(6), eaat0232, doi:10.1126/sciadv.aat0232, 2018.

25. Y.-C. Chen, I. Ghosh, A. Schleife, P.S. Carney, G. Bahl, "Optimization of anisotropic photonic density of states for Raman cooling," **Phys. Rev. A** 97, 043835, 2018.
26. C.W. Peterson, W.A. Benalcazar, T.L. Hughes, G. Bahl, "Demonstration of a quantized microwave quadrupole insulator with topologically protected corner states," **Nature** 555, pp.346–350, 2018. * *Featured in Gizmodo*
27. D.B. Sohn, S. Kim, G. Bahl, "Time-reversal symmetry breaking with acoustic pumping of nanophotonic circuits," **Nature Photonics**, 12, pp.91-97, Feb 2018. * *Cover article for Feb 2018 issue of Nature Photonics.* * *Selected as a Top-30 Development in Optics for 2018 by OSA.*
28. J. Suh, K. Han, G. Bahl, "Imaging of acoustic pressure modes in opto-mechano-fluidic resonators with a single particle probe," **Applied Physics Letters**, 112, 071106, 2018.
29. S. Kim, X. Xu, J.M. Taylor, G. Bahl, "Dynamically induced robust phonon transport and chiral cooling in an optomechanical system," **Nature Communications**, 8, 205, doi:10.1038/s41467-017-00247-7, 2017.
30. J. Kim[‡], S. Kim[‡], G. Bahl, "Complete linear optical isolation at the microscale with ultralow loss," **Scientific Reports**, 7:1647, 2017. [[‡] equal contribution]
31. S. Kim, G. Bahl, "Role of Optical Density of States in Two-Mode Optomechanical Cooling," **Optics Express** 25(2), pp.776-784, 2017.
32. J. Suh, K. Han, C.W. Peterson, G. Bahl "Real-time sensing of flowing nanoparticles with electro-opto-mechanics," **APL Photonics** 2, 010801, doi:10.1063/1.4972299, 2017.
33. Y-C. Chen, S. Kim, G. Bahl, "Brillouin Cooling in a Linear Waveguide," **New Journal of Physics**, 18, 115004, doi:10.1088/1367-2630/18/11/115004, 2016.
34. H. Keum, Z. Yang, K. Han, D.E. Handler, T.N. Nguyen, J. Schutt-Aine, G. Bahl, S. Kim, "Lego-like Microassembly of Heterogeneous Materials for 3D microsystems," **Scientific Reports**, vol.6, 29925, doi:10.1038/srep29925, 2016.
35. G. Bahl, "Raman Cooling in a semiconductor," **Nature Photonics** 10, pp.566-567, doi:10.1038/nphoton.2016.142, July 2016.
36. K. Han, J. Kim, G. Bahl, "High-Throughput Long-Range Photonic Sensing of Flowing Microparticles with Opto-mechano-fluidics," **Optica** 3(6), p.585-591, 2016. * *Cover article for June 2016 issue of Optica*
37. K. Zhang, K. Han, S. Shi, G. Bahl, S. Tawfick, "Highly stretchable conductors made by laser draw-casting of ultralong metal nanowires," **Advanced Electronic Materials**, 1600003, doi:10.1002/aelm/201600003, 2016.
38. N. Dostart, S. Kim, G. Bahl, "Giant Gain Enhancement in Surface-Confined Resonant Stimulated Brillouin Scattering," **Laser & Photonics Reviews**, doi:10.1002/lpor.201500141, October 2015.
39. Y.C. Chen, G. Bahl, "Raman Cooling of Solids through Photonic Density of States Engineering," **Optica** 2(10), pp.893-899, October 2015.
40. J. Kim, M. Kuzyk, K. Han, H. Wang, G. Bahl, "Non-reciprocal Brillouin scattering induced transparency," **Nature Physics** 11, pp.275-280, doi:10.1038/nphys3236, 2015.
41. M.R. Gartia, S. Seo, J. Kim, T.-W. Chang, G. Bahl, M. Lu, G.L. Liu, J.G. Eden, "Injection-seeded optoplasmonic amplifier in the visible," **Scientific Reports**, vol.4, 6168, doi:10.1038/srep06168, 2014.
42. K. Zhu, K. Han, T. Carmon, X. Fan, G. Bahl, "Opto-Acoustic Biosensing with Optomechanofluidic Resonators," **European Physical Journal Special Topics**, 223, 1937-1947, 2014.
43. K. Han, K. Zhu, G. Bahl, "Opto-Mechano-Fluidic Viscometer," **Applied Physics Letters**, 105, 024103, 2014.
44. K. Han, K. H. Kim, J. Kim, W. Lee, J. Liu, X. Fan, T. Carmon, and G. Bahl, "Fabrication and testing of microfluidic optomechanical oscillators," **Journal of Visualized Experiments**, vol.87, e51497, doi:10.3791.51497, 2014.
45. K. Han, J. Kim, G. Bahl, "Aerostatically tunable optomechanical oscillators," **Optics Express**, vol. 22, issue 2, pp. 1267-1276, 2014.

46. G. Bahl, K. H. Kim, W. Lee, J. Liu, X. Fan, T. Carmon, "Brillouin cavity optomechanics with microfluidic devices," **Nature Communications**, 4:1994, doi:10.1038/ncomms2994, 2013. * *Selected as a Top-30 Development in Optics for 2013 by OSA.*
47. K. H. Kim[‡], G. Bahl[‡], W. Lee, J. Liu, M. Tomes, X. Fan, T. Carmon [[‡] equal contribution], "Cavity optomechanics on a microfluidic resonator with water and viscous liquids," **Light: Science and Applications**, 2, e110, doi:10.1038/lsa.2013.66, 2013.
48. G. Bahl, X. Fan, T. Carmon, "Acoustic whispering gallery modes in optomechanical shells," **New Journal of Physics**, vol.14, 115026, 2012.
49. G. Bahl, M. Tomes, F. Marquardt, and T. Carmon, "Observation of Spontaneous Brillouin Cooling," **Nature Physics**, doi:10.1038/nphys2206, 2012. * *Selected as a Top-30 Development in Optics for 2012 by OSA.*
50. M. Tomes, F. Marquardt, G. Bahl, T. Carmon, "Quantum mechanical theory of optomechanical Brillouin cooling," **Physical Review A**, 84, 063806, 2011.
51. G. Bahl, J. Zehnpfennig, M. Tomes, T. Carmon, "Stimulated Optomechanical Excitation of Surface Acoustic Waves in a Microdevice," **Nature Communications**, 2:403, doi:10.1038/ncomms1412, 2011.
52. J. Zehnpfennig, G. Bahl, M. Tomes, T. Carmon, "Surface Optomechanics: Calculating optically excited acoustical whispering gallery modes in microspheres," **Optics Express**, Vol. 19, pp.14240-8, 2011.
53. G. Bahl, J. Salvia, R. Melamud, B. Kim, R.T. Howe, and T. W. Kenny, "AC Polarization for Charge-Drift Elimination in Resonant Electrostatic MEMS and Oscillators," **Journal of Microelectromechanical Systems**, Vol. 20, No. 2, April 2011.
54. S. Yoneoka, J. Salvia, G. Bahl, R. Melamud, S. A. Chandorkar, and T. W. Kenny, "Active Electrostatic Compensation of Micromechanical Resonators Under Random Vibrations," **JMEMS Letters**, Vol. 19, No. 5, October 2010.
55. G. Bahl, R. Melamud, B. Kim, S. A. Chandorkar, J. Salvia, M. A. Hopcroft, D. Elata, R. G. Hennessy, R. N. Candler, R.T. Howe, and T. W. Kenny, "Model and observations of dielectric charge in thermally oxidized silicon resonators," **Journal of Microelectromechanical Systems**, Vol. 19, No. 1, Feb 2010.
56. R. Melamud, S. A. Chandorkar, B. Kim, H. K. Lee, J. Salvia, G. Bahl, M. A. Hopcroft, and T. W. Kenny, "Temperature Insensitive Composite Micromechanical Resonators," **Journal of Microelectromechanical Systems**, Vol. 18, No. 6, Dec 2009.
57. M. Agarwal, S. A. Chandorkar, H. Mehta, R. N. Candler, B. Kim, M. A. Hopcroft, R. Melamud, C. M. Jha, G. Bahl, G. Yama, T. W. Kenny, and B. Murmann, "A study of electrostatic force nonlinearities in resonant microstructures," **Applied Physics Letters**, Vol. 92, pp. 104106-3, 2008.
58. M. Agarwal, H. Mehta, R. N. Candler, S. A. Chandorkar, B. Kim, M. A. Hopcroft, R. Melamud, G. Bahl, G. Yama, T. W. Kenny and B. Murmann, "Scaling of A-f nonlinearities in electrostatically transduced microresonators," **Journal of Applied Physics**, Vol. 102, p. 74903, 2007.
59. C. M. Jha, G. Bahl, R. Melamud, S. A. Chandorkar, M. A. Hopcroft, B. Kim, M. Agarwal, J. Salvia, H. Mehta, and T. W. Kenny, "High resolution microresonator-based digital temperature sensor," **Applied Physics Letters**, Vol. 91, p. 74101, 2007.
60. M. A. Hopcroft, B. Kim, S. Chandorkar, R. Melamud, M. Agarwal, C. M. Jha, G. Bahl, J. Salvia, H. Mehta, H. K. Lee, R. N. Candler, and T. W. Kenny, "Using the temperature dependence of resonator quality factor as a thermometer," **Applied Physics Letters**, Vol. 91, p. 013505, 2007.

JOURNAL PUBLICATIONS SUBMITTED OR FORTHCOMING

1. G. Liu, V. Workman, J. Noh, Y. Ma, T.L. Hughes, W.A. Benalcazar, G. Bahl, "A mono-atomic orbital-based 1D topological crystalline insulator," arXiv:2310.10403, 2023.
2. A. Stegmaier, H. Brand, S. Imhof, A. Fritzsche, T. Helbig, T. Hofmann, I. Boettcher, M. Greiter, C.H. Lee, G. Bahl, A. Szameit, T. Kießling, R. Thomale, L.K. Upreti, "Realizing efficient topological temporal pumping in electrical circuits," arXiv:2306.15434, 2023.

CONFERENCE PRESENTATIONS AND PAPERS

1. O.E. Orsel, J. Noh, G. Bahl, "Giant on-chip non-reciprocity and gyration through synthetic fields in modulated LiNbO₃ ring resonators," at Frontiers in Optics, FW5E.3, Oct 2023.
2. J. Schulz, J. Noh, W.A. Benalcazar, G. Bahl, G. von Freymann, "Photonic Quadrupole Topological Insulator Using Orbital-Induced Synthetic Flux," at Conference on Lasers and Electro Optics (CLEO), FF1D.8, May 2023.
3. O.E. Orsel, J. Noh, G. Bahl, "Suppression of Intrinsic Backscattering in Integrated Optical Resonators via Acoustic Pumping," at Conference on Lasers and Electro Optics (CLEO), SF2K.6, May 2023.
4. G. Liu, J. Noh, J. Zhao, G. Bahl, "Self-Induced Dirac Boundary State Observed in a Nonlinear Magneto-Mechanical Metamaterial", at APS March Meeting, Feb 2023.
5. J. Zhao, M. Lin, Z. Wu, T.L. Hughes, G. Bahl, "Non-reciprocity within piezoelectric micromechanical resonator chains," at IEEE Ultrasonics Symposium, SPC10, Sept 2022.
6. J.M.L. Miller[‡], J. Zhao[‡], C.H. Ahn, E.J. Ng, V. Hong, Y. Yang, N.E. Bousse, T.W. Kenny, G. Bahl, "Giant non-reciprocity through frequency modulation of a two degree-of-freedom micromechanical resonator," at Hilton Head Workshop, June 2022. [[‡] equal contribution]
7. O.E. Orsel, G. Bahl, "Piezoelectric enhancement of SBS in LiNbO₃ thin films," at Workshop on Optomechanics and Brillouin Scattering (WOMBAT), 2022.
8. O.E. Orsel, G. Bahl, "Electrically-driven nonreciprocal polarization rotation at 780 nm in thin-film lithium niobate," at Conference on Lasers and Electro-Optics (CLEO), 2022.
9. D.B. Sohn, O.E. Orsel, G. Bahl, "On-chip lithium niobate isolators at 780 nm with nm-scale tuning bandwidth," at Conference on Lasers and Electro-Optics (CLEO), 2022.
10. D. Woods, S. Sharifi, J. Melia, G. Bahl, E.A. Goldschmidt, "Towards Raman cooling in erbium doped microresonators," at APS March Meeting, G00:333, 2022.
11. D.B. Sohn[‡], O. Orsel[‡], G. Bahl, "Low loss wavelength-agnostic optical isolators through acoustic pumping in a lithium niobate platform," at Frontiers in Optics, FW1D.4, 2021. [[‡] equal contribution]
12. C.W. Peterson, S.S. Yamada, T. Li, M. Lin, W. Jiang, W.A. Benalcazar, T.L. Hughes, G. Bahl, "Fractional charges and defects in high-order microwave topological insulators," at Photonics and Electromagnetics Research Symposium (PIERS), 2021 (delayed to 2022).
13. S.S. Yamada, T. Li, M. Lin, C.W. Peterson, T.L. Hughes, G. Bahl, "Bound states at partial dislocation defects in 2D and 3D high-order topological insulator metamaterials," at Photonics and Electromagnetics Research Symposium (PIERS), 2021 (delayed to 2022).
14. D.B. Sohn, O.E. Orsel, G. Bahl, "Lossless optical isolation and nonreciprocity in integrated photonics", at IEEE Photonics Conference, ThH2.1, Oct 18-21, 2021.
15. D.B. Sohn, O.E. Orsel, G. Bahl, "Low Loss Wavelength-agnostic Optical Isolators Through Acoustic Pumping in a Lithium Niobate Platform," at Frontiers in Optics, FW1D.4, 2021.
16. D.B. Sohn, J. Melia, S. Kim, O.E. Orsel, and G. Bahl, "On-chip electrically driven 780 nm frequency-shifting optical isolation," at Conference on Lasers and Electro-Optics (CLEO), STh4B.5, 2021.
17. D.B. Sohn, O.E. Orsel, G. Bahl, "Electrically-driven linear optical isolation in a lithium niobate nanophotonic platform," at Conference on Lasers and Electro-Optics (CLEO), JTu3A.84, 2021.
18. C.W. Peterson, M. Sha, G. Bahl, "Reconfigurable Gyration and Isolation Through Nonreciprocal Coupling to Resonators with Tunable Q-Factor," at IEEE International Frequency Control Symposium (IFCS/EFTF/ISAF), Virtual conference, paper 4037, July 2020.
19. S. Kim, D.B. Sohn, C.W. Peterson, G. Bahl, "A synthetic Hall effect for photons," at Conference on Lasers and Electro-Optics (CLEO), STu3J.3, San Jose, CA, May 2020.

20. D.B. Sohn, S. Kim, G. Bahl, "Unreleased on-chip frequency-shifting optical isolator," at Conference on Lasers and Electro-Optics (CLEO), STh4J.5, San Jose, CA, May 2020.
21. C.W. Peterson, T. Li, T.L. Hughes, G. Bahl, "Measurement of fractional charge at disclination defects in higher-order topological crystalline insulators," at APS March Meeting 2020, H71.00031, Denver, March 2020.
22. C.W. Peterson, W.A. Benalcazar, M. Lin, T.L. Hughes, G. Bahl, "A synthetic Hall effect creates strong photonic nonreciprocity," at APS March Meeting 2020, W01.00011, Denver, March 2020.
23. A. Kanj, J. Kulikowsky, R.P. Thanalakshme, G. Bahl, S. Tawfick, "Dynamics of a torsional magnetic spring oscillator," at ASME IMECE, Salt Lake City, Utah, Nov 2019.
24. I.H. Grinberg, M. Lin, C. Harris, W.A. Benalcazar, C.W. Peterson, T.L. Hughes, G. Bahl, "Topological pumping in a magneto-mechanical system," at APS March Meeting, Boston, March 2019.
25. C.W. Peterson, W.A. Benalcazar, T. Li, T.L. Hughes, G. Bahl, "Measurement of fractional corner charges in rotationally symmetric crystalline topological insulator metamaterials," at APS March Meeting, Boston, March 2019.
26. S. Kim, J. M. Taylor, G. Bahl, "Suppression of Rayleigh Backscattering in Resonators," at IEEE Photonics Conference, Reston, VA, Oct 2018.
27. D.B. Sohn, S. Kim, G. Bahl, "GHz-Bandwidth Optical Isolation Through Acoustic Pumping of a Nanophotonic Circuit," at IEEE Photonics Conference, Reston, VA, Oct 2018.
28. I. Grinberg, J. Kim, G. Bahl, "Eigenmode Optimization and Topologically Protected States in Magneto-Mechanical ULF Transmitter Arrays," at Solid State Sensors Actuators and Microsystems Workshop, Hilton Head Island, SC, June 2018.
29. I. Grinberg, M. Lin, W. Benalcazar, T. Hughes, G. Bahl, "Magneto-Mechanical Topological Lego," at APS March Meeting, Los Angeles, 2018.
30. S. Kim, X. Xu, J.M. Taylor, G. Bahl, "Chiral phonons and photons in an optomechanical system," at Gordon Research Conference, Mechanical Systems in the Quantum Regime, Ventura, CA Feb 2018.
31. C.W. Peterson, W. Benalcazar, T. Hughes, G. Bahl, "Measurement of topologically protected corner states in a microwave metamaterial quadrupole insulator," at APS March Meeting, Los Angeles, 2018.
32. J. Suh, K. Han, and G. Bahl, "Imaging of acoustic pressure field in opto-mechano-fluidic resonators with a single particle probe," *Frontiers in Optics* 2017, Washington DC, Sept 2017.
33. S. Kim., X. Xu, J.M. Taylor, and G. Bahl, "Optomechanical cooling without added damping," *Frontiers in Optics* 2017, Washington DC, Sept 2017.
34. C.W. Peterson, J.T. Bernhard, and G. Bahl, "Nonreciprocal zero-transmission filters through nonreciprocal coupling to resonators," International Frequency Control Symposium (IFCS), Besancon, France, July 2017.
35. D. Sohn, S. Kim, and G. Bahl, "Piezo-optomechanical nonreciprocal modulator," Workshop on Optomechanics and Brillouin Scattering: Fundamentals, Applications and Technology (WOMBAT), Besancon, France, July 2017.
36. D. Sohn, J. Kim, S. Kim, and G. Bahl, "Non-reciprocal Optomechanical Modulator," Conference on Lasers and Electro-Optics (CLEO), San Jose, CA, May 2017.
37. Y.-C. Chen, I. Ghosh, G. Bahl, "Optimization of anisotropic photonic density of states for Raman laser cooling," at SPIE Photonics West (Optical and Electronic Cooling of Solids II), Feb 2017.
38. J. Suh, K. Han, C.W. Peterson, G. Bahl, "High-throughput real-time sensing with microfluidic electro-opto-mechanical resonators," at SPIE Photonics West, Feb 2017.
39. S. Kim, X. Xu, J.M. Taylor, G. Bahl, "Dynamically induced chiral phonon transport in an optomechanical system," at Nanometa 2017, Seefeld, Austria, Jan 2017.
40. C.W. Peterson, J.T. Bernhard, G. Bahl, "Toward lossless nonreciprocity through spatiotemporal modulation," at Nanometa 2017, Seefeld, Austria, Jan 2017.

41. J. Kim, S. Kim, G. Bahl, "Ultralow loss optical isolation in silica microresonators," at Nanometa 2017, Seefeld, Austria, Jan 2017.
42. D. Sohn, J. Kim, G. Bahl, "Ultrahigh-Q Silica-AlN Hybrid Disk Optomechanical Modulator," IEEE MEMS 2017, Las Vegas, Jan 2017.
43. K. Han, J. Kim, and G. Bahl, "Opto-Mechano-Fluidic MEMS for Extremely High-Throughput Photonic Sensing of Flowing Microparticles," at Solid State Sensors Actuators and Microsystems Workshop, Hilton Head Island, SC, June 2016.
44. Y.-C. Chen, G. Bahl, "Raman cooling in silicon photonic crystals," at SPIE Photonics West (Optical and Electronic Cooling of Solids), San Francisco CA, Feb 2016.
45. Y.-C. Chen, G. Bahl, "Raman Cooling of Solids through Density of States Engineering," at Frontiers in Optics, San Jose, CA, Oct 2015.
46. K. Han, J. Kim, G. Bahl, "Towards High-Throughput Opto-Mechanical Flow Cytometry," at Frontiers in Optics, San Jose, CA, Oct 2015.
47. J. Kim, M. Kuzyk, K. Han, H. Wang, G. Bahl, "Magnet-Free Linear Nonreciprocity in Brillouin Systems," at 8th International Conference on Materials for Advanced Technologies (ICMAT), Materials Research Society of Singapore (MRS-S), Symposium F: Emerging Infrared Technologies and Applications, June 2015.
48. K. Zhang, S. Shi, K. Han, G. Bahl, S. Tawfick, "Flexible Transparent Conductor/Strain Sensors from Downsizing Traditional Metallic Wires to the Nanoscale", MRS Conference Spring, April 2015.
49. J. Kim, M. Kuzyk, K. Han, H. Wang, G. Bahl, "Observation of optical non-reciprocity in a Brillouin optomechanical system," at SPIE Photonics West (Laser Resonators, Microresonators, and Beam Control XVII), San Francisco CA, Feb 2015.
50. Ng, E., Y. Yang, V.A. Hong, C.H. Ahn, D.B. Heinz, I. Flader, Y. Chen, C.L.M. Everhart, B. Kim, R. Melamud, R.N. Candler, M.A. Hopcroft, J.C. Salvia, S. Yoneoka, A.B. Graham, M. Agarwal, M.W. Messana, K.L. Chen, H.K. Lee, S. Wang, G. Bahl, V. Qu, C.F. Chiang, T.W. Kenny, A. Partridge, M. Lutz, G. Yama, and G.J. O'Brien, "The long path from MEMS resonators to timing products," Proc. 28th IEEE MEMS 2015, Estoril, Portugal, 18-22 Jan 2015.
51. J. Kim, M. Kuzyk, K. Han, H. Wang, G. Bahl, "Magnet-free Non-reciprocity Demonstrated with Brillouin Scattering Induced Transparency," Postdeadline paper at Frontiers in Optics, Tucson AZ, Oct 2014.
52. J. Kim, M. Kuzyk, K. Han, H. Wang, G. Bahl, "Observation of Brillouin Scattering Induced Transparency in a Silica Microsphere Resonator," at Conference on Lasers and Electro-Optics (CLEO:2014), June 2014.
53. M.R. Gartia, S. Seo, J. Kim, T. Chang, G. Bahl, M. Lu, J.G. Eden, G. Liu, "Injection-Seeded Optoplasmonic Amplifier in the Visible," at Conference on Lasers and Electro-Optics (CLEO:2014), June 2014.
54. K. Han, K. Zhu, G. Bahl, "Optomechanical Viscometer," Solid State Sensors Actuators and Microsystems Workshop, Hilton Head Island, SC, June 2014.
55. G. Bahl, K.H. Kim, W. Lee, J. Liu, X. Fan, T. Carmon, "Brillouin cavity optomechanics with microfluidic devices (invited)," SPIE Laser Resonators, Microresonators, and Beam Control XVI (Photonics West), San Francisco, CA, January 2014.
56. K. Han, J. H. Kim, G. Bahl, "Radiation driven optomechanical pressure sensor," Frontiers in Optics 2013/Laser Science XXIX, Orlando, FL, Oct 2013.
57. K.H. Kim, G. Bahl, W. Lee, J. Liu, M. Tomes, X. Fan, T. Carmon, "Microfluidic Optomechanics," Frontiers in Optics 2013/Laser Science XXIX, Orlando, FL, Oct 2013. [*Winner of Emil Wolf Best Student Paper Award*]
58. G. Bahl, K. H. Kim, W. Lee, J. Liu, X. Fan, and T. Carmon, "Brillouin actuation of whispering-gallery modes in microfluidic optomechanical oscillators," Conference on Lasers and Electro-Optics (CLEO), San Jose CA, June 9-14, 2013.
59. G. Bahl, M. Tomes, F. Marquardt, and T. Carmon, "Observation of Spontaneous Brillouin Cooling (invited)," at Phonons 2012, Ann Arbor, MI, USA, July 8-12, 2012.
60. G. Bahl, K. H. Kim, W. Lee, J. Liu, X. Fan, and T. Carmon, "Microfluidic Optomechanical Oscillators," at the Solid-State Sensors, Actuators and Microsystems Workshop, Hilton Head Island, SC, USA, June 3-7, 2012.

61. G. Bahl, M. Tomes, F. Marquardt, and T. Carmon, "Observation of Brillouin Cooling (invited)," at Conference on Lasers and Electro-Optics (CLEO:2012), San Jose, CA, USA, May 2012.
62. G. Bahl, M. Tomes, F. Marquardt, and T. Carmon, "Optical filtering of Stokes lines for cooling (invited)," at SPIE Laser Refrigeration of Solids V (Photonics West), San Francisco, CA, USA, January 2012.
63. G. Bahl, M. Tomes, F. Marquardt, and T. Carmon, "Observation of Brillouin Cooling," at Frontiers in Optics 2011, San Jose, CA, USA, Oct 16-20 2011.
64. G. Bahl, J. Zehnpfennig, M. Tomes, and T. Carmon, "Characterization of Surface Acoustic Wave Optomechanical Oscillators," at the International Frequency Control Symposium (IFCS 2011), San Francisco, CA, May 2011.
65. G. Bahl, J. Zehnpfennig, M. Tomes, and T. Carmon, "Surface Optomechanics: Observation of Surface Acoustic Resonances in Whispering Gallery Resonators," at the Conference on Lasers and Electro-Optics (CLEO 2011), Baltimore, MD, USA, May 2011.
66. J. Zehnpfennig, G. Bahl, M. Tomes, and T. Carmon, "Surface Optomechanics: Observation of Surface Acoustic Resonances," at Frontiers in Optics 2010, Rochester, NY, USA, Oct 24-28, 2010.
67. G. Bahl, J. Salvia, H. K. Lee, R. Melamud, B. Kim, R.T. Howe, and T. W. Kenny, "Heterodyned Electrostatic Transduction Oscillators Evade Low Frequency Noise Aliasing," at Solid-State Sensors, Actuators, and Microsystems Workshop, Hilton Head 2010, Hilton Head, SC, USA, 2010.
68. H. K. Lee, J. Salvia, S. Yoneoka, G. Bahl, Y. Q. Qu, R. Melamud, S. Chandorkar, M. A. Hopcroft, B. Kim, and T. W. Kenny, "Stable Oscillation of MEMS Resonators Beyond the Critical Bifurcation Limit," at Solid-State Sensors, Actuators, and Microsystems Workshop, Hilton Head 2010, Hilton Head, SC, USA, 2010.
69. G. Bahl, J. Salvia, I. Bargatin, S. Yoneoka, R. Melamud, B. Kim, S. Chandorkar, M. A. Hopcroft, R. Bahl, R. T. Howe, and T. W. Kenny, "Charge-Drift Elimination in Resonant Electrostatic MEMS," in Proc. 23rd IEEE MEMS 2010, Hong Kong, China, Jan. 24-28, 2010.
70. S. Yoneoka, Y. Q. Qu, S. Wang, M. W. Messana, A. B. Graham, J. Salvia, B. Kim, R. Melamud, G. Bahl, and T. W. Kenny, "High-Cyclic Fatigue Experiments of Single Crystal Silicon in an Oxygen-Free Environment," in Proc. 23rd IEEE MEMS 2010, Hong Kong, China, Jan. 24-28, 2010.
71. H. K. Lee, J. Salvia, G. Bahl, R. Melamud, S. Yoneoka, Y. Q. Qu, S. Chandorkar, M. A. Hopcroft, B. Kim, and T. W. Kenny, "Influence of the Temperature Dependent A-f Effect on the Design and Performance of MEMS Oscillators," in Proc. 23rd IEEE MEMS 2010, Hong Kong, China, Jan. 24-28, 2010.
72. H. K. Lee, S. Yoneoka, G. Bahl, J. Salvia, Y. Q. Qu, R. Melamud, S. Chandorkar, B. Kim, M. A. Hopcroft, and T. W. Kenny, "A Novel Characterization Method for Temperature Compensation of Composite Resonators," in Proc. 23rd IEEE MEMS 2010, Hong Kong, China, Jan. 24-28, 2010.
73. G. Bahl, R. G. Walmsley, B. E. DeMartini, K. L. Turner, and P. G. Hartwell, "Passivated Electrode Actuator with Stable Resonance Amplitude," in Proc. 22nd IEEE MEMS 2009, Sorrento, Italy, Jan. 25-29, 2009.
74. S. Yoneoka, G. Bahl, J. Salvia, K. L. Chen, A. B. Graham, H. K. Lee, G. Yama, R. N. Candler, and T. W. Kenny, "Acceleration Compensation of MEMS Resonators Using Electrostatic Tuning," in Proc. 22nd IEEE MEMS 2009, Sorrento, Italy, Jan. 25-29, 2009.
75. J. Salvia, M. Messana, M. Ohline, M. A. Hopcroft, R. Melamud, S. Chandorkar, H. K. Lee, G. Bahl, B. Murmann, T.W. Kenny, "Exploring the Limits and Practicality of Q-Based Temperature Compensation for Silicon Resonators," in Technical Digest 2008 International Electron Devices Meeting, San Francisco, CA, USA, pp. 671-674, December 15-17, 2008.
76. G. Bahl, R. N. Candler, R. Hennessy, D. Elata, R. Melamud, S. Chandorkar, B. Kim, M. Hopcroft, J. Salvia, C. M. Jha, S. Yoneoka, G. Yama, R. T. Howe, and T. W. Kenny, "Observation of Fixed and Mobile Charge in Composite MEMS Resonators," in Solid-State Sensors, Actuators, and Microsystems Workshop, Hilton Head 2008, Hilton Head, SC, USA, pp 102-105, 2008.
77. C. M. Jha, G. Bahl, R. Melamud, S. A. Chandorkar, M. A. Hopcroft, B. Kim, M. Agarwal, J. Salvia, H. Mehta, and T. W. Kenny, "CMOS-Compatible Dual-Resonator MEMS Temperature Sensor with Millidegree Accuracy," in Transducers'07, Lyon France, Vol. 1, pp. 229-232, 2007.

78. B. Kim, R. Melamud, M. A. Hopcroft, S. A. Chandorkar, M. Agarwal, G. Bahl, M. Messana, R. N. Candler, G. Yama, and T. W. Kenny, "Si-SiO₂ Composite MEMS Resonators in CMOS Compatible Wafer-scale Thin-film Encapsulation," in IEEE Frequency Control Symposium, Geneva, Switzerland, 2007.
79. M. A. Hopcroft, H. K. Lee, B. Kim, R. Melamud, S. A. Chandorkar, M. Agarwal, C. M. Jha, J. Salvia, G. Bahl, H. Mehta, and T. W. Kenny, "A High-Stability MEMS Frequency Reference," in Transducers'07, Lyon France, vol. 2, pp. 1307-1310, 2007.
80. M. Agarwal, H. Mehta, R. N. Candler, S. Chandorkar, B. Kim, M. A. Hopcroft, R. Melamud, G. Bahl, G. Yama, T. W. Kenny, and B. Murmann, "Impact of Miniaturization of the Current Handling of Electrostatic MEMS Resonators," in Proc. 20th IEEE MEMS 2007, Kobe, Japan, pp. 783-786, 2007.
81. S. Chandorkar, H. Mehta, M. Agarwal, M. A. Hopcroft, R. N. Candler, G. Yama, G. Bahl, B. Kim, R. Melamud, K. E. Goodson, and T. W. Kenny, "Non-Isothermal Micromechanical Resonators," in Proc. 20th IEEE MEMS 2007, Kobe, Japan, pp. 211-214, 2007.
82. S. Dumitrescu, X. Wu, and G. Bahl, "Fast Algorithms for Optimal Two-Description Scalar Quantizer Design," in Data Compression Conference (DCC 2004), pp.42-51, 2004.

OTHER PUBLICATIONS

1. D. Sohn, S. Kim, G. Bahl, "Breaking optical symmetry with sound," *Optics and Photonics News*, "Optics in 2018", vol.29, iss.12, p.43, Dec 2018.
2. G. Bahl, K.H. Kim, W. Lee, J. Liu, M. Tomes, X. Fan, and T. Carmon, "Bridging two worlds: Microfluidic optomechanics," *Optics and Photonics News*, "Optics in 2013", vol. 24, iss.12, p.39, Dec 2013.
3. G. Bahl, M. Tomes, F. Marquardt, and T. Carmon, "Experimental observation of spontaneous Brillouin cooling," *Optics and Photonics News*, "Optics in 2012", vol. 23, iss.12, p.43, Dec 2012.

BOOK CHAPTERS

1. G. Bahl, "Microfluidic Optomechanics," *Encyclopedia of Nanotechnology*, Ed: Bharat Bhushan, Dordrecht: Springer Netherlands, 2015. ISBN: 978-94-007-6178-0 (**invited**)
2. G. Bahl and T. Carmon, "Brillouin Optomechanics," *Cavity Optomechanics*, Eds: Markus Aspelmeyer, Tobias Kippenberg, Florian Marquardt, Verlag Berlin Heidelberg: Springer, 2014. ISBN:978-3-642-55312-7 (**invited**)
3. N.T. Otterstrom, E.A. Kittlaus, D.B. Sohn, G. Bahl, "Non-reciprocity in Brillouin scattering," in *Semiconductors and Semimetals vol 109, Brillouin Scattering Part 1*. Eds: B.J. Eggleton, M. Steel, C.G. Poulton, Elsevier, 2022, ISSN 0080-8784, ISBN 978-03-239-89299, doi:10.1016/bs.semsem.2022.05.006. (**invited**)

PATENTS

1. US Patent # 9,594,267. Mar 14, 2017. System and Method for Brillouin Scattering Induced Transparency. Authors: Gaurav Bahl, JunHwan Kim, Hailin Wang, Mark Kuzyk.
2. US Patent # 10,234,444. March 19, 2019. System and Method for nano-opto-mechanical-fluidic Sensing of Particles. Authors: Gaurav Bahl, Kewen Han.
3. US Patent # 10,690,856, June 23, 2020, "Breaking Time-Reversal Symmetry with Acoustic Pumping of Nanophotonic Circuits." Authors: Gaurav Bahl, Donggyu Benjamin Sohn.
4. US Patent # 10,693,524. June 23, 2020, "System and Method for Mechanically-Based Magnetic-Field Transmitter." Authors: Gaurav Bahl, Sameh Tawfick, Rhinithaa P. Thanalakshme, Ali Kanj, Inbar Grinberg, Jennifer Bernhard.
5. US Patent # 10,693,206. June 23, 2020, "Nonreciprocal devices having reconfigurable nonreciprocal transfer functions through nonreciprocal coupling." Authors: Gaurav Bahl, Christopher Peterson.
6. US Patent #11,073,465. Jul 27, 2021. "Real-time sensing of flowing nanoparticles with electro-opto-mechanics." Authors: Gaurav Bahl, Jeewon Suh.

TALKS

KEYNOTES / PLENARIES

1. Plenary speaker at IONS Midwest Conference at Purdue University Discovery Park. Aug 2-3, 2018.
2. Keynote speaker at Workshop on Optomechanics and Brillouin Scattering: Fundamentals Applications and Technologies (WOMBAT) at The University of Sydney, July 2015. Hosted by Prof. Benjamin Eggleton and Prof. Christopher Poulton.

INVITED SCIENTIFIC TUTORIALS

1. "Brillouin optomechanical systems" at IEEE International Frequency Control Symposium (IFCS), New Orleans, May 2016. Host: Prof. Gianluca Piazza.
2. "Cavity optomechanics: Theory and phenomenology," Tutorial at Workshop on Optomechanics and Brillouin Scattering: Fundamentals Applications and Technologies (WOMBAT) at The University of Sydney, July 2015. Invited by Prof. Benjamin Eggleton and Prof. Christopher Poulton.
3. "Optomechanical sensors and actuators," a 90-minute tutorial session at IEEE Sensors 2013 in Baltimore, November 3rd, 2013. Invited by Prof. Masood Tabib-Azar.

INVITED TALKS

1. "Non-reciprocal devices in lithium niobate photonic integrated circuits," Invited talk, IEEE RAPID, Florida, Sept 2023.
2. "Non-reciprocal and robust photonics with light-sound interactions," Invited colloquium, TU Kaiserslautern, Germany (Virtual), May 15, 2023.
3. "Non-reciprocal and robust photonics with light-sound interactions," Invited lecture, Max Planck Institute for the Science of Light, Erlangen, Germany, Jan 16, 2023.
4. "Non-reciprocal and robust photonics with light-sound interactions," Invited lecture, University of Wuerzburg, Wuerzburg, Germany, Jan 13, 2023.
5. "Fractional Charges and Defects in High-order Microwave Topological Insulators," at Photonics and Electromagnetics Research Symposium (PIERS), Hangzhou, China, April 27, 2022.
6. "Nonreciprocal and robust photonics with light-sound interactions," Northwestern University ECE Distinguished Seminar, April 13, 2022. Host: Prof. Selim Shahriar.
7. "Lossless optical isolation and nonreciprocity in integrated photonics," at IEEE Photonics Conference, Nov 2021.
8. "Nonreciprocity and disorder resilience through phonon-photon interactions in microcavities," SPIE Photonics West, March 6-11, 2021.
9. "Non-reciprocal and robust photonics with opto-mechanical resonator systems," JQI Seminar, Joint Quantum Institute, University of Maryland, 24th Feb 2020. Host: Prof. Mohammad Hafezi.
10. "Non-reciprocal and robust photonics with optomechanical resonator systems," ECE Department Colloquium, University of Washington, 18th Feb 2020. Host: Prof. Karl Bohringer.
11. "Chiral and topologically robust opto-mechanical systems," Special seminar at the University of Michigan, Ann Arbor, Dec 2019. Host: Prof. Pramod Reddy.
12. "Non-reciprocal photonics with optomechanical resonator systems," at the US Naval Research Laboratory, Washington DC, Sept 2019. Hosts: Dr. Joseph Tischler and Dr. Chase Ellis.

13. "High throughput electro-opto-mechano-fluidic sensors," at Progress in Electromagnetics Research Symposium (PIERS), Rome, Italy, June 2019.
14. "Non-reciprocal photonics with optomechanical resonator systems" at CREOL The College of Optics and Photonics, University of Central Florida, 17 Jan 2019. Host: Prof. Mercedeh Khajavikhan.
15. "Reconfigurable nonreciprocal acoustics and topological phases in spatiotemporally modulated media," at EFRI Grantees Meeting, San Diego, 17-19 Oct 2018.
16. "Demonstration of a microwave-frequency quadrupole topological insulator with topologically protected corner states," at Nature Conference on Topological Photonics - From Concepts to Devices, at Washington University in St. Louis, Nov 11-13th 2018. Host: Prof. Lan Yang.
17. "Non-magnetic reconfigurable optical isolators for cold-atom microsystems" at Midwest Cold Atoms Workshop (MCAW) at UIUC, 10 Nov 2018. Host: Prof. Bryce Gadway.
18. "Chirality and nonreciprocity in optomechanical resonator systems," at IEEE Summer Topicals Meeting: Non-Hermitian and Topological Photonics (NTP), Waikoloa, Hawaii, 10 July 2018. Host: Prof. Mikael Rechtsman.
19. "Extremely high-throughput nanoparticle detection with opto-mechano-fluidics", at Gordon Research Conference on Lasers in Micro, Nano and Bio Systems, 17-22 June 2018. Host: Prof. Xudong Fan and Prof. Seok-Hyun Yun.
20. "Non-reciprocal photonics with optomechanical resonator systems," at Indian Institute of Technology Delhi, IEEE EDS Seminar, New Delhi, India, 21 March, 2018. Host: Dr. Samaresh Das.
21. "Chirality and nonreciprocity in optomechanical resonator systems," at Gordon Research Conference on Mechanical Systems in the Quantum Regime, Feb 25 - Mar 2, 2018. Host: Dr. John Teufel and Prof. Markus Aspelmeyer.
22. "Non-reciprocal and chiral acoustics in optomechanical systems," at International Congress on Ultrasonics, Hawaii, Dec 2017. Host: Prof. Vincent Laude.
23. "Non-reciprocal photonics and acoustics with optomechanical resonator systems," at Army Research Lab, Adelphi, MD, Nov 13th 2017. Host: Dr. Robert Benoit.
24. "Chirality and nonreciprocity in optomechanical resonator systems," at University of North Texas, Physics Colloquium, Oct 31st 2017. Host: Prof. Arup Neogi.
25. "Chirality and nonreciprocity in optomechanical resonator systems," at Banff International Research Station for Mathematical Innovation and Discovery (BIRS) Photonic Topological Insulators Workshop, in Banff, Canada, Sept 2017. Host: Prof. Mikael Rechtsman.
26. "Nonreciprocity and chirality in optomechanical resonators," at 2017 Napa Institute Microsystems Workshop sponsored by the Transducers Research Foundation (TRF), Aug 2017. Hosts: Prof. Sunil Bhawe and Prof. David Horsley.
27. "Exploring nonreciprocity and high throughput sensing with optomechanical interactions," at Atominstitut, TU Wien, Vienna, Austria, July 2017. Host: Prof. Arno Rauschenbeutel.
28. "Brillouin Optomechanics in Microresonators," at OSA Incubator on Materials for Optomechanical Actuation, June 2017. Host: Dr. Antti Makinen (Office of Naval Research).
29. "Exploring nonreciprocity and induced chirality for light and sound with opto-mechanical coupling in fiber resonators," at ONNA: Optical Nanofibre Applications 2017 at Okinawa Institute of Science and Technology (OIST), Japan. June 2017. Host: Prof. Sile Nic Chormaic.
30. "Exploring nonreciprocity and high-throughput nanoparticle sensing with opto-mechanical interactions," Cornell University Electron Devices Society (EDS) seminar series, 24th Feb 2017. Host: Prof. Amit Lal.
31. "Nonreciprocal slow and fast light with whispering gallery optomechanics" at SPIE Photonics West (OE122), San Francisco CA, 28 Jan - 2 Feb 2017. Host: Prof. Selim Shahriar.
32. "Ultra-high throughput microfluidic optomechanical sensors" at SPIE Photonics West (OE114), San Francisco CA, Feb 2017. Host: Dr. Giuseppe Leo.

33. "Exploring optical isolation with silica microresonators" at SPIE Photonics West (LA203), San Francisco CA, Feb 2017. Host: Dr. Vladimir Ilchenko.
34. "Exploring optical isolation and nonreciprocity with resonators" at SPIE Photonics West (OE109), San Francisco CA, Feb 2017. Host: Prof. Xudong Fan.
35. "Exploring nonreciprocity and induced chirality for light and sound with opto-mechanical microresonators," Stanford University Ginzton Lab Optics & Electronics Seminar, 31st Oct 2016. Host: Dr. Jonathan Fan.
36. "Exploring nonreciprocity and induced chirality for light and sound with opto-mechanical microresonators," MIT Micro-Nano Seminar, 26th Oct 2016. Host: Dr. Nicholas X. Fang.
37. "Exploring nonreciprocity and high-throughput sensing with optomechanical interactions," Special AMO seminar, Northwestern University Department of Physics. 31 May 2016. Host: Prof. Selim Shahriar.
38. "Brillouin optomechanics and optomechanofluidics." seminar at Lehigh University Physics Department Colloquium. 28 April 2016. Host: Prof. Jean Toulouse.
39. "Brillouin and Raman cooling in resonant and non-resonant systems," at SPIE Photonics West, San Francisco CA, 13-18 February 2016. Host: Prof. Denis Seletskiy.
40. "Slow and fast light through Brillouin Scattering Induced Transparency," at SPIE Photonics West, San Francisco CA, 13-18 February 2016. Host: Prof. Selim Shahriar.
41. "Nonreciprocal transparency and isolation with WGRs," at IEEE Photonics Conference (IPC), Reston VA, 4-8 October 2015. Host: Dr. Andrey Matsko.
42. "Nonreciprocal transparency and isolation with whispering-gallery resonators," at DARPA MTO Workshop on Emerging Nonreciprocal Technologies for RF Devices and Systems, 5th October 2015. Host: Dr. Troy Olsson.
43. "Optomechanics and light-vibration interactions : Research and outreach at the Bahl Research Group," at the UIUC Illinois Scholars Undergraduate Research Program (ISUR) fall luncheon, 16 Sept 2015. Host: Dr. Natasha Mamaril.
44. "Brillouin Optomechanics, Nonreciprocity, and Opto-Mechano-Fluidics," UIUC Condensed Matter Physics seminar, 4th September 2015. Host: Dr. Lucas Wagner.
45. "Brillouin Optomechanics, Brillouin Cooling, and Raman Cooling," at 8th International Conference on Materials for Advanced Technologies (ICMAT), Materials Research Society of Singapore (MRS-S), Symposium: Laser cooling of solids and optical refrigeration, June 2015. Host: Prof. Qihua Xiong.
46. Invited speaker at Nanyang Technological University, School of Physical and Mathematical Sciences, in Singapore, 30th June 2015. Host: Prof. Qihua Xiong.
47. Speaker for the MoES Nanotechnology Seminar Series organized by the Molecular Engineering and Sciences Institute at the University of Washington, 31 March 2015. Hosted by Prof. Karl Bohringer.
48. "Brillouin Optomechanics," at Nano-EP Seminar Series at UIUC, November 10th 2014.
49. "Brillouin Optomechanical Systems and Optomechanical Non-Reciprocity," at Oklahoma State University (Physics Department colloquium), October 9th, 2014. Hosted by Prof. Girish Agarwal.
50. "Microfluidic optomechanics," Photonics West 2014, LASE symposium, February 2014. Host: Dr. Vladimir Ilchenko.
51. "OptoMechanoFluidic Sensors," at IEEE Sensors 2013 in Baltimore, November 4th, 2013. Host: Prof. Yogesh Gianchandani.
52. "Observation of spontaneous Brillouin cooling," at Phonons 2012, Ann Arbor, MI, July, 2012.
53. "Observation of Brillouin cooling," at Conference on Lasers and Electro-Optics (CLEO), San Jose, CA, May 2012.
54. "Cooling by optical filtering of Stokes lines," at SPIE Photonics West, Laser cooling of solids, San Francisco, CA, January 2012.
55. "Surface Acoustic Wave Optomechanical Oscillators," at Electron Devices Society seminar series, Cornell University, Ithaca, NY, May 2011.

56. "MEMS Frequency References and Charge-Drift Control," University of Michigan, Apr 2010.
57. "Charge-Drift in Micromechanical Resonators," at SiTime Corporation, Sunnyvale, CA; Oct 2009.
58. "Overview of Charge Phenomena in Oxide-Coated Flexural Mode Resonators," at Hewlett-Packard Laboratories, Palo Alto, CA; 28th November 2007.

CONTRIBUTED TALKS

1. "Magnet-Free Nonreciprocity in Brillouin Systems," at 8th International Conference on Materials for Advanced Technologies (ICMAT), Materials Research Society of Singapore (MRS-S), Symposium: Emerging infrared technologies and applications, June 2015.
2. "Brillouin actuation of whispering-gallery modes in microfluidic optomechanical oscillators," at Conference on Lasers and Electro-Optics (CLEO), San Jose CA, June, 2013.
3. "Brillouin Optomechanics," at 11th Annual UIUC Center for Nanoscale Science and Technology (CNST) Nanotechnology Workshop, May 3rd, 2013.
4. "Brillouin MEMS," at UIUC iOptics Seminar Series 2013, on 3/12/2013.
5. "Microfluidic Optomechanical Oscillators," at Solid-State Sensors, Actuators and Microsystems Workshop, Hilton Head Island, SC, June, 2012.
6. "Observation of Brillouin Cooling," Frontiers in Optics 2011, San Jose, CA, Oct 2011.
7. "Characterization of Surface Acoustic Wave Optomechanical Oscillators," at IEEE International Frequency Control Symposium (IFCS), San Francisco, CA, May 2011.
8. "Surface Optomechanics: Observation of Surface Acoustic Resonances," at Frontiers in Optics 2010, Rochester, NY; 27th October 2010.
9. "Charge-Drift Elimination in Resonant Electrostatic MEMS," at IEEE Intl. Conf. on Micro Electro Mechanical Systems (MEMS), Hong Kong, China; 26th January 2010.
10. "Observation of Static and Mobile Charge in Oxide-Coated Resonators," at IEEE Solid State Sensors, Actuators and Microsystems Workshop, Hilton Head Island, SC; 5th June 2008.

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- AIP – Applied Physics Letters (APL), APL Photonics (APL-P), Journal of Applied Physics (JAP)
- Wiley - Laser & Photonics Reviews, Advanced Materials
- IOP – New Journal of Physics (NJP)
- ACS - ACS Photonics, Analytical Chemistry
- IEEE - Selected Topics in Quantum Electronics (JSTQE), Antennas and Wireless Propagation Letters (AWPL), Transactions on Control System Technology (TCST), Journal of Microelectromechanical Systems (JMEMS), IEEE Photonics Journal, Sensors Letters, Trans. on Ultrasonics Ferroelectrics and Frequency Control (UFFC)
- Others - Journal of Visualized Experiments, European Physical Journal

PROFESSIONAL SERVICE – FEDERAL PANELS

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- DoD **Future Directions Workshop on Topological Sciences**, in Washington DC, Participant and Group Ambassador July 2019
 - *Ad Hoc* Panel Reviewer, National Science Foundation ECCS (Electrical, Communications and Cyber Systems) EPMD Program, Program Manager: Dr. Dominique Dagenais. Apr. 2019
 - External Reviewer, Air Force Office for Scientific Research (AFOSR) Young Investigator Program 2016, Lasers & Optical Physics, Program Manager: Dr. John Luginsland Dec. 2015
 - External Reviewer, National Science Foundation DMR (Division of Materials Research) EPM Program (Electronic and Photonic Materials), Program Manager: Dr. Charles Ying Mar. 2013
 - Panel Reviewer, National Science Foundation ECCS (Electrical, Communications and Cyber Systems) CCSS Program, Program Manager: Dr. Massoud Tabib Azar. Feb. 2013

PROFESSIONAL SERVICE – EDITORSHIP AND ADVISORY BOARD

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- Associate Editor for *Optica* (3-year term) Feb 2023 – Jan 2026
 - Editorial Advisory Board for *APL Photonics* (3-year term, renewed) Jan 2019 – Dec 2024
 - Guest editor of Focus Collection on “Stimulated Brillouin Scattering” at the *New Journal of Physics* 2015
<http://iopscience.iop.org/1367-2630/focus/Focus-on-Stimulated-Brillouin-Scattering>

PROFESSIONAL SERVICE – UNIVERSITY

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- Chair, Faculty Recruitment Committee, Mechanical Science and Engineering 2022 - 2023
 - Advisory Committee, Mechanical Science and Engineering (2-year term) 2019 - 2021
 - Faculty Recruitment Committee, Mechanical Science and Engineering 2015 - present
 - Reviewer, Knight-Hennessy Scholarship, UIUC Campus Review Committee 2018, 2019
 - Reviewer, NSF Major Research Instrumentation (MRI), UIUC Campus Review Committee 2018 - present
 - Reviewer, UIUC College of Engineering Strategic Research Initiative (SRI) Program 2016
 - Reviewer, UIUC Electrical and Computer Engineering Yang Award 2016
 - Reviewer, UIUC Campus panel for Lindau-Nobel Travel Awards 2018

PROFESSIONAL SERVICE – CONFERENCES

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- Session Chair - Hybrid Quantum Systems - APS March Meeting. Mar. 2021
 - Organizing committee for **Transducer Research Foundation Microsystems Workshop**, Napa, CA. Aug. 2017
 - Steering committee for **Workshop on Optomechanics and Brillouin Scattering (WOMBAT)** 2015 - present
 - TPC for **SPIE Photonics West** - Laser Resonators, Microresonators, and Beam Control. 2015 - 2018
 - TPC for **IEEE Sensors Conference 2014**, Valencia, Spain. 2014, 2015
 - Session Chair – Novel Microresonator Optics II – at Laser Resonators, Microresonators, and Beam Control XVIII, SPIE Photonics West. Feb. 2016
 - Session Chair – Sensing Techniques – at IEEE Sensors 2013 Nov. 2013
 - Session Chair – Optomechanics II - at Frontiers in Optics 2011 / Laser Science XXVII Oct. 2011

EDUCATION AND OUTREACH

PHD GRADUATES

- Dr. Jeewon Suh (2021). Thesis: “High-throughput real-time sensing in optomechanical systems with opto-mechano-fluidics.” Currently at Intel PTD (Portland Technology Development).
- Dr. Christopher W. Peterson (2020). Thesis: “High-Order Crystalline Topology in Resonator Circuits”. Currently at Georgia Tech Research Institute (GTRI)
- Dr. Donggyu Benjamin Sohn (2020). Thesis: “Non-Reciprocal Light Transmission in Integrated Photonic Systems via Acousto-Optic Modulation”. Postdoc at NIST Boulder in 2021. Moved to PsiQuantum in 2022.
- Dr. JunHwan Kim (2019). Thesis: “Brillouin scattering induced transparency: Coherent optomechanical interaction leading to slow light and non-reciprocal light transmission”. Currently at Newomics, Berkeley, CA
- Dr. Seunghwi Kim (2018). Thesis: “Suppression of Disorder-Induced Scattering in Optomechanical Systems”. Currently at Andrea Alu research group at CUNY.
- Dr. Yinchung Chen (2018). Thesis: “Laser cooling of solids through inelastic light scattering”. Currently at E2Open, Chicago, IL.
- Dr. Kewen Han (2017). Thesis: “High-throughput sensing of bulk fluids and freely flowing particles with opto-mechano-fluidics”. LAM Research, San Jose, CA. Moved to Apple in 2019.

COURSES TAUGHT

- Mechanical Design I (ME370) – Sp’20, Sp’23
Description: Kinematics and dynamics of machinery, including analytical kinematics, force analysis, cam design and balancing. Application of elementary mechanics of solids to analyze and size machine components for stress and deflection. Introduction to finite element analysis with emphasis on beam and plate models.
- Photonic MEMS, special topics (ME498-PM4) – Fa’12, Sp’14, Fa’16
Description: In this course students learn about the ways in which light interacts mechanically with photonic microsystems (i.e. via radiation pressure, gradient force, electrostrictive pressure, and photothermal effects), and how mechanical systems can affect and manipulate light. We also discuss how optically and mechanically resonant micro/nanodevices can enhance nonlinear optical interactions. Some prior exposure to electromagnetics, Fourier analysis, and vector calculus is recommended.
- Signal Processing (ME360) – Fa’13, Fa’15, Sp’16, Sp’17, Fa’17, Fa’18, Sp’19, Fa’19, Fa’20, Sp’22
Description: Analog and digital signal processing and feedback control methods with emphasis on frequency domain techniques. Frequency response of continuous and discrete systems. Basic electromechanical techniques used in modern instrumentation and control systems. Use of transducers and actuators. Signal conditioning, grounding, and shielding.
- MEMS-NEMS Theory & Fabrication (ME487) – Fa’14, Sp’15, Sp’18, Sp’21, Fa’21, Fa’22
Description: Physical and chemical theory, design, and hands-on fabrication of micro- and nano-electromechanical systems (MEMS and NEMS); cleanroom fabrication theory, including general cleanroom safety, lithography, additive and subtractive processes, bulk and surface micromachining, deep reactive ion etching (DRIE), packaging, scaling, actuators, and micro-nanofluids; fabrication of two take-home devices, such as piezoresistive sensors and microfluidic chips, that demonstrate advanced fabrication processing.

EDUCATIONAL OUTREACH ACTIVITIES

1. "Accelerometers" at Girls Building Awesome Machines (G-BAM) during Girls' Adventures in Math Engineering and Science (GAMES) summer camp in July 2013 at the University of Illinois.
Participants: Gaurav Bahl, Joseph Muskin
Sponsorship: UIUC MechSE
2. "Paper accelerometers," for a sub-freshmen class at University of Illinois High School (teacher Elizabeth Westfall) in November 2013.
Participants: Elizabeth Westfall, Joseph Muskin, Gaurav Bahl
Sponsorship: UIUC MechSE
3. "Paper MEMS devices," for a senior engineering class at University of Illinois High School (teacher Elizabeth Westfall) in December 2013.
Participants: Elizabeth Westfall, Joseph Muskin, Gaurav Bahl
Sponsorship: UIUC MechSE
4. "Opto-Mechanical Sensors," at Girls Building Awesome Machines (G-BAM) during Girls' Adventures in Math Engineering and Science (GAMES) summer camp in July 2014 at the University of Illinois.
Participants: Shengtai Shi, Joseph Muskin, Gaurav Bahl
Sponsorship: National Science Foundation ECCS-1408539 and UIUC MechSE
5. "Opto-Mechanical Sensors in the Classroom," for senior class at University of Illinois High School (teacher Sharlene Denos) in September 2014.
Participants: Shengtai Shi, Donggyu Benjamin Sohn, Sharlene Denos, Joseph Muskin, Gaurav Bahl
Sponsorship: National Science Foundation ECCS-1408539 and UIUC MechSE
6. "Converting light to mechanical motion," at Girls Building Awesome Machines (G-BAM) during Girls' Adventures in Math Engineering and Science (GAMES) summer camp in June 2015 at the University of Illinois.
Participants: Joanna Bober, Eric Currier, Indronil Ghosh, Joseph Muskin, Peter Du, Gaurav Bahl
Sponsorship: National Science Foundation ECCS-1408539 and UIUC MechSE
7. "Opto-Mechanical Sensors in the Classroom," for senior class at University of Illinois High School (teacher Sharlene Denos) in Sept-Oct 2015.
Participants: Donggyu Benjamin Sohn, Christopher Peterson, Sharlene Denos, Joseph Muskin, Gaurav Bahl
Sponsorship: National Science Foundation ECCS-1408539 and UIUC MechSE
8. "Converting light to mechanical motion," at Campus Middle School for Girls, March 2017.
Participants: Anudeep Mangu, Inbar Grinberg, Indronil Ghosh, Gaurav Bahl
Sponsorship: National Science Foundation ECCS-1408539.

STUDENT-LED OUTREACH

1. Ivan Velkovsky – Led a 5-week after school robotics club for 9th – 11th graders at Urbana High School. Oct-Nov 2019.
2. Christopher Peterson – Curriculum development on "Introduction to CAD, 3D printing, and rapid prototyping" for 6th Grade students at Jefferson, Edison, and Franklin Middle Schools in Champaign, IL. Oct 2015 – May 2016.
3. Donggyu Benjamin Sohn – "Introduction to engineering: Paper rockets, popsicle catapults, hot chocolate machines" for 3rd Grade students at Dr. Howard Elementary School in Champaign, IL. Oct-Nov 2014.
4. Nathan Dostart – "Introduction to engineering" for 4th Grade students at Stratton Elementary School in Champaign, IL. Oct 2013.

AWARDS AND FELLOWSHIPS FOR STUDENTS

- 2021, Ogulcan Orsel selected into the **Mavis Future Faculty Fellows** program at UIUC.
- 2018, Christopher Peterson selected into the **Mavis Future Faculty Fellows** program at UIUC.
- 2018, Distinguished Graduate Student, UIUC Mechanical Science and Engineering award for Seunghwi Kim.

- 2018, Outstanding Mechanical Engineering PhD Dissertation, for Kewen Han.
- 2017, Chinese Government Award for Outstanding Self-Financed Students Abroad, for Kewen Han. Award amount: \$6,000.
- **2016, National Science Foundation Graduate Research Fellowship** (NSF GRF), for Christopher Peterson. Award amount: \$138,000.
- 2016 Yee Fellowship, UIUC College of Engineering, for Kewen Han, Award amount: \$5,000.
- 2016, Illinois Scholars Undergraduate Research Program (ISUR), grant for Indronil Ghosh. Sponsor: Semiconductor Research Corporation. Award amount: \$1,000.
- 2016, Illinois Scholars Undergraduate Research Program (ISUR), grant for Alan Luo. Sponsor: Semiconductor Research Corporation, Intel. Award amount: \$1,000.
- 2015 Distinguished Graduate Student, UIUC Mechanical Science and Engineering award for Kewen Han.
- 2015, UIUC MechSE Society for Engineering Mechanics, Undergraduate research grant for Jafir Haidri. Award amount: \$2,000.
- **2015, National Science Foundation Graduate Research Fellowship** (NSF GRF), for Donggyu Benjamin Sohn. Award amount: \$132,000.
- **2014, National Science Foundation Graduate Research Fellowship** (NSF GRF), for Nathan Dostart. Award amount: \$132,000.
- 2013, UIUC MechSE Society for Engineering Mechanics, Undergraduate research grant for Kaiyuan Zhu. Award amount: \$2,000.

OTHER ACTIVITIES

McMaster Solar Car Project

Sept 2002 – Aug 2005

Electrical Team Leader, McMaster University

- Designed electrical subsystems (battery protection, telemetry, lighting, signaling) for solar powered competitive racing vehicles
- Participated in the Canadian Solar Tour (2004), North American Solar Challenge (2003) and Formula Sun Grand Prix (2004).