Peter L. McMahon

+1 (510) 387 7680
pmcmahon@cornell.edu
mcmahon.aep.cornell.edu
Google Scholar: MR_WZxkAAAAJ
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Education

Jun 2010 – Sep 2014 **Ph.D.**, *Stanford University*, Electrical Engineering.
Minor: Physics

Sep 2008 – Jun 2010 **M.S.**, *Stanford University*, Electrical Engineering.
Concentration: Quantum Electronics

Feb 2003 – Aug 2008 **B.Sc. (Eng); M.Sc. (Eng); M.Sc.**, *University of Cape Town*, Electrical and Computer Engineering; Electrical Engineering; Computer Science.

Appointments

Jul 2019 – **Assistant Professor**, *Cornell University*, Applied and Engineering Physics.

Oct 2014 – Jun 2019 **Postdoctoral Researcher**, *Stanford University*, Applied Physics, Ginzton Laboratory.

Jun 2009 – Sep 2014 **Research Assistant**, *Stanford University*, Electrical Engineering, Ginzton Laboratory.

Sep 2008 – May 2009 **Research Assistant**, *Stanford University*, Electrical Engineering, Pervasive Parallelism Lab.

May 2007 – Apr 2008 **Visiting Research Student**, *University of California, Berkeley*, Space Sciences Laboratory and Berkeley Wireless Research Center.

Honors and Awards

Research

- Optica Adolph Lomb Medal (2025) *Awarded to one optics researcher globally who is within 10 years of having received their Ph.D.*
- Moore Inventor Fellowship Finalist (2024) *Selected as one of 10 finalists from over 200 professors nominated by universities in the US; nominees must be within 10 years of having received their Ph.D.*
- IUPAP C17 Early Career Scientist Prize for Applied Aspects on Laser Physics and Photonics (2022) *Awarded to one early career optical scientist globally who is within eight years of having received their Ph.D.*
- Office of Naval Research Young Investigator Program Award (2022 – 2025) *Awarded to 32 assistant professors—3 in physics—out of 220 applicants from universities across the US.*

- Sloan Research Fellowship (Physics) (2022 – 2024) *Awarded to 23 assistant professors in physics and astronomy from universities in the US and Canada.*
- Packard Fellowship in Science and Engineering (Physics) (2021 – 2026) *Awarded to 20 assistant professors—4 in physics—out of 100 nominees from 50 universities in the US.*
- *Light: Science & Applications* Rising Stars of Light – Second Prize (2021) *Tied second among optical scientists under the age of 40 globally.*
- CIFAR Azrieli Global Scholar in Quantum Information Science (2020 – 2022) *Awarded to 13 assistant professors out of 184 applicants from universities globally.*
- Google Quantum Research Award (2019) *Awarded to 18 researchers from universities globally.*
- Stanford Nano- and Quantum Science and Engineering Postdoctoral Fellowship (2015 – 2017) *Awarded to one applicant annually, across the Departments of Physics, Electrical Engineering, Applied Physics, and Materials Science and Engineering.*
- Stanford Graduate Fellowship (2008 – 2011) *Awarded to ~100 Ph.D. students annually across all science and engineering disciplines.*

Teaching and Mentoring

- Cornell Engineering Dorothy and Fred Chau, M.S. '74 Excellence in Teaching Award (2023) *The highest award for teaching in the College of Engineering.*
- Cornell Merrill Presidential Scholar selection by Hannah Doyle as *Faculty member who made the most significant contribution to her education at Cornell* (2021)

Publications

Last-Author and Co-Last-Author Papers

Preprints

- L. J. I. Moon*, M. M. Sohoni*, M. A. Shimizu, P. Viswanathan, K. Zhang, E.-A. Kim and **P.L. McMahon**. "Hamiltonian-reconstruction distance as a success metric for the Variational Quantum Eigensolver." (2024). arXiv:2403.11995
- T. Onodera*, M. M. Stein*, B. A. Ash, M. M. Sohoni, M. Bosch, R. Yanagimoto, M. Jankowski, T. P. McKenna, T. Wang, G. Shvets, M. R. Shcherbakov, L. G. Wright and **P. L. McMahon**. "Scaling on-chip photonic neural processors using arbitrarily programmable wave propagation." (2024). arXiv:2402.17750
- F. Presutti, L. G. Wright, S.-Y. Ma, T. Wang, B. K. Malia, T. Onodera and **P. L. McMahon**. "Highly multimode visible squeezed light with programmable spectral correlations through broadband up-conversion." (2024). arXiv:2401.06119

Journal papers (original research)

- S.-Y. Ma, T. Wang, J. Laydevant, L. G. Wright and **P. L. McMahon**. "Quantum-limited stochastic optical neural networks operating at a few quanta per activation." *Nature Communications* **16**, 359 (2025). doi:10.1038/s41467-024-55220-y

- A. Senanian, S. Prabhu, V. Kremenetski, S. Roy, Y. Cao, J. Kline, T. Onodera, L. G. Wright, X. Wu, V. Fatemi and **P. L. McMahon**. "Microwave signal processing using an analog quantum reservoir computer." *Nature Communications* **15**, 7490 (2024). doi:10.1038/s41467-024-51161-8
- A. Sarma, T. W. Watts, M. Moosa, Y. Liu and **P. L. McMahon**. "Variational solving of nonlinear and multidimensional partial differential equations." *Physical Review A* **109**, 062616 (2024). doi:10.1103/PhysRevA.109.062616
- M. G. Anderson, S.-Y. Ma, T. Wang, L. G. Wright and **P. L. McMahon**. "Optical Transformers." *Transactions on Machine Learning Research* (2024). OpenReview:Xxw0edFFQC
- M. Moosa*, T. W. Watts*, Y. Chen, A. Sarma and **P. L. McMahon**. "Linear-depth quantum circuits for loading Fourier approximations of arbitrary functions." *Quantum Science and Technology* **9**, 1, 015002 (2023) doi:10.1088/2058-9565/acfc62
- A. Senanian, L. G. Wright, P. F. Wade, H. K. Doyle and **P. L. McMahon**. "Programmable large-scale simulation of bosonic transport in optical synthetic frequency lattices." *Nature Physics* **19**, 1333 – 1339 (2023). doi:10.1038/s41567-023-02075-7
- T. Wang*, M. M. Sohoni*, L. G. Wright, M. M. Stein, S.-Y. Ma, T. Onodera, M. Anderson and **P. L. McMahon**. "Image sensing with multilayer, nonlinear optical neural networks." *Nature Photonics* **17**, 408 – 415 (2023). doi:10.1038/s41566-023-01170-8
- L. G. Wright*, T. Onodera*, M. M. Stein, T. Wang, D. T. Schachter, Z. Hu and **P. L. McMahon**. "Deep physical neural networks trained with backpropagation." *Nature* **601**, 549 – 555 (2022). doi:10.1038/s41586-021-04223-6
- E. Rosenberg, P. Ginsparg and **P. L. McMahon**. "Experimental error mitigation using linear rescaling for variational quantum eigensolving with up to 20 qubits." *Quantum Science and Technology* **7**, 015024 (2022). doi:10.1088/2058-9565/ac3b37
- T. Wang, S.-Y. Ma, L. G. Wright, T. Onodera, B. Richard and **P. L. McMahon**. "An optical neural network using less than 1 photon per multiplication." *Nature Communications* **13**, 123 (2022). doi:10.1038/s41467-021-27774-8
- T. Onodera*, E. Ng* and **P. L. McMahon**. "A quantum annealer with fully programmable all-to-all coupling via Floquet engineering." *npj Quantum Information* **6**, 48 (2020). doi:10.1038/s41534-020-0279-z

Journal papers (reviews and perspectives)

- **P. L. McMahon**. "Nonlinear computation with linear systems." *Nature Physics* (2024). doi:10.1038/s41567-024-02531-y
- J. Laydevant*, L. G. Wright*, T. Wang, **P. L. McMahon**. "The hardware is the software." *Neuron* **112**, 2, 180 – 183 (2024). doi:10.1016/j.neuron.2023.11.004
- **P. L. McMahon**. "The physics of optical computing." *Nature Reviews Physics* **5**, 717 – 734 (2023). doi:10.1038/s42254-023-00645-5

- N. Mohseni, **P. L. McMahon*** and T. Byrnes*. "Ising machines as hardware solvers of combinatorial optimization problems." *Nature Reviews Physics* **4**, 363 – 379 (2022). doi:10.1038/s42254-022-00440-8

Other Papers

Preprints

- A. Momeni, B. Rahmani, B. Scellier, L. G. Wright, **P. L. McMahon**, C. C. Wanjura, Y. Li, A. Skalli, N. G. Berloff, T. Onodera, I. Oguz, F. Morichetti, P. del Hougne, M. Le Gallo, A. Sebastian, A. Mirhoseini, C. Zhang, D. Marković, D. Brunner, C. Moser, S. Gigan, F. Marquardt, A. Ozcan, J. Grollier, A. J. Liu, D. Psaltis, A. Alù and R. Fleury. "Training of Physical Neural Networks." (2024). arXiv:2406.03372
- S. Roy, A. Senanian, C. S. Wang, O. C. Wetherbee, L. Zhang, B. Cole, C. P. Larson, E. Yelton, K. Arora, **P. L. McMahon**, B. L. T. Plourde, B. Royer and V Fatemi. "Synthetic high angular momentum spin dynamics in a microwave oscillator." (2024). arXiv:2405.15695

Journal papers

- A. K. Singh, K. Jamieson, **P. L. McMahon** and D. Venturelli. "Ising Machines' Dynamics and Regularization for Near-Optimal MIMO Detection." *IEEE Transactions on Wireless Communications* **21**, 12, 11080 – 11094 (2023). doi:10.1109/TWC.2022.3189604
- E. Ng, T. Onodera, S. Kako, **P. L. McMahon**, H. Mabuchi and Y. Yamamoto. "Efficient sampling of ground and low-energy Ising spin configurations with a coherent Ising machine." *Physical Review Research* **4**, 013009 (2022). doi:10.1103/PhysRevResearch.4.013009
- T. Onodera, E. Ng, C. Gustin, N. Lörch, A. Yamamura, R. Hamerly, **P. L. McMahon**, A. Marandi and H. Mabuchi. "Nonlinear quantum behavior of ultrashort-pulse optical parametric oscillators." *Physical Review A* **105**, 033508 (2022). doi:10.1103/PhysRevA.105.033508
- R. Yanagimoto, E. Ng, A. Yamamura, T. Onodera, L. G. Wright, M. Jankowski, M. M. Fejer, **P. L. McMahon** and H. Mabuchi. "Onset of non-Gaussian quantum physics in pulsed squeezing with mesoscopic fields." *Optica* **9**, 4, 379 – 390 (2022). doi:10.1364/OPTICA.447782
- P. Cha, P. Ginsparg, F. Wu, J. Carrasquilla, **P. L. McMahon** and E.-A. Kim. "Attention-based quantum tomography." *Machine Learning: Science and Technology* **3**, 1, 01LT01 (2021). doi:10.1088/2632-2153/ac362b
- R. Yanagimoto*, T. Onodera*, E. Ng, L. G. Wright, **P. L. McMahon** and H. Mabuchi. "Engineering a Kerr-based Deterministic Cubic Phase Gate via Gaussian Operations." *Physical Review Letters* **124**, 240503 (2020). doi:10.1103/PhysRevLett.124.240503

- R. Hamerly*, T. Inagaki*, **P. L. McMahon***, D. Venturelli, A. Marandi, T. Onodera, E. Ng, C. Langrock, K. Inaba, T. Honjo, K. Enbutsu, T. Umeki, R. Kasahara, S. Utsunomiya, S. Kako, K. Kawarabayashi, R. L. Byer, M. M. Fejer, H. Mabuchi, D. Englund, E. Rieffel, H. Takesue and Y. Yamamoto. "Experimental investigation of performance differences between Coherent Ising Machines and a quantum annealer." *Science Advances* **5**, 5, eaau0823 (2019). doi:10.1126/sciadv.aau0823
- R. M. Parrish, E. G. Hohenstein, **P. L. McMahon** and T. J. Martinez. "Quantum Computation of Electronic Transitions Using a Variational Quantum Eigensolver." *Physical Review Letters* **122**, 230401 (2019). doi:10.1103/PhysRevLett.122.230401
- C. J. Layton, **P. L. McMahon** and W. J. Greenleaf. "Large-scale, quantitative protein assays on a high-throughput DNA sequencing chip." *Molecular Cell* **73**, 5 (2019). doi:10.1016/j.molcel.2019.02.019
- T. Leleu, Y. Yamamoto, **P. L. McMahon** and K. Aihara. "Destabilization of Local Minima in Analog Spin Systems by Correction of Amplitude Heterogeneity." *Physical Review Letters* **122**, 040607 (2019). doi:10.1103/PhysRevLett.122.040607
- R. She*, A. K. Chakravarty*, C. J. Layton*, L. M. Chircus, J. O. L. Andreasson, N. Damaraju, **P. L. McMahon**, J. D. Buenrostro, D. F. Jarosz and W. J. Greenleaf. "Comprehensive and quantitative mapping of RNA–protein interactions across a transcribed eukaryotic genome." *Proceedings of the National Academy of Sciences* **114**, 14, 3619 – 3624 (2017). doi:10.1073/pnas.1618370114
- S. Puri, **P. L. McMahon** and Y. Yamamoto. "Universal logic gates for quantum-dot electron-spin qubits using trapped quantum-well exciton polaritons." *Physical Review B* **95**, 125410 (2017). doi:10.1103/PhysRevB.95.125410
- K. G. Lagoudakis, K. A. Fischer, T. Sarmiento, **P. L. McMahon**, M. Radulaski, J. L. Zhang, Y. Kelaita, C. Dory, K. Müller and J. Vučković. "Observation of Mollow Triplets with Tunable Interactions in Double Lambda Systems of Individual Hole Spins." *Physical Review Letters* **118**, 013602 (2017). doi:10.1103/PhysRevLett.118.013602
- **P. L. McMahon***, A. Marandi*, Y. Haribara, R. Hamerly, C. Langrock, S. Tamate, T. Inagaki, H. Takesue, S. Utsunomiya, K. Aihara, R. L. Byer, M. M. Fejer, H. Mabuchi and Y. Yamamoto. "A fully programmable 100-spin coherent Ising machine with all-to-all connections." *Science* **354**, No. 6312, 614 – 617 (2016). doi:10.1126/science.aah5178
- T. Inagaki, Y. Haribara, K. Igarashi, T. Sonobe, S. Tamate, T. Honjo, A. Marandi, **P. L. McMahon**, T. Umeki, K. Enbutsu, O. Tadanaga, H. Takenouchi, K. Aihara, K. Kawarabayashi, K. Inoue, S. Utsunomiya and H. Takesue. "A coherent Ising machine for 2000-node optimization problems." *Science* **354**, No. 6312, 603 – 606 (2016). doi:10.1126/science.aah4243
- K. G. Lagoudakis*, **P. L. McMahon***, C. Dory*, K. A. Fischer, K. Müller, V. Borish, D. Dalacu, P. J. Poole, M. E. Reimer, V. Zwiller, Y. Yamamoto and J. Vučković "Ultrafast Coherent Manipulation of Trions in Site-Controlled Nanowire Quantum Dots." *Optica* **3**, 12, 1430 – 1435 (2016). doi:10.1364/OPTICA.3.001430

- K. G. Lagoudakis*, **P. L. McMahon***, K. A. Fischer, S. Puri, K. Müller, D. Dalacu, P. J. Poole, M. E. Reimer, V. Zwiller, Y. Yamamoto and J. Vučković. "Initialization of a spin qubit in a site-controlled nanowire quantum dot." *New Journal of Physics* **18** 053024 (2016). doi:10.1088/1367-2630/18/5/053024
- **P. L. McMahon** and K. De Greve. "Towards Quantum Repeaters with Solid-State Qubits: Spin-Photon Entanglement Generation using Self-Assembled Quantum Dots." Invited chapter in *Engineering the Atom-Photon Interaction*, Springer-Verlag (2015). doi:10.1007/978-3-319-19231-4_14
- S. Puri*, **P. L. McMahon*** and Y. Yamamoto. "Single-Shot Quantum Non-Demolition Measurement of a Quantum Dot Electron Spin, using Cavity Exciton-Polaritons." *Physical Review B* **90**, 155421 (2014). doi:10.1103/PhysRevB.90.155421
- K. De Greve*, **P. L. McMahon***, L. Yu, J. S. Pelc, C. Jones, C. M. Natarajan, N. Y. Kim, E. Abe, S. Maier, C. Schneider, M. Kamp, S. Höfling, R. H. Hadfield, A. Forchel, M. M. Fejer and Y. Yamamoto. "Complete tomography of a high-fidelity solid-state entangled spin-photon qubit pair." *Nature Communications* **4**, 2228 (2013). doi:10.1038/ncomms3228
- K. De Greve, D. Press, **P. L. McMahon** and Y. Yamamoto. "Ultrafast optical control of individual quantum dot spin qubits." *Reports on Progress in Physics* **76**, 092501 (2013). doi:10.1088/0034-4885/76/9/092501
- K. De Greve, L. Yu*, **P. L. McMahon***, J. S. Pelc*, C. M. Natarajan, N. Y. Kim, E. Abe, S. Maier, C. Schneider, M. Kamp, S. Höfling, R. H. Hadfield, A. Forchel, M. M. Fejer and Y. Yamamoto. "Quantum-dot spin-photon entanglement via frequency downconversion to telecom wavelength." *Nature* **491**, 421 – 425 (2012). doi:10.1038/nature11577
- J. S. Pelc, L. Yu*, K. De Greve*, **P. L. McMahon***, C. M. Natarajan, V. Esfandyarpour, S. Maier, C. Schneider, M. Kamp, S. Hoefling, R. H. Hadfield, A. Forchel, Y. Yamamoto, M. M. Fejer. "Downconversion quantum interface for a single quantum dot spin and 1550-nm single-photon channel." *Optics Express* **20**, 25, 27510 – 27519 (2012). doi:10.1364/OE.20.027510
- N. C. Jones, R. Van Meter, A. G. Fowler, **P. L. McMahon**, J. Kim, T. D. Ladd and Y. Yamamoto. "Layered Architecture for Quantum Computing." *Physical Review X* **2**, 031007 (2012). doi:10.1103/PhysRevX.2.031007
- N. C. Jones, J. D. Whitfield, **P. L. McMahon**, M.-H. Yung, R. Van Meter, A. Aspuru-Guzik and Y. Yamamoto. "Faster quantum chemistry simulation on fault-tolerant quantum computers." *New Journal of Physics* **14**, 115023 (2012). doi:10.1088/1367-2630/14/11/115023
- A. P. V. Siemion, G. C. Bower, G. Foster, **P. L. McMahon**, M. I. Wagner, D. Werthimer, D. Backer, J. Cordes and J. van Leeuwen. "The Allen Telescope Array Fly's Eye Survey for Fast Radio Transients." *Astrophysical Journal*, **744**, 109 (2012). doi:10.1088/0004-637X/744/2/109

- K. De Greve, **P. L. McMahon**, D. Press, T. D. Ladd, D. Bisping, C. Schneider, M. Kamp, L. Worschech, S. Höfling, A. Forchel and Y. Yamamoto. "Coherent control and suppressed nuclear feedback of a single quantum dot hole qubit." *Nature Physics* **7**, 872 – 878 (2011). doi:10.1038/nphys2078
- H.-H. Kuo, J.-H. Chu, S. C. Riggs, L. Yu, **P. L. McMahon**, K. De Greve, Y. Yamamoto, J. G. Analytis, and I. R. Fisher. "Possible origin of the nonmonotonic doping dependence of the in-plane resistivity anisotropy of $Ba(Fe_{1-x}T_x)_2As_2$ (T=Co, Ni and Cu)." *Physical Review B*, **84**, 054540 (2011). doi:10.1103/PhysRevB.84.054540
- T. D. Ladd, D. Press, K. De Greve, **P. L. McMahon**, B. Frieß, C. Schneider, M. Kamp, S. Höfling, A. Forchel and Y. Yamamoto. "Pulsed Nuclear Pumping and Spin Diffusion in a Single Charged Quantum Dot." *Physical Review Letters*, **105**, 107401 (2010). doi:10.1103/PhysRevLett.105.107401
- J.-H. Chu, J. G. Analytis, K. De Greve, **P. L. McMahon**, Z. Islam, Y. Yamamoto and I. R. Fisher. "In-Plane Resistivity Anisotropy in an Underdoped Iron Arsenide Superconductor." *Science*, **329**, No. 5993, 824 – 826 (2010). doi:10.1126/science.1190482
- D. Press, K. De Greve, **P. L. McMahon**, T. D. Ladd, B. Frieß, C. Schneider, M. Kamp, S. Höfling, A. Forchel and Y. Yamamoto. "Ultrafast optical spin echo in a single quantum dot." *Nature Photonics*, **4**, 367 – 370 (2010). doi:10.1038/nphoton.2010.83
- M. J. Keith, A. Jameson, W. Van Straten, M. Bailes, S. Johnston, M. Kramer, A. Possenti, S. D. Bates, N. D. R. Bhat, M. Burgay, S. Burke-Spolaor, N. D'Amico, L. Levin, **P. L. McMahon**, S. Milia and B. W. Stappers. "The High Time Resolution Universe Pulsar Survey – I. System configuration and initial discoveries." *Monthly Notices of the Royal Astronomical Society*, **409**, 2, 619 – 627 (2010). doi:10.1111/j.1365-2966.2010.17325.x
- A. Siemion, J. Von Korff, **P. McMahon**, E. Korpela, D. Werthimer, D. Anderson, G. Bower, J. Cobb, G. Foster, M. Lebofsky, J. van Leeuwen, W. Mallard and M. Wagner. "New SETI Sky Surveys for Radio Pulses." *Acta Astronautica*, **67**, 11 – 12 (2010). doi:10.1016/j.actaastro.2010.01.016
- K. Stevens, H. Chen, T. Filiba, **P. McMahon** and Y. S. Song. "SeqHive: A Reconfigurable Computer Cluster for Genome Re-sequencing." *Proceedings of the IEEE Conference on Field Programmable Logic and Applications (FPL)*, 31 August – 2 September 2010. doi:10.1109/FPL.2010.121
- S. K. Kim, **P. L. McMahon** and K. Olukotun. "A Large-scale Architecture for Restricted Boltzmann Machines." *Proceedings of the IEEE Symposium on Field-Programmable Custom Computing Machines (FCCM)*, 2 – 4 May 2010. [Acceptance rate: 18%] doi:10.1109/FCCM.2010.38
- S. K. Kim, L. McAfee, **P. L. McMahon** and K. Olukotun. "A Highly Scalable Restricted Boltzmann Machine FPGA Implementation." *Proceedings of the IEEE Conference on Field Programmable Logic and Applications (FPL)*, 31 August – 2 September 2009. [Acceptance rate: 25%] doi:10.1109/FPL.2009.5272262

- A. Parsons, D. Backer, H. Chen, P. Droz, T. Filiba, D. MacMahon, J. Manley, **P. McMahon**, A. Parsa, A. Siemion, D. Werthimer and M. Wright. "A Scalable Correlator Architecture Based on Modular FPGA Hardware, Reuseable Gateware, and Data Packetization." *The Publications of the Astronomical Society of the Pacific*, **120**, 873, 1207 – 1221 (2008). doi:10.1086/593053

Invited Talks

Cornell Era (2019 – present)

- "Optical Computing: Principles, Examples, and Prospects." (Invited Tutorial) *Optical Fiber Communication Conference (OFC)*, San Francisco, CA, 30 March – 3 April, 2025.
- "Computing with Physical Systems." *Condensed and Living Matter Seminar, University of Pennsylvania*, Philadelphia, PA, 28 August, 2024.
- "Generation, control, and measurement of squeezed light across >400 frequency modes." *Workshop on Quantum Light Generation, Detection, and Applications, JILA*, Boulder, CO, 17–19 July, 2024.
- "Computing with Physical Systems." *Institute of Electrical and Micro Engineering Distinguished Lecturers Seminar, École Polytechnique Fédérale de Lausanne*, Lausanne, Switzerland, 28 May, 2024.
- "Computing with Physical Systems." *MIT.nano Seminar, Massachusetts Institute of Technology*, Cambridge, MA, 13 May, 2024.
- "Optical Neural Networks Implemented using Linear and Nonlinear Optics." *Conference on Lasers and Electro-Optics (CLEO)*, Charlotte, NC, 7 May, 2024.
- "Computing with Physical Systems." *NeurIPS Workshop on ML with New Compute Paradigms*, New Orleans, LA, 16 December, 2023.
- "Computing with Physical Systems." *DARPA ERI 2.0 Summit, Physics-inspired Computing Workshop*, Seattle, WA, 24 August, 2023.
- "A neural approach to building classical and quantum physics-based machines." *Applied Physics Seminar, Stanford University*, Stanford, CA, 16 March, 2023.
- "Computing with Physical Systems." *Computations in Science Seminar, University of Chicago*, Chicago, IL, 1 March, 2023.
- "Physics-based Computing." *Electrical Engineering and Computer Sciences Seminar, University of California*, Berkeley, CA, 23 February, 2023.
- "Computing with Physical Systems." *Electrical and Computer Engineering Seminar, University of Pittsburgh*, Pittsburgh, PA, 2 November, 2022. (Online.)
- "Computing with Physical Systems." *Centre for Frontier AI Research Seminar, A*STAR*, Singapore, 20 October, 2022. (Online.)
- "Computing with Physical Systems." *Physics Colloquium, Syracuse University*, Syracuse, NY, 13 October, 2022.
- "Computing with Physical Systems." *EECS Solid-State Seminar, University of California*, Berkeley, CA, 2 September, 2022.

- "Computing with Light: Photonic Neural Networks using Linear and Nonlinear Optics" *Lake Como Machine Learning Photonics School*, Lake Como, Italy, 29 August, 2022. (Online.)
- "Computing with Physical Systems." *Computer Systems Colloquium, Stanford University*, Stanford, CA, 1 June, 2022. (Online.)
- "Photonic neural networks using linear and nonlinear optics." *Photonics North*, Niagara Falls, Canada, 26 May, 2022. (Online.)
- "Physical Neural Networks: Harnessing complex dynamics to perform machine learning." *IBM Quantum Qiskit Seminar*, 6 May, 2022. (Online.)
- "Ising solving using an optical matrix-vector multiplier." *NSF-FET Workshop on Ising Machines*, 8 April, 2022. (Online.)
- "Computing with Physical Systems." *Department of Electrical and Computer Engineering Seminar, University of Delaware*, Newark, DE, 25 March, 2022. (Online.)
- "Physical Neural Networks: Harnessing complex dynamics to perform machine learning." *Yale Quantum Institute Colloquium, Yale University*, New Haven, CT, 18 February, 2022. (Online.)
- "Computing with Physical Systems." *Google X Journal Club*, Mountain View, CA, 4 February, 2022. (Online.)
- "Neural networks with linear and nonlinear photonics." *SPIE Photonics West – AI and Optical Data Sciences Conference*, San Francisco, CA, 22 – 27 January, 2022. (Online.)
- "Computing with Physical Systems." *51st Winter Colloquium on the Physics of Quantum Electronics (PQE)*, Snowbird, UT, 10 – 14 January, 2022. (Online.)
- "Fully programmable quantum machines with all-to-all connectivity via Floquet engineering." *Many-body Cavity QED 2022, Aspen Center for Physics*, Aspen, CO, 5 – 10 December, 2021. (Online.)
- "Computing with Physical Systems." *CUNY-Princeton Workshop on Computation with Physical Systems*, New York, NY, 15 October, 2021. (Online.)
- "Photonic Neural Networks Using Linear and Nonlinear Optics" *OSA Photonics in Switching and Computing (PSC)*, 27 – 29 September, 2021. (Online.)
- "Computing with Physical Systems." *Hewlett Packard Enterprise Labs*, Palo Alto, CA, 24 September, 2021. (Online.)
- "Computing with Physical Systems." *NTT Research Upgrade Summit*, Sunnyvale, CA, 20 – 21 September, 2021. (Online.)
- "Computing with Physical Systems." *Joby Aviation*, Santa Cruz, CA, 17 September, 2021. (Online.)
- "Computing with Physical Systems." *Corning*, Corning, NY, 30 August, 2021. (Online.)
- "Computing with Physical Systems." *Microsoft Research*, Cambridge, England, 24 August, 2021. (Online.)

- "Quantum Engineering: Photonics in quantum computing and quantum networking." *IEEE Quantum Computing Education Series*, 28 July, 2021. (Online.)
- "Quantum machines with fully programmable all-to-all coupling via Floquet engineering." *IBM Quantum Qiskit Seminar*, 23 July, 2021. (Online.)
- "Computing with Physical Systems." *Departments of Electrical Engineering and Physics, University of Washington*, Seattle, WA, 25 June, 2021. (Online.)
- "Photonics in quantum computing and quantum networking." *Hamamatsu Quantum Webinar Series*, 22 May, 2021. (Online.)
- "Computing with Physical Systems." *Unite Mixte de Physique CNRS/Thales*, Palaiseau, France, 3 May, 2021. (Online.)
- "Coherent Ising Machines: non-von Neumann computing using networks of optical parametric oscillators." *47-779 Quantum Integer Programming, Carnegie Mellon University*, Pittsburgh, PA, 6 October, 2020. (Online.)
- "A quantum annealer with fully programmable all-to-all coupling via Floquet engineering." *Conference on Quantum Annealing/Adiabatic Quantum Computation 2020*, Trieste, Italy, 5 – 6 October, 2020. (Online.)
- "Fully programmable quantum machines with all-to-all connectivity via Floquet engineering." *Advanced Quantum Testbed Colloquium, Lawrence Berkeley National Laboratory*, Berkeley, CA, 24 September, 2020. (Online.)
- "The return of optical computing: photonic processing for optimization and machine learning." *Computational Physics Seminar, ExxonMobil Research*, Annandale, NJ, 24 February, 2020.
- "Explorations in Computation using Classical and Quantum Photonics." *Department of Physics Colloquium, Cornell University*, Ithaca, NY, 27 January, 2020.
- "Fully programmable quantum machines with all-to-all connectivity via Floquet engineering." *Department of Electrical Engineering Colloquium, Princeton University*, Princeton, NJ, 25 October, 2019.
- "A quantum annealer with fully programmable all-to-all coupling via Floquet engineering." (Plenary) *Quantum Innovators in Science and Engineering Workshop*, Institute for Quantum Computing, Waterloo, Canada, 30 September – 3 October, 2019.

Before Cornell

- "Combinatorial optimization using networks of optical parametric oscillators with measurement feedback." *49th Winter Colloquium on the Physics of Quantum Electronics (PQE)*, Snowbird, UT, 7 – 11 January, 2019.
- "Non-von Neumann computing using networks of optical parametric oscillators." *Center in Quantum Information and Quantum Physics, University of Science and Technology of China*, Shanghai, China, 24 May, 2018.
- "Non-von Neumann computing using networks of optical parametric oscillators." *School of Electrical and Computer Engineering, Cornell University*, Ithaca, NY, 1 March, 2018.

- "Non-von Neumann computing using networks of optical parametric oscillators." *School of Applied and Engineering Physics, Cornell University*, Ithaca, NY, 27 February, 2018.
- "Non-von Neumann computing using networks of optical parametric oscillators." *Department of Electrical and Computer Engineering & Joint Quantum Institute Special Seminar, University of Maryland*, College Park, MD, 20 February, 2018.
- "Combinatorial optimization with Coherent Ising Machines based on Degenerate Optical Parametric Oscillators." *Physical Chemistry Seminar, Purdue University*, West Lafayette, IN, 22 March, 2017.
- "Computing using networks of optical parametric oscillators." *RLE/EECS Optics and Quantum Electronics Seminar, Massachusetts Institute of Technology*, Cambridge, MA, 29 November, 2017.
- "Computing using networks of optical parametric oscillators." *10th IEEE/ACM Workshop on Variability, Modeling, and Characterization (VMC)*, Irvine, CA, 16 November, 2017.
- "Combinatorial optimization using networks of optical parametric oscillators." *Workshop on Non-conventional Approaches to Hard Optimization*, Irvine, CA, 16 November, 2017.
- "Computing using networks of optical parametric oscillators." *Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology*, Cambridge, MA, 27 February, 2017.
- "Computing using networks of optical parametric oscillators." *Los Alamos National Laboratory*, Los Alamos, NM, 9 February, 2017.
- "Computing using networks of optical parametric oscillators." *Institute for Molecular Engineering, University of Chicago*, Chicago, IL, 24 January, 2017.
- "Combinatorial optimization using networks of optical parametric oscillators: present (bulk) and future (on-chip)." *47th Winter Colloquium on the Physics of Quantum Electronics (PQE)*, Snowbird, UT, 8 – 13 January, 2017.
- "Physical computing using networks of optical parametric oscillators: solving Ising problems using optical-electronic machines." *SystemX Alliance Fall Conference*, Stanford, CA, 15 – 17 November, 2016.
- "Combinatorial Optimization with Coherent Ising Machines based on Degenerate Optical Parametric Oscillators." *Frontiers in Optics / Laser Science (FiO/LS)*, Rochester, NY, 17 – 21 October, 2016.
- "Explorations with a New Qubit System: Hybrid Quantum Dot and Quantum Well Exciton-Polariton Devices." *American Physical Society March Meeting*, San Antonio, TX, 5 March, 2015.
- "Tomography of a high-fidelity entangled spin-photon qubit pair." *MSS-16: 16th International Conference on Modulated Semiconductor Structures*, Wrocław, Poland, 1 – 5 July, 2013.

Service

- Journal reviewer for *Optics Express* (2015, 2017, 2020); *Nature Communications* (2016, 2020, 2022, 2023 x2, 2024 x2); *Physical Review Letters* (2016, 2020); *Physical Review A* (2016); *Electronics Letters* (2016); *Physical Review B* (2017); *Quantum Information Processing* (2017, 2019, 2020); *ACS Photonics* (2018); *Science Advances* (2018, 2020, 2021, 2023 x2, 2024); *Scientific Reports* (2019); *Nanophotonics* (2020); *New Journal of Physics* (2020); *Communications Physics* (2020, 2022); *Transactions on Computers* (2020); *Frontiers in Physics* (2020); *Nature Photonics* (2020, 2024); *Nature Computational Science* (2020); *Physical Review Applied* (2022, 2023); *Nature Physics* (2022, 2023); *Communications Engineering* (2022); *Science Robotics* (2022); *Laser & Photonics Reviews* (2022); *Physical Review X* (2022); *Matter* (Cell Press) (2022); *PNAS Nexus* (2022); *Photonics Research* (2023); *npj Quantum Information* (2023); *Nature* (2023, 2024); *Nature Electronics* (2024); *Science* (2024 x2)
- Organizing Committee, 2nd Conference on Computing with Physical Systems (2026)
- Program Committee, Aspen Summer Workshop on Beyond-von Neumann Computing (2025)
- Program Committee, International Workshop on Ising Machines (2025)
- Contributor, IEEE International Roadmap for Devices and Systems – Beyond CMOS (2024)
- Panelist, U.S. Department of State event on Optical Computing (2024)
- Co-Organizer, Aspen Center for Physics Winter Conference: Computing with Physical Systems (2024)
- Reviewer, 5th Annual Learning for Dynamics & Control Conference (L4DC) (2023)
- Reviewer, IEEE Conference on Design of Circuits and Integrated Systems (DCIS) (2022)
- Advisory Council, SheQuantum (2021–2023)
- Program Committee, SPIE Photonics West: AI and Optical Data Sciences Conference (2023, 2024, 2025)
- Co-Chair, International Laser Physics Workshop (LPHYS): Optical Computing Seminar (2024, 2025)
- Co-Chair, CIFAR Workshop on Quantum Information Science (2023)
- Co-Chair, CIFAR Workshop on Quantum Machine Learning (2022)
- Program Committee (Quantum Optics section), 15th Pacific Rim Conference on Lasers and Electro-Optics (CLEO Pacific Rim) (2022)
- Program Committee (Quantum Algorithms and Applications track), IEEE International Conference on Quantum Computing & Engineering (QCE) (2021)
- Program Committee, 21st Asian Quantum Information Science Conference (2021)

- Funding/proposal reviewer for *UK Research and Innovation* (2020); *Israel Science Foundation* (2022); *U.S. Department of Energy, Office of Science, Advanced Scientific Computing Research* (2022), *Austrian Science Fund (FWF)* (2023), *Singapore National Research Foundation* (2024)
- Program Committee, Photonics for Quantum Workshop (2020)
- Program Committee, 19th Asian Quantum Information Science Conference (2019)
- Briefed the U.S. DoD Defense Science Board Task Force on Applications of Quantum Technologies (2019)
- Program Committee, Coherent Network Computing (2019, 2022)
- Invited Abstract Reviewer, Cognitive Computing (2018)

Thesis Committee Member or External Examiner (other universities)

- Ilker Oguz, École Polytechnique Fédérale de Lausanne, School of Photonics (2025)
- Fabian Böhm, Vrije Universiteit Brussel, Department of Applied Physics and Photonics (2022)
- Kirill Kalinin, University of Cambridge, Department of Applied Mathematics and Theoretical Physics (2021)
- Connor Hann, Yale University, Department of Physics (2021)