

NATHAN YOUNGBLOOD, PhD

Assistant Professor

Department of Electrical and Computer Engineering

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EDUCATION

University of Oxford, Oxford, UK	MSE, Post-Doc	2017–2019
University of Minnesota, Minneapolis, MN	ECE, Ph.D.	2016
University of Minnesota, Minneapolis, MN	ECE, M.S.	2015
Bethel University, St. Paul, MN	Physics, B.S.	2011

PROFESSIONAL POSITIONS

09/2019 – Present	Assistant Professor, Department of Electrical and Computer Engineering, University of Pittsburgh, Pittsburgh, PA
06/2015 – 08/2015	Summer Intern, Photolithography Group, Seagate, Bloomington, MN

SUMMARY OF SCHOLARLY ACTIVITY

- *h*-index 26; ~6,050 total citations (Google Scholar)
- 42 peer-reviewed journal publications including:
 - 4 Web of Science “highly cited” papers (top 1% in field)
 - 1 Web of Science “hot paper” (top 0.1% in field)
 - Top 0.5% of researchers by annual citations in “Optoelectronics & Photonics” according to Stanford’s single-year standardized citation list (<http://doi.org/10.17632/btchxktzyw.5>)
- 23 invited presentations
- 6 graduate and 8 undergraduate students mentored
- ~\$2.8M total external research funding
- NSF CAREER (2024) and AFOSR YIP (2024) awardee

PUBLICATIONS

(Youngblood Photonics Lab group members and co-advisees in **bold**)

46. H. Sun, C. Lian, F. Vásquez-Aza, **S. Rahimi Kari**, Y.S. Huang, A. Restelli, S. A. Vitale, I. Takeuchi, J.J. Hu, **N. Youngblood**, G. Pavlidis, C. A. Ríos Ocampo, “Microheater hotspot engineering for repeatable multi-level switching in foundry-processed phase change silicon photonics,” *Under Review* (2024)
45. **S. Rahimi Kari**, M. Tamura, Z. Gao, Y.S. Huang, H. Sun, C. Lian, **N. Nobile**, **J. Erickson**, C. A. Ríos, B. Shastri, **N. Youngblood**, “High-Speed Multifunctional Photonic Memory on a Foundry-Processed Photonic Platform,” *Under Review* (2024)
44. P. Pintus, M. Dumont, **V. Shah**, T. Murai, Y. Shoji, D. Huang, J. E. Bowers, **N. Youngblood**, “Integrated nonreciprocal magneto-optics for photonic in-memory computing,” *Under Review* (2024)

43. **V. Shah, N. Youngblood**, “Leveraging Continuously Differentiable Activation Functions for Learning in Quantized Noisy Environments,” *Under Review* (2024)
42. **S. Rahimi Kari, N. Nobile, D. Pantin, V. Shah, N. Youngblood**, “Realization of an integrated coherent photonic platform for scalable matrix operations,” *Optica* 11(4), 542-551 (2024)
41. **N. Nobile, C. Lian, H. Sun, Y.-S. Huang, B. Mills, C. Constantin Popescu, D. Callahan, J. Hu, C.A. Ríos Ocampo, N. Youngblood**, “Nonvolatile Tuning of Bragg Structures Using Transparent Phase-Change Materials” *Optics Materials Express* 13(10), 2700-2710 (2023)
40. **J. Erickson, N. Nobile, D. Vaz, G. Vinod, C. Ríos, Y. Zhang, JJ Hu, S. Vitale, F. Xiong, N. Youngblood**, “Comparing the thermal performance and endurance of resistive and PIN silicon microheaters for phase-change photonic applications,” *Optics Materials Express* 13 (6), 1677-1688 (2023)
39. **N. Youngblood, C. Ríos, W.H.P Pernice, H. Bhaskaran** “Integrated Optical Memristors,” *Nature Photonics* 17, 561-572 (2023)
38. **W. Zhou, B. Dong, N. Farmakidis, X. Li, N. Youngblood, K. Huang, Y. He, C. D. Wright, W. H. P. Pernice, H. Bhaskaran**, “In-memory photonic dot-product engine with electrically programmable weight banks,” *Nature Communications* 14, 2887 (2023)
37. **S. Rahimi Kari, C. Ríos, L. Jiang, J. Meng, N. Peserico, V. J. Sorger, JJ Hu, N. Youngblood**, “Optical and Electrical Memories for Analog Optical Computing,” *IEEE JSTQE* 29(2), 16100812 (2023)
36. **N. Youngblood**, “Coherent Photonic Crossbar Arrays for Large-Scale Matrix-Matrix Multiplication [Invited],” *IEEE JSTQE* 29(2), 1–11 (2023)
35. **V. Shah, N. Youngblood**, “AnalogVNN: A Fully Modular Framework for Modeling and Optimizing Photonic Neural Networks,” *APL Machine Learning* 1, 026116 (2023)
34. **N. Nobile, J. Erickson, C. Ríos, Y. Zhang, JJ Hu, S. Vitale, F. Xiong, N. Youngblood**, “Time-resolved temperature mapping leveraging the strong thermo-optic effect in phase-change devices,” *advanced online publication in ACS Photonics* (2023)
33. **J. Y. S. Tan* / Z. Cheng*, J. Feldmann, X. Li, N. Youngblood, U. E. Ali, C. D. Wright, W. H. P. Pernice, H. Bhaskaran**, “Monadic Pavlovian associative learning in a backpropagation-free photonic network,” *Optica* 9(7), 792–802 (2022)
32. **C. Lian, C. Vagionas, T. Alexoudi, N. Pleros, N. Youngblood, C. Ríos**, “Photonic (computational) memories: tunable nanophotonics for data storage and computing,” *Nanophotonics* 11(17), 3823-3854 (2022)
31. **N. Farmakidis* / N. Youngblood*, J. S. Lee, J. Feldmann, A. Lodi, X. Li, S. Agarwal, W. Zhou, L. Bogani, W. H. P. Pernice, C. D. Wright, H. Bhaskaran**, “Electronically reconfigurable photonic switches incorporating phase change plasmonics,” *Advanced Science* 2200383 (2022)
30. **J. Erickson, V. Shah, Q. Wan, N. Youngblood, F. Xiong**, “Designing fast and efficient electrically driven phase change photonics using foundry compatible waveguide-integrated microheaters,” *Optics Express* 30, 13673-13689 (2022)
29. **N. Youngblood, C. Talagrand, B. Porter, C. G. Galante, S. Kneepkens, D. Yarmolich, R. S. Bonilla, P. Hosseini, R. Taylor, H. Bhaskaran**, “Reconfigurable Low-Emissivity Optical

- Coating Using Ultrathin Phase Change Materials,” *ACS Photonics* 9(1), 90–100 (2022) **Featured in The Times, London and the Daily Mail**
28. N. Farmakidis* / J. L. Swett*, **N. Youngblood**, X. Li, C. Evangelini, S. Agarwal, J. A. Mol, H. Bhaskaran, “Exploiting rotational asymmetry for sub-50 nm mechanical nanocalligraphy,” *Microsystems & Nanoengineering* 7, 84 (2021)
 27. J. Feldmann* / **N. Youngblood*** / M. Karpov*, H. Gehring, X. Li, M. Stappers, M. Le Gallo, X. Fu, A. Lukashchuk, A. Raja, J. Liu, C. D. Wright, A. Sebastian, T. Kippenberg, W. H. P. Pernice, H. Bhaskaran, “Parallel convolution processing using an integrated photonic tensor core,” *Nature* 589, 52–58 (2021) [Web of Science “*Hot Paper*”] **Featured in Nature “News and Views”**
 26. X. Ma, **N. Youngblood**, X. Liu, Y. Cheng, P. Cunha, K. Kudtarkar, X. Wang, S. Lan, “Engineering photonic environments for two-dimensional materials,” *Nanophotonics* 10(3), 1031–1058 (2021)
 25. Q. He, **N. Youngblood**, Z. Cheng, X. Miao, H. Bhaskaran, “Dynamically tunable transmissive color filters using ultra-thin phase change materials,” *Optics Express* 28, 39841–39849 (2020)
 24. X. Li, **N. Youngblood**, Z. Cheng, S. G.-C. Carrillo, E. Gemo, W. Zhou, W. H. P. Pernice, C. D. Wright, H. Bhaskaran, “Experimental investigation of silicon and silicon nitride platforms for phase change photonic in-memory computing,” *Optica* 7(3), 218–225 (2020)
 23. J. Feldmann, **N. Youngblood**, X. Li, C. D. Wright, H. Bhaskaran, W. H. P. Pernice, “Integrated 256 cell photonic phase change memory with 512-bit capacity,” *IEEE JSTQE* 26(2), 1–7 (2020)
 22. F. Zokaee, Q. Lou, **N. Youngblood**, W. Liu, Y. Xie, L. Jiang, “LightBulb: a photonic-nonvolatile-memory-based accelerator for binarized convolutional neural networks” **2020 Design, Automation & Test in Europe Conference & Exhibition (DATE)** 1438–1443 (2020)
 21. N. Farmakidis* / **N. Youngblood***, X. Li, J. Tan, J. L. Swett, Z. Cheng, W. H. P. Pernice, C. D. Wright, H. Bhaskaran, “Plasmonic nanogap enhanced phase change devices with dual electrical-optical functionality,” *Science Advances* 5(11), eaaw2687 (2019) **Featured in Nature “Research Highlights”**
 20. S. G.-C. Carrillo, E. Gemo, X. Li, **N. Youngblood**, A. Katumba, P. Bienstman, W. H. P. Pernice, H. Bhaskaran, C. D. Wright, “Behavioral modeling of integrated phase-change photonic devices for neuromorphic computing applications,” *APL Materials* 7, 091113 (2019)
 19. S. G. Sarwat, Z. Cheng, **N. Youngblood**, M. S. Alias, S. Sinha, J. H. Warner, H. Bhaskaran, “Strong Opto-structural coupling in low dimensional GeSe₃ films,” *Nano Letters* 19 (10), 7377–7384 (2019)
 18. E. Gemo, S. G.-C. Carrillo, C. R. De Galarreta, A. Baldycheva, H. Hayat, **N. Youngblood**, H. Bhaskaran, W. H. P. Pernice, C. D. Wright, “Plasmonically-enhanced all-optical integrated phase-change memory,” *Optics Express* 27(17), 24724–24737 (2019)
 17. J. Feldmann, **N. Youngblood**, C. D. Wright, H. Bhaskaran, W. H. P. Pernice, “All-optical spiking neurosynaptic networks with self-learning capabilities” *Nature* 569, 208–214 (2019) [Web of Science “*Highly Cited Paper*”] **Featured in Nature “News and Views”**
 16. **N. Youngblood**, C. A. Rios, E. Gemo, J. Feldmann, Z. Cheng, A. Baldycheva, W. H. P. Pernice, C. D. Wright, H. Bhaskaran, “Tunable volatility of Ge₂Sb₂Te₅ in integrated photonics,” *Advanced Functional Materials* 29, 1807571 (2019)

15. X. Li, **N. Youngblood**, C. A. Rios, Z. Cheng, W. H. P. Pernice, C. D. Wright, H. Bhaskaran, "Fast and reliable storage using a 5-bit, non-volatile photonic memory cell," *Optica* 6(1), 1–6 (2019) [Web of Science "**Highly Cited Paper**"] **Featured on the cover of Optica**
14. C. A. Rios* / **N. Youngblood***, Z. Cheng, M. Le Gallo, W. H. P. Pernice, C. D. Wright, A. Sebastian, H. Bhaskaran, "In-memory computing on a photonic platform," *Science Advances* 5(2), eaau5759 (2019) [Web of Science "**Highly Cited Paper**"] **Featured on IBM's research blog and in Nature Electronics "Research Highlights"**
13. S. G. Sarwat, **N. Youngblood**, Y.-Y. Au, J. A. Mol, C. D. Wright, H. Bhaskaran, "Engineering interface-dependent photoconductivity in Ge₂Sb₂Te₅ nanoscale devices," *ACS Applied Materials and Interfaces* 10(51), 44906–44914 (2018)
12. C. A. Rios, M. Stegmaier, Z. Cheng, **N. Youngblood**, C. D. Wright, W. H. P. Pernice, H. Bhaskaran, "Controlled switching of phase-change materials by evanescent-field coupling in integrated photonics [Invited]," *Optical Materials Express* 8(9), 2455–2470 (2018)
11. Z. Cheng, C. A. Rios, **N. Youngblood**, C. D. Wright, W. H. P. Pernice, H. Bhaskaran, "Device-level photonic memories and logic applications using phase-change materials," *Advanced Materials* 30, 1802435 (2018)
10. Z. Cheng, C. A. Rios, **N. Youngblood**, C. D. Wright, W. H. P. Pernice, H. Bhaskaran, "On-chip phase-change photonic memory and computing," *SPIE Proceedings*, 10345:1034519 (2017)
9. R. Peng, K. Khaliji, **N. Youngblood**, R. Grassi, T. Low, M. Li, "Mid-infrared electro-optic modulation in few-layer black phosphorus," *Nano Letters*, 17, 6315–6320 (2017)
8. M. Xu, Y. Gu, R. Peng, **N. Youngblood**, M. Li, "Black phosphorus mid-infrared photodetectors," *Applied Physics B*, 123:130 (2017)
7. **N. Youngblood**, M. Li, "Ultrafast photocurrent measurements of a black phosphorus photodetector," *Applied Physics Letters*, 110, 051102 (2017)
6. C. Chen, **N. Youngblood**, R. Peng, D. Yoo, D. A. Mohr, T. W. Johnson, S.-H. Oh, M. Li, "Three-dimensional integration of black phosphorus photodetector with silicon photonics and nanoplasmonics," *Nano Letters*, 17, 6315–6320 (2017)
5. **N. Youngblood**, R. Peng, A. Nemilentsau, T. Low, M. Li, "Layer tunable third-harmonic generation in multilayer black phosphorus," *ACS Photonics*, 4(1), 8–14 (2017)
4. **N. Youngblood**, M. Li, "Integration of 2D materials on a silicon photonics platform for optoelectronics applications," *Invited Review Article for Nanophotonics*, 6(6), 1205–1218 (2016)
3. **N. Youngblood**, C. Chen, S. J. Koester, M. Li, "Waveguide-integrated black phosphorus photodetector with high responsivity and low dark current," *Nature Photonics*, 9, 249–252 (2015) [Web of Science "**Highly Cited Paper**"]
2. S. C. Lee, **N. Youngblood**, Y. B. Jiang, E. J. Peterson, C. J. M. Stark, T. Detchprohm, C. Wetzel, S. R. J. Brueck, "Incorporation of indium on cubic GaN epitaxially induced on a nanofaceted Si(001) substrate by phase transition," *Applied Physics Letters*, 107(23), 231905 (2015)
1. **N. Youngblood**, Y. Anugrah, R. Ma, S. J. Koester, M. Li, "Multifunctional graphene optical modulator and photodetector integrated on silicon waveguides," *Nano Letters*, 14(5), 2741–2746 (2014)

BOOK CHAPTERS

1. **N. Youngblood**, C. A. Rios, “Configuring Phase Change Photonics for Memories and Computing,” *Phase Change Materials-Based Photonic Computing*, edited by H. Bhaskaran, W. Pernice, (Elsevier, Amsterdam, Netherlands, ISBN: 978-0-12-823491-4).

CONFERENCES PROCEEDINGS

29. **S. Rahimi Kari, D. Pantin, N. Youngblood**, “Scalable and efficient coherent photonic unit cell for time-multiplexed multiplication and correlation detection,” *SPIE Photonics West*, San Francisco, CA (Jan 2023)
28. **V. Shah, N. Youngblood**, “AnalogVNN: A Fully Modular Framework for Photonic Analog Neural Networks,” *IEEE IPC 2022*, Vancouver, Canada (Nov 2022)
27. **N. Nobile, J. Erickson, C. Rios, Y. Zhang, JJ Hu, F. Xiong, N. Youngblood**, “Dynamic Mapping of Temperature Using Phase-Change Materials,” *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA (2022)
26. **N. Farmakidis, N. Youngblood, J. S. Lee, J. Feldmann, W. H. P. Pernice, C. D. Wright, H. Bhaskaran**, “Plasmonically Enhanced Electronically Addressable Photonic Switches Incorporating Phase-Change Materials,” *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA (2022)
25. **W. Zhou, X. Li, N. Youngblood, W. H. P. Pernice, C. D. Wright, H. Bhaskaran**, “Electrical switching of $\text{Ge}_2\text{Sb}_2\text{Te}_5$ memory cells based on silicon photonic waveguide microheaters,” *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA (2022)
24. **J. Erickson, V. Shah, Q. Wan, N. Youngblood, F. Xiong**, “Designing fast and efficient electrically driven phase change photonics using foundry compatible waveguide-integrated microheaters,” *Photonics and Electronics Research Symposium (PIERS)*, Hangzhou, China (2022)
23. **J. Tan, Z. Cheng, J. Feldmann, X. Li, N. Youngblood, U. E. Ali, C. D. Wright, W. H. P. Pernice, H. Bhaskaran**, “Associative learning on phase change photonics,” *SPIE Nanoscience + Engineering*, San Diego, CA (2021)
22. **E. Gemo, S. G. C. Carrillo, J. Faneca, C. Ruíz de Galarreta, H. Hayat, N. Youngblood, A. Baldycheva, W. H. P. Pernice, H. Bhaskaran, C. D. Wright**, “Sub-wavelength plasmonic-enhanced phase-change memory,” *SPIE OPTO*, San Francisco, CA (2020)
21. **X. Li, N. Youngblood, W. Zhou, J. Feldmann, J. L. Swett, S. Aggarwal, A. Sebastian, C. D. Wright, W. H. P. Pernice, H. Bhaskaran**, “On-chip Phase Change Optical Matrix Multiplication Core,” *2020 IEEE International Electron Devices Meeting (IEDM)*, San Francisco, CA, 7.5.1–7.5.4 (2020)
20. **N. Youngblood, N. Farmakidis, X. Li, H. Bhaskaran**, “Nanoscale Optoelectronic Memory with Nonvolatile Phase-Change Photonics [Highlighted Talk],” *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, California USA (2020)
19. **E. Gemo, S. G. C. Carrillo, J. Faneca, N. Youngblood, W. H. P. Pernice, H. Bhaskaran, C. D. Wright**, “A plasmonic route towards the energy scaling of on-chip integrated all-photonic phase-change memories,” *European Phase-Change and Ovonic Symposium (EPCOS)*, Grenoble, France (2019)

18. **N. Youngblood**, Z. Cheng, N. Farmakidis, X. Li, J. Tan, H. Bhaskaran, "Phase change photonics for brain-inspired computing," *SPIE Defense + Commercial Sensing*, Baltimore, MD (2019)
17. C. Ríos, **N. Youngblood**, Z. Cheng, M. Le Gallo, W. H. P. Pernice, C. D. Wright, A. Sebastian, and H. Bhaskaran, "All-photonic in-memory computing based on phase-change materials," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA (2019)
16. C. D. Wright, H. Bhaskaran, W. H. P. Pernice, S. G. Carrillo, E. Gemo, A. Baldycheva, Z. Cheng, X. Li, C. Ríos, **N. Youngblood**, J. Feldmann, N. Gruhler, and M. Stegmaier, "Integrated Phase-change Photonics: A Strategy for Merging Communication and Computing," *Optical Fiber Communication Conference (OFC)*, San Diego, CA (2019)
15. E. Gemo, **N. Youngblood**, Z. Cheng, C. Ríos, M. Stegmaier, A. Baldycheva, W. H. P. Pernice, H. Bhaskaran, C. D. Wright, "Modelling phase-change integrated photonic devices," *European Phase-Change and Ovonic Symposium (EPCOS)*, Catania, Italy (2018)
14. **N. Youngblood**, X. Li, H. Bhaskaran, "Phase-change materials for non-volatile, integrated photonic memory and computation [Invited Talk]," *LIMIS*, Changsha, China (2018)
13. **N. Youngblood**, C. Talagrand, P. Hosseini, H. Bhaskaran, "Dynamic Smart Windows Using Phase Change Materials [Late Breaking Paper]," *MRS Spring Meeting*, Phoenix, Arizona USA (2018)
12. **N. Youngblood**, C. Ríos, E. Gemo, Z. Cheng, W. H. P. Pernice, C. D. Wright, H. Bhaskaran, "Phase change materials exhibit tunable volatility in integrated photonics," *SPIE Photonics West*, San Francisco, California USA (2018)
11. R. Peng, K. Khaliji, **N. Youngblood**, R. Grassi, T. Low, M. Li, "Mid-infrared electro-optic modulation in few-layer black phosphorus," *SPIE OPTO*, San Francisco, CA (2018)
10. Z. Cheng, C. Ríos, **N. Youngblood**, C. D. Wright, W. H. P. Pernice, H. Bhaskaran, "On-chip phase-change photonic memory and computing," *SPIE Nanoscience + Engineering*, San Diego, CA (2017)
9. S. G. C. Carrillo, E. Gemo, **N. Youngblood**, X. Li, A. Katumba, P. Bienstman, W. H. P. Pernice, H. Bhaskaran, C. D. Wright, "A behavioural model for integrated phase-change photonics," *European Phase-Change and Ovonic Symposium (EPCOS)*, Aachen, Germany (2017)
8. R. Peng, **N. Youngblood**, M. Li, "Mid-infrared electro-optic modulation in black phosphorus," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA (2017)
7. C. Chen, D. Yoo, **N. Youngblood**, S. Oh, M. Li, "Mid-infrared plasmonic coaxial nanorings for surface enhanced infrared absorption (SEIRA) spectroscopy," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA (2017)
6. **N. Youngblood**, M. Li, "Ultrafast photocurrent spectroscopy in a black phosphorus van der waals heterostructure [Invited Talk]," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA (2016)
5. C. Chen, **N. Youngblood**, D. Mohr, D. Yoo, T. Johnson, R. Peng, S. Oh, and M. Li, "Black Phosphorus Photodetector on Silicon Photonic and Plasmonic Hybrid Platform," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA (2016)

4. **N. Youngblood**, R. Peng, A. Nemilentsau, T. Low, M. Li, "Thickness dependent third-harmonic generation in few-layer black phosphorus [Post-Deadline Talk]," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA (2016)
3. C. Chen, **N. Youngblood**, M. Li, "Study of black phosphorus anisotropy on silicon photonic waveguide," *IEEE Optoelectronics Global Conference (OGC)*, Shenzhen, China (2015)
2. **N. Youngblood**, C. Chen, S. J. Koester, M. Li, "A black phosphorus FET integrated on a silicon waveguide for high speed, low dark current photodetection," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA (2015)
1. **N. Youngblood**, Y. Anugrah, R. Ma, S. J. Koester, M. Li, "Simultaneous optical modulation and detection using graphene integrated on a silicon waveguide," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA (2014)

INVITED TALKS

23. **N. Youngblood**, "Photonic Architectures for In-Memory Computing Using Nonvolatile Optical Materials" *CadenceCONNECT 2024 Photonics*, San Jose, CA (Feb 2024)
22. **N. Youngblood**, "Reconfigurable phase-change photonic platforms for fast and efficient in-memory computing" *SPIE Optics + Photonics*, San Diego, CA (Aug 2023)
21. **N. Youngblood**, "Computational photonic crossbar arrays for scalable and efficient matrix operations," *2nd Workshop on Neuromorphic Photonics and Applications*, Athens, Greece (July 2023)
20. **N. Youngblood**, "Measuring the dynamic thermal response in electrically programmable phase-change photonics," *PhotonIX Forum 2023*, Hangzhou, China (May 2023)
19. **N. Youngblood**, "Measuring the dynamic thermal response in electrically programmable phase-change photonics," *Materials Research Society (MRS) Spring Meeting*, San Francisco, CA (April 2023)
18. **N. Youngblood**, "Reconfigurable photonic platforms for fast and efficient in-memory computing," *Hewlett Packard LSIP Tech Talk*, Virtual Seminar (Mar 2023)
17. **N. Youngblood**, "Photonic Architectures for Computing in Memory Using Nonvolatile Optical Materials," *IEEE HPCA-29*, Montreal, Canada (Feb 2023)
16. **N. Youngblood**, V. Shah, S. Rahimi Kari, "Computational photonic crossbar arrays for scalable and efficient matrix operations," *SPIE Photonics West*, San Francisco, CA (Jan 2023)
15. **N. Youngblood**, "Reconfigurable phase-change photonics for fast and efficient in-memory computing," *NanoES Seminar, University of Washington*, Seattle, WA (Nov 2022)
14. **N. Youngblood**, "Photonic crossbar arrays for scalable photonic computing," *Invited Talk, IEEE IPC 2022*, Vancouver, Canada (Nov 2022)
13. **N. Youngblood**, "Reconfigurable photonic materials for optical memory, computation, and beyond," *MSE Graduate Seminar, University of Maryland*, College Park, MD (Oct 2022)
12. **N. Youngblood**, "Integrated photonics circuits for fast and efficient (classical) computing," *Invited Talk, PQI 2022 Conference*, Pittsburgh, PA (Sept 2022)
11. **N. Youngblood**, "Design and characterization of electrically programmable phase change photonic devices," *Invited Talk, 12th International Conference on Metamaterials, Photonic Crystals and Plasmonics (META 2022)*, Torremolinos, Spain (July 2022)

10. **N. Youngblood**, “Controlling and characterizing phase change devices for photonic computing applications,” *Invited Seminar for Advanced Nanoscale Engineering Group, University of Oxford*, Oxford, UK (July 2022)
9. **N. Youngblood**, “Phase change materials for photonic memory and neuromorphic computing,” *Guest Lecture, CMC Active Silicon Photonics Fabrication Course*, Virtual Event (June 2022)
8. **N. Youngblood**, “Reconfigurable photonic systems for optical memory, computation, and beyond,” *ECE Graduate Seminar, Tufts University*, Medford, MA (March 2022)
7. **N. Youngblood**, “Reconfigurable photonic processors for ultrafast and efficient computation,” *Accipiter Systems*, Wexford, PA (March 2022)
6. **N. Youngblood**, “Nanoscale Optoelectronic Memory with Nonvolatile Phase-Change Photonics,” *Pittsburgh Quantum Institute*, Pittsburgh, PA (July 2020)
5. **N. Youngblood**, “Phase-change materials for photonic memory, computing, and beyond,” *ECE Graduate Seminar, University of Minnesota*, Minneapolis, MN (Feb 2020)
4. **N. Youngblood**, “Phase-change materials for photonic memory, computing, and beyond,” *Physics Undergraduate Seminar, Bethel University*, St. Paul, MN (Feb 2020)
3. **N. Youngblood**, “Phase-change photonic computing and beyond,” *ECE Graduate Seminar, University of Pittsburgh*, Pittsburgh, PA (2019)
2. **N. Youngblood**, X. Li, H. Bhaskaran, “Phase-change materials for non-volatile, integrated photonic memory and computation,” *LIMIS*, Changsha, China (2018)
1. **N. Youngblood**, M. Li, “Ultrafast photocurrent spectroscopy in a black phosphorus van der waals heterostructure,” *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, California USA (2016)

DISCLOSURES AND PATENTS

6. **N. Youngblood**, P. Pintus, “Systems and methods for non-reciprocal magneto-optics,” US Patent App. 63/608,796, 22 Dec 2023
5. M. Robbins, **N. Youngblood**, M. Puckett, “Methods and apparatus for modulating light,” US Patent App. 63/604,130, 29 Nov 2023
4. **N. Youngblood**, “Systems and methods for coherent photonic crossbar arrays,” US Patent App. 63/224,994 and 63/278,885, 13 Sept 2022
3. A. Sebastian, M. Le Gallo-Bourdeau, C. D. Wright, **N. Youngblood**, H. Bhaskaran, X. Li, W. H. P. Pernice, J. Feldmann, “Photonic in-memory co-processor for convolutional operations” P201904211US01, US Patent App. 16/925,998, July 2020
2. C. Rios, **N. Youngblood**, Z. Cheng, H. Bhaskaran, “Optical methods and devices,” US 16/764,893, 29 Oct 2020
1. **N. Youngblood**, C. Rios, H. Bhaskaran, “Large area switching & sensing of a phase-change material integrated in a capacitor via displacement current,” WO 2018/224807, 13 Dec 2018

DOCUMENTED SOFTWARE

1. **V. Shah, N. Youngblood**, “AnalogVNN: A PyTorch Framework for Modeling Analog Neural Networks,” <https://analogvnn.readthedocs.io/en/latest/>, Oct 2022

GRANTS

External, Competitive Grants:

Active

12. PI, “CAREER: Multi-Dimensional Photonic Accelerators for Scalable and Efficient Computing,” NSF/CCSS, 04/24–03/29, \$552,166
11. PI, “YIP: Photonic in-memory accelerators for low-latency and efficient computing,” DoD/AFOSR, 02/24–01/27, \$449,240
10. Co-Investigator (PI: Accipiter Systems), “SBIR: High Throughput Photonic Processor for AI/ML Programs,” DoD/SCO, 10/22–06/24, \$295,000
9. PI, “Waveguide-Integrated Graphene Nano-tweezERS (WIGNER) for rapid sorting and analysis of nanovesicles and viruses,” NSF/CCSS, 09/22–08/25, \$250,000
8. Co-Investigator (PI: Rios), “Fast and efficient phase-change photonics using low-dimensional materials” NSF/EPMD, 09/22–08/25, \$225,000
7. Co-Investigator (PI: Moazeni), “FET: Medium: A Hybrid Co-processing Unit (HCU) using Phase-change Photonics in CMOS for Large-scale and Ultra-fast Machine Learning Acceleration,” NSF/CISE, 03/21–02/25, \$278,459
6. PI, “High-endurance phase-change devices for electrically reconfigurable optical systems,” NSF/EPMD, 09/20–08/24, \$380,000
5. PI, “Elucidating Structural Transformations in MoTe₂ for Efficient Optoelectronic Memory,” NSF/DMR, 07/20–06/24, \$501,953

Internal or Non-Competitive Grants:

Active

4. PI, “CrystaLight near-memory compute demonstrator,” Steel Perlot, 09/23–09/24, \$44,673

Previous

3. PI, “Highly Scalable and Efficient Deep Learning Accelerator Enabled by 3D Photonic Integration,” Pitt Momentum Funds, 07/22–06/23, \$25,000 (with additional \$25,000 in matching support)
2. PI, “Pitt Lumerical Site License for Research of Impact,” Pitt UPCAM, 01/22–12/22, \$9,800
1. PI, “Rad-hard ferroelectric memory,” NSF SHREC Industrial Support, 09/20–08/21, \$40,000

SERVICE AND LEADERSHIP

Department, College, and University:

- Member, SSOE Safety Committee, Spring 2022–present
- Member, University of Pittsburgh Strategic Quantum Advisory Committee, Jan 2021–present
- Member, University of Pittsburgh Quantum Computing Certificate Committee, 2021–2022
- Member, ECE ABET Outcome Sub-committee, 2020–2021
- Member, ECE Faculty Search Committee, March 2020

Conference:

- Optica (formerly OSA): Conference on Lasers & Electro-Optics (CLEO)

- Session Organizer, “S&I: Micro- and Nanophotonics,” 2021–2023
- Session Chair for 3 sessions, 2021–2022
- Special Panel Organizer and Moderator, “Opportunities and Challenges for Optical Phase-Change Materials in Foundry-Processed Photonics,” May 2022
- IEEE: Si Photonics Conference (Formerly GFP)
 - Session Organizer, “Novel Materials and Processes,” April 2023
- Optica (formerly OSA): Advanced Photonics Congress
 - Session Organizer, “IPR: Novel Materials,” July 2022
- Photonics and Electromagnetics Research Symposium (PIERS)
 - Special Session Organizer and Chair, “SC3: Reconfigurable Photonic Circuits for Computing and Switching,” April 2022
- Pittsburgh Quantum Institute (PQI) Conference
 - Judge, Graduate Student Poster Competition, Fall 2019, Spring 2020, Fall 2020
- Conversations in Oxford: Future of Integrated Photonics in Computing
 - Conference Organizer, Aug 2019

Reviewer:

- NSF:
 - Panelist, MRSEC Review Panel, Sept 2022
 - Ad Hoc Panelist, HBCU-UP Panel, Nov 2020
 - Panelist and Scribe, NSF Workshop on AI session, “Opportunities for Photonics in ML Hardware,” Nov 2020
 - Panelist, EPMD Core Panel, Oct 2020
- NASA:
 - Panelist, NASA Space Technology Graduate Research Opportunity, Jan 2021
- Optica (formerly OSA):
 - Reviewer, OSA Foundation Siegmund School Fellowships, March 2020 & Feb 2023
- Journal Reviewer:
 - Nature, Nature Photonics, Nature Communications, Optica, Optics Express, ACS Photonics, Applied Physics Letters, Journal of Applied Physics, Scientific Bulletin, Advanced Materials, Advanced Electronic Materials

Community Outreach:

- Panelist at HCS Mon Valley high school “Engineering Job Shadow” panel, 2023–2024
- Workshop Organizer, LEAD AI Summer Workshop for high school students from underrepresented groups in STEM, 2021–present
- Workshop Organizer, Invest NOW: Virtual AI Summer Workshop for high school students from underrepresented groups in STEM, June 2021
- Volunteer/Lecturer, AI Group (part of the Boys & Girls Clubs of Western PA), 2019–2020