NATHAN YOUNGBLOOD, PHD

Assistant Professor
Department of Electrical and Computer Engineering
University of Pittsburgh
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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 20; ~4,120 total citations (Google Scholar)
- 36 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)
- 17 invited presentations
- 6 graduate and 5 undergraduate students mentored
- ~$2M total external research funding

PUBLICATIONS

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

39. **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," *Under Review* (2023)
38. **N. Youngblood**, C. Ríos, W.H.P Pernice, H. Bhaskaran "Integrated Optical Memristors," *to appear in* ***Nature Photonics*** (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. **V. Shah**, **N. Youngblood**, "AnalogVNN: A Fully Modular Framework for Modeling and Optimizing Photonic Neural Networks," *arXiv:*2210.10048 (2022)

35. **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," *arXiv:*2210.08142 (2022)
34. 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)
33. C. Lian, C. Vagionas, T. Alexoudi, N. Pleros, **N. Youngblood**, C. Ríos, "Photonic (computational) memories: tunable nanophotonics for data storage and computing," *Advanced online publication in* ***Nanophotonics*** (2022)
32. **N. Youngblood**, "Coherent Photonic Crossbar Arrays for Large-Scale Matrix-Matrix Multiplication [Invited]," *Advanced online publication in* ***IEEE JSTQE*** (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. Evangeli, 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 $Ge_2Sb_2Te_5$ 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 $Ge_2Sb_2Te_5$ 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," to be published in *Phase Change Materials in Photonic Computation*, edited by H. Bhaskaran, W. Pernice, L. Bywater (Elsevier, Amsterdam, Netherlands).

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 $Ge_2Sb_2Te_5$ 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 (E\PCOS)***, 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. Rios, **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 (E\PCOS)***, 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. Rios, 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 (E\PCOS)***, 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

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

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

9. Co-Investigator (PI: Accipiter Systems), "SBIR: High Throughput Photonic Processor for AI/ML Programs," DoD/SCO, 10/22–06/24, $295,000
8. PI, "Waveguide-Integrated Graphene Nano-tweezERs (WIGNER) for rapid sorting and analysis of nanovesicles and viruses," NSF/CCSS, 09/22–08/25, $250,000
7. Co-Investigator (PI: Rios), "Fast and efficient phase-change photonics using low-dimensional materials" NSF/EPMD, 09/22–08/25, $225,000
6. 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
5. PI, "High-endurance phase-change devices for electrically reconfigurable optical systems," NSF/EPMD, 09/20–08/23, $380,000
4. PI, "Elucidating Structural Transformations in MoTe2 for Efficient Optoelectronic Memory," NSF/DMR, 07/20–06/23, $501,953

Internal or Non-Competitive Grants:

Active

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

Previous

1. PI, "Rad-hard ferroelectric memory," NSF SHREC Industrial Support, 09/20–08/21, $40,000

COURSES TAUGHT

Semester	Course Name	Course Number	Level	Type	Class Enrollment	Overall Student Evaluation Score
Fall 2019	Introduction to Nanotechnology	ECE 1250	Undergraduate	Lecture	30	4.23/5.0
Fall 2020	Digital Electronics	ECE 1238	Undergraduate	Lecture	17	4.43/5.0
Spring 2021	* Design & Sim. of Photonic Circuits	ECE 2295	Graduate	Lecture	7	4.14/5.0
Spring 2022	* Design & Sim. of Photonic Circuits	ECE 2272	Graduate	Lecture	5	5.0/5.0
Fall 2022	Senior Design	ECE 1896	Undergraduate	Lecture	27	-
Unweighted Average						4.45/5.0

*** New course (ECE 2272)**: Created new graduate course with the goal of enabling students to design photonic integrated circuits and systems by providing them with an intuitive understanding

of core photonic components (e.g., waveguides, couplers, resonators, etc.) as well as a solid grasp of the tools needed to simulate multi-component designs. By the end of the course, students should understand the steps needed to take a PIC design from original concept to fabrication at a foundry.

STUDENTS MENTORED

Graduate:

Advisor

- Sadra Rahimi Kari, Spring 2022 – present, Ph.D. student
- Daniel Vaz, Spring 2022 – present, Ph.D. student
- Nicholas Nobile, Spring 2022 – present, Ph.D. student
- Vivswan Shah, Fall 2020 – present, Ph.D. student

Co-advisor

- Xingyu Zhang, Fall 2020 – present, Ph.D. student
- John Erickson, Fall 2017 – present, Ph.D. candidate

Undergraduate:

- Guhan Kumaran, Fall 2022 – present, Undergraduate student researcher
- Dominique Pantin, Summer 2022 – present, Undergraduate student researcher
- Nicholas Nobile, Spring 2021 – Fall 2021, Undergraduate student researcher
- Brendan Schuster, Spring 2020, Undergraduate student researcher
- Owen Lucas, Spring 2020, Undergraduate student researcher

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–
  - Special Panel Organizer and Moderator, “,” 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 Siegman 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:

- 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

CONTRIBUTIONS TO DIVERSITY

- Advisor for multiple students from underrepresented groups in STEM (e.g., first-time college graduates and female undergraduate students)
- Organizer of multiple AI workshops for high school students from underrepresented groups in STEM through Pitt's LEAD and Invest NOW programs.

CONSULTING ACTIVITIES

- Consultant, Steel Perlot, 2022–present