

Shelbi Jenkins

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Summary

I am looking to pursue an academic career in photonics and optical engineering, with a focus on device design, testing and system integration for practical quantum networks. My most recent research includes developing analytical models for quantum network architectures and optimizing routing and spectrum allocation for variable source and consumer node configurations in scalable repeaterless quantum networks. My previous research emphasized integrating novel optical polymers with silicon nitride photonics. I have worked to develop hybrid polymer and silicon photonic devices such as magnetometers, modulators, optical switches, and other optical devices through collaboration with Ligentech and the AIM foundry.

Education

Doctor of Philosophy, Optical Sciences. University of Arizona, Wyant College of Optical Sciences. August 2016 – August 2021

Master of Science, Optical sciences. University of Arizona, Wyant College of Optical Sciences. August 2016 – August 2018

Bachelor of Arts, Physics. Willamette University. August 2013 – May 2016

Research and Work Experience

Postdoctoral Researcher, University of Arizona, Dept of Electrical and Computer Engineering:

Provided technical leadership in quantum and classical modeling of optical networks and photonic devices comprising such networks. Led the development and integration efforts necessary for delivery of a software platform to simulate/emulate hybrid classical and quantum data. Realized optical network designs in prototype optical hardware implementations. Co-advised graduate and undergraduate students with research efforts including writing and presenting peer-reviewed publications. Presented at national and international conferences in addition to annual meetings with collaborators. Assisting in writing research proposals and project updates for funding agencies. Nov 2022 - Present

Principal Investigator, Optical engineer at TIPD, LLC:

Collaborated within designated research teams to develop and write research proposals, conduct research and development activities for various company programs related to optical engineering and photonic device development and characterization, wrote project reports and presentations, and interacted with customers and potential customers. Served as PI for a Navy SBIR Phase II program, leading the program team, presenting quarterly reports to Navy TPoC, leading technical and review sessions. August 2021 – Sept 2022.

Research Technician, University of Arizona, James C Wyant College of Optical Sciences:

Researched novel hybrid polymer and silicon photonic devices for mid-wave infrared systems. This included planning and designing experiments on polymer materials and

devices. Conducting this research included formulating and developing procedures for fabricating integrated photonic devices and systems, operating, conducting, and calibrating active and passive photonic measurements of these devices, and preparing primary and supporting documents for grants and contract proposals. August 2021 – January 2022.

Dr. Robert Norwood's optical polymers and devices lab:

Research in this lab included working with a system designed to measure the Verdet constant of various materials using balanced auto-differential detection techniques. This consisted of designing, fabricating, testing and optimizing novel magneto-optic modulators for telecommunication applications. This work required knowledge of optical systems, photolithography, material science, lasers, polarization, light detection, optical fibers, as well as various optical instruments (mirrors, beams splitters, polarizers, etc.) April 2017 – July 2021.

Dr. Judith Su's photonic biosensor Lab:

Biosensor research for Alzheimer's Disease detection. This research was conducted using tapered optical fibers and various micro resonators to detect the presence of biomarkers within solution. January 2017 – April 2017.

Dr. Jennifer Barton's biomedical engineering lab:

Optimization of an Optical Coherence Tomography (OCT) system. This process included optical alignment, various lasers and optical instruments, and a fundamental understanding of interferometry and its uses in medical imaging. August 2016 – November 2016.

Dr. Michaela Kleinert's ultra-fast laser and ablation research lab:

Undergraduate Senior Thesis - Ultrafast lasers and ablation studies. This research focused on the use of ultra-fast (picosecond) ablation in altering the physical and optical properties of materials. This work required experience with mirrors, a laser-amplifier system, a scan lens system, wave plates, and a basic knowledge of C++, Python, and Arduino coding. August 2014 – May 2016.

Teaching Experience

Co-Instructor for ECE 381, Introduction to Electromagnets: Assisting Dr. Melde in developing the course materials, homework, and exams for the ECE 381 in Spring 2025. I am scheduled to give 5-8 class lectures in including both theoretical and problem-solving lectures.

Co-Instructor at the Center for Quantum Networks Quantum Winter School: Created three 3.5 hour courses on classical and quantum networks, focusing on integration, coexistence, and the practical limitations of current technologies and infrastructure. Course development included creating lecture materials, pre- and post-surveys, interactive components, and facilitating small group discussions. January 2023, January 2024, Upcoming January 2025.

Faculty Learning Community Facilitator: TA learning community. Created lesson plans and facilitated discussions for current U of A graduate teaching associates to investigate best practices to promote learning and foster diversity and inclusion in the classroom. Spring 2022.

Teaching associate. OPTI 429A/539A: From Photonics Innovation to the Marketplace. Assisted with in-class discussions, held office hours for students, contributed to grading and organizing class assignments and projects. Professor: Robert Norwood. Spring 2021.

Teaching associate. OPTI 501: Electromagnetic Waves. Held office hours for students, graded homework and exams, hosted class forums and discussions for students, prepared and taught full review sessions for two midterms and one final exam. Professor: Masud Mansuripur. Fall 2020.

RET advisor: O-RETINAS (Optics Research Experience for Teachers in Native American Schools). Facilitated research goals for teachers. Helped develop lesson plans for students in the areas of optics, photonics, polarization, and magneto-optics. Worked with teachers to develop multiple hands-on experiments for high school level students.

Teaching associate. OPTI 403A/503A: Mathematical methods for optics and photonics. Held office hours for students, graded homework, and exams, communicated students' performance and class retention to the instructor. Professor: Masud Mansuripur. Spring 2020.

Presentations and Publications

"Routing and Spectrum Allocation in Broadband Quantum Entanglement Distribution," Accepted with minor revisions to IEEE Journal of Selected Areas in Communications (JSAC), July 2024.

"Routing and Spectrum Allocation in Broadband Degenerate EPR-Pair Distribution," ICC 2024 - IEEE International Conference on Communications, June 2024.

"Optical Network Design for Entanglement Distribution," Poster Presentation, Southwest Quantum Information and Technology (SQuInT), October 2023.

"Manufacturability and performance of microdisk resonators from the AIM Photonics foundry," Opt. Continuum, OPTCON 2, 2209–2214 (2023).

"Magneto-optic and integrated Si₃N₄ devices for Mid-IR and C-band applications", PhD dissertation, *University of Arizona*, accepted August 2021.

"Magneto-optic Modulator Fabricated Using Polymer-Coated Magnetic Nanoparticles with 4.75dB Extinction Ratio", NOMA 2021 proceedings, August 2021.

"Optical tuning of Si₃N₄ ring resonators using an external short visible wavelength laser source," *OSA Continuum*, **4**, 5, 1669-1675 (2021).

"Polymer coated Magnetic nanoparticles as ultra-high Verdet constant materials: Correlation of nanoparticle size with magnetic & magneto-optical properties," *Chemistry of Materials*, **33**, 13 5010-5020 (2021).

"Polymer and magnetic nanoparticle composites with tunable magneto-optical activity: Role of nanoparticle dispersion for high Verdet constant materials," *Journal of Materials Chemistry* **8**, 5417 (2020).

"Magneto-optical properties of highly Dy³⁺ doped multicomponent glasses," *Optics Express* **28**, 8 11789 (2020).

Patents

MAGNETO-OPTIC MAGNETOMETER. Patent no. 18/712428. Issued Sept 2024.

Service

Center for Quantum Networks Student and Postdoc retreat: Helped organize the event, including recruiting and coordinating a panel for undergraduate and early-career graduate students to discuss navigating grad school, applying for jobs, and choosing a career path. Assisted with developing the DCI “Allyship Workshop” to help foster a stronger community and support network within CQN. September 2023.

Wyant College of Optical Sciences PRISM Week Coordinator: Helped develop the agenda for the week-long diversity celebration and informational sessions. Created and led the “Diversity in Optics” session that focused on notable contributions to the field of optics by people with underrepresented identities, as well as a workshop on privilege, allyship and best practices for supporting people with underrepresented identities in STEM. February 2020, February 2021.

Reviewer for Optica: Reviewed multiple papers each year discussing magneto-optics, integrated photonics, silicon nitride devices, and novel optical materials. Provided meaningful feedback to the authors and offered sincere recommendations for acceptance or rejection to the editors. 2020-Present.

Professional Development

Attended the Optica “Level Up” Leadership conference. This workshop helps develop and improve professional leadership skills including career planning, conflict resolution, mentorship, networking and volunteering. March 2024.

Related coursework

Electromagnetic Waves · Geometrical Optics · Linear Systems and Fourier transforms · Diffraction and Interferometry · Optical Physics and Lasers · Mathematical Methods for Optics and Photonics · Photonics · Nonlinear Photonics · Nanophotonics · Solid State Optics · Lens design · Medical Physics · Microfabrication and Opti-Electronics · From Photonics Innovation to the Marketplace · Semiconductor Physics

Software

MATLAB · Python · Klayout · Layout Editor · SolidWorks · COMSOL · Lumerical · FIMMWAVE · Mininet Optical · LightTools

Honors and Awards

Outstanding Teaching Associate, College of Optical Sciences. 2020-2021

Mary Jo Lake Memorial Fellowship in Optical Sciences. 2020-2021

Harrison H. Barrett Graduate Student Scholarship in Optical Sciences and Medical Imaging. 2016-2017.

Webber Scholar. 2015-2016

National Society of Collegiate Scholars member. 2014-2016.

Willamette University Merit Scholar. 2013-2016.

References

Boulat Bash. Professor, Electrical and Computer Engineering, The University of Arizona. Postdoctoral Supervisor. boulat@arizona.edu

Robert Norwood. Professor, James C Wyant College of Optical Sciences, The University of Arizona. Research advisor. rnorwood@optics.arizona.edu

Dan Kilper. Professor, Electronic and Electrical Engineering, Trinity College Dublin. Science Foundation Ireland CONNECT Centre Director. Dan.kilper@tcd.ie

Masud Mansuripur. Professor, James C Wyant College of Optical Sciences, The University of Arizona. TA advisor and Ph.D Dissertation Committee member. mansuripur@optics.arizona.edu