



MONTANA
STATE UNIVERSITY

Optical Technology Center

32nd Annual OpTeC Conference

Highlighting Optical Science and Engineering

Thursday, October 8, 2026

Montana State University • Bozeman, Montana

7:45 AM Check-in & Hot Breakfast

Conference Locations

Oral Presentations 8:15 AM to 5:05 PM Room 201 (Inspiration Hall) Norm Asbjornson Hall Enter through the south-facing door on the 2nd floor	Poster Pitches 5:10 PM to 6:00 PM Norm Asbjornson Hall Atrium First Floor Seating available on Spanish stairs	Exhibitors & Research Posters AND MPQA Q4 Networking Social 6:00 PM to 8:00 PM Ballroom A Strand Union Building (SUB) North of Norm Asbjornson Hall	Thorlabs Mobile Photonics Lab Experience 3-Day Event 10/8 – Intro to Photonics 10:00 AM to 4:00 PM Behind Norm Asbjornson Hall 10/9 – Fiber Coupling 10:00 AM to 4:30 PM Behind Norm Asbjornson Hall 10/10 – Intro to Photonics 10:00 AM to 4:00 PM @ Museum of the Rockies
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Sponsors

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Office of Research & Economic Development



THORLABS



BOZEMAN^{MT}



UP
NANO



Conference Organizers

Joseph Shaw, Director
Brian D'Urso, Associate Director
Riley Logan, Associate Director
Michelle Leonti, Conference Coordinator

Optical Technology Center

SPIE-Sponsored Happy Hour Reception

October 7, 2026

5:30 PM to 7:00 PM

Montana Ale Works
611 E Main St, Bozeman, MT 59715
Semi-Private Area on the East End

Parking is plentiful at Ale Works and
the building next door

Beverages and light snacks/hors d'oeuvres served

Enter the raffle to win some fun SPIE swag!

Come as you are; no registration required.

Thorlabs Mobile Photonics Lab Experience

Three-Day Event

The Thorlabs Mobile Photonics Lab offers students a hands-on experience with photonics equipment used to measure, study, and harness the power of light. Guided by current Thorlabs employees, students are introduced to key photonics concepts, gain insight into potential careers, and engage with individuals that have years of experience working in the field.

Thursday, 10/8 – Intro to Photonics Experience

10 AM – 4 PM

Behind Norm Asbjornson Hall

Friday, 10/9 – Fiber Coupling Experience

10 AM – 4:30 PM

Behind Norm Asbjornson Hall

Registration Required:

<https://www.signupgenius.com/go/MLatMSU#/>

Saturday, 10/10 – Intro to Photonics Experience @ Museum of the Rockies,
10 AM

Conference Opening Keynote Speaker

Room 201 (Inspiration Hall), Norm Asbjornson Hall

7:45 AM Check-In and hot breakfast provided

8:15 AM Opening Remarks

Joseph Shaw, Director, Optical Technology Center, Montana State University

1 8:30 AM Teaching optical design at scale: Lessons from the University of Rochester

Julie L Bentley

Institute of Optics, University of Rochester, Rochester, NY, USA

Oral Presentations

Session 1

Parvinder Gill & Riley Logan

2 8:50 AM Photonics and Robotics in Chur, Switzerland

Hannes Merbold,¹ Tobias Leutenegger,¹ Mirco Seeli,¹ Philipp Roebrock,¹ Gion-Pol Catregu,¹ Andreas Bitzer,¹ Ursin Soler,¹ Christian Bermes,¹ Yves Diggelmann,¹ Noel Frey,¹ Robin Derungs,¹ Philipp Roebrock,¹ Ursin Soler,¹ Marco Ruggia,² Manuel Schlegel,¹ Simon Müller,¹ Udo Birk¹

¹University of Applied Sciences of the Grisons, Institute of Photonics and Robotics, Chur, Switzerland

²University of Twente, Faculty of Engineering Technology, Twente, The Netherlands

3 9:10 AM Custom airborne radiometer for validation of short-wave infrared satellite snow products

Shannon Hamp,¹ Riley D. Logan,^{1,2} Eric A. Sproles,³ Joseph A. Shaw^{1,2}

¹Optical Technology Center, Montana State University, Bozeman, MT, USA

²Electrical and Computer Engineering Department, Bozeman, Montana, USA

³Geospatial Core Facility, Earth Sciences Department, Montana State University, Bozeman, Montana, USA

4 9:30 AM Evaluating uncertainties in modeled snow reflectance from multispectral remote sensing using UAV-based and field-based hyperspectral imaging

Jeremy Wood, Eric A. Sproles,¹ Duilio Fonseca-Gallardo,¹ Joseph A. Shaw,¹

Shannon M. Hamp,² Riley D. Logan,² Henna-Reetta Hannula,³ Roberta Pirazzini³

¹Montana State University, Geospatial Core Facility, Earth Sciences, Bozeman, MT, USA

²Montana State University, Optical Technology Center, Electrical Engineering, Bozeman, MT, USA

³Finnish Meteorological Institute, Helsinki, Finland

- 5 **9:50 AM** *UAV-based multispectral optical sensing for AI-driven plant-level Potato Virus Y detection*
Muhammad Shehzore Hashmi,¹ Bradley M. Whitaker,¹ Paul W. Nugent²
¹Department of Electrical and Computer Engineering, Montana State University, Bozeman, MT USA
²Department of Land Resources and Environmental Sciences, Montana State University, Bozeman, MT, USA
- 6 **10:10 AM** *Diode-laser-based direct-detection Doppler wind lidar and high spectral resolution lidar*
Luke Colberg, Kevin S. Repasky
Electrical and Computer Engineering, Montana State University, Bozeman, MT, USA
- 10:30 AM BREAK (Refreshments provided)**
- Session 2** **Brian D'Urso**
- 7 **10:50 AM** *Exciton diffusion dynamics in strain-localized WS₂ nanobubble quantum emitters*
Mohammad Soroush,^{1,2} Matt Strasbourg,^{2,3} Joe Stage,² Deep Jariwala,⁴ P. James Schuck,³ Nick Borys,^{2,5} David Dickensheets¹
¹Department of Electrical and Computer Engineering, Montana State University, Bozeman, MT, USA
²Department of Physics, Montana State University, Bozeman, MT, USA
³Department of Mechanical Engineering, Columbia University, NYC, NY, USA
⁴Electrical and Systems Engineering, University of Pennsylvania, Philadelphia, Pennsylvania, USA
⁵Department of Physics and Astronomy, University of Utah, Salt Lake City, USA
- 8 **11:10 AM** *Thin films and heterostructures for engineering light-matter interactions*
Brelon J. May^{1,2}
¹QCORE, Montana State University
²Condensed Matter Physics and Material Science, Idaho National Laboratory, Idaho Falls, ID, USA
- 9 **11:30 AM** *Pairing operando Raman spectroscopy and electrochemical analysis to describe DC-SOFC function and degradation*
Keegan Walker,¹ Kylie Held,¹ Robert Walker¹
Department of Chemistry and Biochemistry, Montana State University, Bozeman, MT, USA
- 10 **11:50 AM** *Illuminating communication patterns in neuronal ensembles: Optical readouts and new tools to modulate bottom-up neuronal circuits*
Anja Kunze,¹ Rafat Tazim,¹ Connor L. Beck^{1, 2}
¹Montana State University, Electrical and Computer Engineering Department, Bozeman, MT, USA
²Purdue University, Weldon School of Biomedical Engineering, West Lafayette, IN, USA

12:10 PM LUNCH (Provided)

Session 3

Joseph Shaw & Jason Yager

- 11 **1:00 PM** *Engineering novel optical material solutions for the Infrared (IR)*
Kathleen A. Richardson^{1,2}
¹College of Optics and Photonics, CREOL, University of Central Florida, Orlando, FL, USA
²Department of Material Science and Engineering, University of Central Florida, Orlando, FL, USA
- 12 **1:10 PM** *Powerful lasers, fusion energy and directed energy*
Martin Richardson
Center for Directed Energy, University of Central Florida, Orlando, FL, USA
College of Optical & Photonics, University of Central Florida, Orlando, FL, USA
- 13 **1:20 PM** *Self-coherent holographic reconstruction for physically layer-encrypted optical communication*
Cole Hammond, Krishna Rupavatharma
Spectrum Lab, Montana State University, Bozeman, MT, USA
- 14 **1:40 PM** *Programmable photonic mode vector receivers*
Aishik Biswas, Md. Atiqur Rahman, Ioannis Rouda
Department of Electrical and Computer Engineering, Montana State University, Bozeman, MT, USA
- 15 **2:00 PM** *Entangled photon interactions with rare-earth ion-doped materials*
Eric Pritchard, Owen Wolfe, Joshua Dugre, Krishna Rupavatharam
Spectrum Lab, Montana State University, Bozeman, MT, USA
- 16 **2:20 PM** *2D exciton-polaritons for classical and quantum photonic computing*
Li He
Physics Department, Montana State University, Bozeman, MT, USA
- 17 **2:40 PM** *Updates from SPIE*
Kent Rochford
Chief Executive Officer, SPIE
- 18 **2:50 PM** *Updates from Optica*
Jose Pozo
CTO, Optica
- 3:00 PM BREAK (Refreshments provided)**

Session 4 - Industry Session

Jose Pozo

- 19 **3:15 PM** *Advances in two-photon polymerization for industrial microoptics manufacturing*
Erika Bechtold
UpNano GmbH
- 20 **3:30 PM** *From complex optical systems to commercial-grade quantum hardware*
Tim Day
Monarch Quantum
- 21 **3:45 PM** *Entanglement networks, from deployment to quantum advantage*
Mehdi Namazi
Qunnect
- 22 **4:00 PM** *Leading in Deep Tech Today*
Michele Nichols
Launch Team Inc.
- 23 **4:15 PM** *MSU Optical Metrology Lab: New shared resource*
Nathaniel J. Field,¹ Mark Craig,¹ Riley D. Logan,^{2,3} Joseph A. Shaw^{2,3}
¹Gallatin College, Montana State University, Bozeman, MT, USA
²Department of Electrical and Computer Engineering, Montana State University, Bozeman, MT, USA
³Optical Technology Center, Montana State University, Bozeman, MT, USA
- 24 **4:30 PM** *From lab to system: Commercializing integrated photonic products in Montana*
Sean Spillane, Jason Yager, Timothy Pendrell
Montana Photonics and Quantum Alliance
- 25 **4:45 PM** *Packaging and assembly for Photonic Integrated Chips*
Albert Hasper
Phix Photonics Assembly

Session Ends

Poster Pitches

Norm Asbjornson Hall Atrium, First Floor – Seating is available on the Spanish stairs

5:10 PM *Students will present a one-minute slide of their research poster.*

Exhibitors & Research Posters

*Ballroom A, Strand Union Building (SUB)
Dinner provided*

6:00 PM *Opening Remarks & Montana Optics Innovator Awards*
Joseph Shaw, Director, Optical Technology Center
Alison Harmon, Vice President for Research and Economic Development
Optica
Zygo
SPIE
Jason Yager, Executive Director, MPQA
Commissioner Sarah Swanson, Montana Department of Labor and Industry

Exhibitors

Altos Photonics	nLight Defense Systems, Inc.
CACI	OptoSigma
Edmund Optics	PROTECH, University of Montana
Four9 Design	Quartus Engineering
Hawthorn Photonics	Resonon, Inc.
ID Quantique	Shimadzu Scientific Instruments
Keysight Technologies	Spark Photonics Foundation
Lattice Materials	SPIE
Lumibird Photonics USA, Inc	Teledyne FLIR
MKS Newport	UpNano US, Inc.
Montana Microfabrication Facility, MSU	Zygo
Montana Photonics & Quantum Alliance	

Research Posters

- 1** *Investigation of Tm³⁺ LiTaO₃ for integrated photonic quantum hardware*
Carter Gall, Jason Scott, Charles Thiel
Montana State University, Bozeman, MT, USA
- 2** *High-pressure, air-independent combustion mechanisms: a real-time operando investigation using optical emission spectroscopy*
Dalton T. Forbes,¹ Paul Munson,² Enola Barker,³ and Robert A. Walker^{1,2}
¹Materials Science and Engineering Ph.D. Program, Montana State University, Bozeman, MT, USA
²Department of Chemistry and Biochemistry, Montana State University, Bozeman, MT, USA
³Chemical and Biological Engineering Department, Montana State University, Bozeman, MT, USA
- 3** *Probing PFAS-hemoglobin interactions using steady-state and time-resolved fluorescence spectroscopy*
Robin Das Sourab, Robert Walker
Department of Chemistry and Biochemistry, Montana State University, Bozeman, MT, USA
- 4** *Probing surface redox in yttria-stabilized zirconia (YSZ) using second harmonic generation and Raman spectroscopy*
Shah Ali Haider Shanto,¹ Robert Walker^{1,2}
¹Material Science and Engineering Program, Montana State University, Bozeman, MT, USA
²Department of Chemistry and Biochemistry, Montana State University, Bozeman, MT, USA
- 5** *Influence of SiO₂ thickness on O₂ adsorption at n-doped silicon interfaces probed by second harmonic generation*
Shah A. H. Shanto,¹ **Debaleena D. Gupta**,² and Robert A. Walker^{1,3}
¹Materials Science and Engineering Program, Montana State University, Bozeman, MT, USA
²Electrical and Computer Engineering Department, Montana State University, Bozeman, MT, USA
³Department of Chemistry and Biochemistry, Montana State University, Bozeman, MT, USA

6 *Temperature-dependent biomass oxidation: consequences for combustion emission factors*

Kayode I. Fesomade,¹ Robert A. Walker^{1,2}

¹Materials Science and Engineering Program, Montana State University, Bozeman, MT, USA

²Department of Chemistry and Biochemistry, Montana State University, Bozeman, MT, USA

7 *Organo-chromophore functionalized two-dimensional materials: tuning spectral and spatial optical properties for energy transfer and single-photon emission*

Tagert Mueller,^{1,2} Logan Mikesell,^{1,2} Chris Lemon,^{1,2} Erik Grumstrup^{1,2}

¹Department of Chemistry and Biochemistry, Montana State University, Bozeman, MT, USA

²QCORE, Montana State University, Bozeman, MT, USA

8 *Single particle spectroscopy of defects in porphyrinic MOF crystals*

Belief Rifore,¹ Erik Grumstrup^{1,2}

¹Materials Science and Engineering Program, Montana State University, Bozeman, MT, USA

²Department of Chemistry and Biochemistry, Montana State University, Bozeman, MT, USA

9 *Precision gravity sensing with a compact, robust atom interferometer*

Christopher Siebor, Matt Jaffe

Department of Physics, Montana State University, Bozeman, MT, USA

10 *Precision beam steering for autonomous fiber coupling*

Zade Little, Bridger McGimpsey, Matt Jaffe

Department of Physics, Montana State University, Bozeman, MT, USA

11 *Exciton diffusion dynamics in strain-localized WS₂ nanobubble quantum emitters*

Mohammad Soroush,^{1,2} Matt Strasbourg,^{2,3} Joe Stage,² Deep Jariwala,⁴ P. James Schuck,³ Nick Borys,^{2,5} David Dickensheets¹

¹Electrical & Computer Engineering Department, Montana State University, Bozeman, MT, USA

²Department of Physics, Montana State University, Bozeman, MT, USA

³Department of Mechanical Engineering, Columbia University, New York, NY, USA

⁴Electrical and Systems Engineering, University of Pennsylvania, Philadelphia, PA, USA

⁵Department of Physics and Astronomy, University of Utah, Salt Lake City, UT, USA

- 12** *A MEMS cantilever for strain tuning 2D materials in cryogenic conditions*
Nikolas Torgerson,¹ Masoud Hakimi Heris,² Nicholas Borys,³ David Dickensheets¹
¹Electrical and Computer Engineering Department, Montana State University, Bozeman, MT, USA
²Electrical and Computer Engineering, NC State University
³Physics and Astronomy, University of Utah
- 13** *Gate-tunable spectroscopy of excitons and trions in monolayer MoSe₂*
Lucas Clouser, Li He
Department of Physics, Montana State University, Bozeman, MT, USA
- 14** *Shaping the trap, sharpening the constant: A levitated approach to Big G*
Yateendra Sihag,¹ Connor E. Murphy,¹ Cody Jessup,¹ Tahereh Naderishahab,¹ Leonardo R. Werneck,² Zachariah B. Etienne,^{2,3} Brian D'Urso,¹
¹Department of Physics, Montana State University, Bozeman, MT, USA
²Department of Physics, University of Idaho, Moscow, ID, USA
³Center for Gravitational Waves and Cosmology, Morgantown, WV, USA
- 15** *Levitated mirror interferometer*
Sophia Balderrama, Michael Testagrossa, Brian D'Urso
Department of Physics, Montana State University, Bozeman, MT, USA
- 16** *Workflow development for nano-composite fabrication using 2PP*
Katerina Shabalina, Samuel Fritsch, Krishna Rupavatharam
Spectrum Lab, Montana State University, Bozeman, MT, USA
- 17** *Quantum machine learning for galaxy data*
Emily Moss, Tadeo Aviles Zuniga, Ray Yager
QCORE, Montana State University, Bozeman, MT, USA
- 18** *Transmission spectrum analysis of a silicon micro-ring resonator*
Gracie Brockie, Corey Pearson, Dennis Dempsy, Krishna Rupavatharam
Spectrum Lab, Montana State University, Bozeman, MT, USA
- 19** *Arbitrary state manipulation of photonic qubits using liquid crystal retarders*
Grant M. Kirkland,¹ Ector Ayala Diego,¹ Joshua Dugre,¹ Nathan Kuehl,¹ Owen R. Wolfe,¹ Aditya Verma,² Jason Rosenberg,² Rourke Sekelsky,² R. Krishna Rupavatharam,¹
¹Spectrum Lab, Montana State University, Bozeman, MT, USA
²Qunnect, New York City, New York, USA

- 20** *Development of an all-fiber polarization analysis module (PAM) for network entangled photons*
Ector Ayala Diego, Nathan Kuehl, Joshua Dugre, Owen Wolfe, Krishna Rupavatharam
Spectrum Lab, Montana State University, Bozeman, MT, USA
- 21** *Development of amplitude and phase modulation driver for control of quantum signal processor systems*
Ava Arbogast, Owen Wolfe, Krishna Rupavatharam
Spectrum Lab, Montana State University, Bozeman, MT, USA
- 22** *Optically addressable spin systems for quantum technologies: From defects to molecules*
Richard Escalante, Brelon May,² Krishna Rupavatharam¹
¹Spectrum Lab, Montana State University, Bozeman, MT, USA
²QCORE, Montana State University, Bozeman, MT, USA
- 23** *Evaluating hybrid photonic quantum-classical neural network architectures for nonlinear classification*
Rebekah Yager,¹ Krishna Rupavatharam²
¹Gianforte School of Computing, Montana State University, Bozeman, MT, USA
²Spectrum Lab, Montana State University, Bozeman, MT, USA
- 24** *Rydberg states in Rubidium as a platform for quantum sensing of RF fields*
Luke Robins, Owen Wolfe, Krishna Rupavatharam
Spectrum Lab, Montana State University, Bozeman, MT, USA
- 25** *Optical turbulence generator for testing free-space optical systems*
Rachel Tan, Trent Jackson, Krishna Rupavatharam
Spectrum Lab, Montana State University, Bozeman, MT, USA
- 26** *Gimbal control interface for free-space optical communications payloads*
Hutchins Vujovich, Kevin Gates, Trent Jackson
Spectrum Lab, Montana State University, Bozeman, MT, USA
- 27** *Auto-tensioning UAS tether for modular free-space optical communication nodes*
Ciaran Courtnage, Christopher Balas, Krishna Rupavatharam
Spectrum Lab, Montana State University, Bozeman, MT, USA

- 28** *Optical phase-locked loop to improve laser coherence length*
James Broderick, Zachery Lakin, Krishna Rupavatharam
Spectrum Lab, Montana State University, Bozeman, MT, USA
- 29** *Synchronized multi-LiDAR sensing for object classification and traffic flux analysis*
Lola Pizzato-Smith,¹ Saylor Cook,¹ Hayden Shupp,¹ **Caleb Rohn**,² Krishna Rupavatharam²
¹Bozeman High School, Bozeman, MT, USA
²Spectrum Lab, Montana State University, Bozeman, MT, USA
- 30** *Low-cost all-sky polarization imaging for aerosol characterization*
Morgan Hasenmyer,^{1,2} Joseph Shaw,^{1,2}
¹Electrical and Computer Engineering Department, Montana State University, Bozeman, MT, USA
²Optical Technology Center, Montana State University
- 31** *Progress toward a low-cost, miniature downwelling irradiance sensor*
Adin J. Matthes,¹ Milo S. Anderson,² Joseph A. Shaw,^{1,3} Riley D. Logan^{1,3}
¹Electrical and Computer Engineering Department, Montana State University
²Department of Physics, Montana State University, Bozeman, MT, USA
³Optical Technology Center, Montana State University, Bozeman, MT, USA
- 32** *Evolution of low-cost multispectral imaging systems for monitoring river water quality and characteristics*
Izzy C. Perez,¹ Shannon M. Hamp,¹ Joseph A. Shaw,^{1,2} Riley D. Logan^{1,2}
¹Electrical & Computer Engineering Department, Bozeman, MT, USA
²Optical Technology Center, Bozeman, MT, USA
- 33** *In-flight UAV detection using a miniaturized wing-beat modulation lidar*
Lars G. Johnson,¹ Henry Hamp,¹ Riley D. Logan^{1,2}
¹Electrical & Computer Engineering Department, Montana State University, Bozeman, MT, USA
²Optical Technology Center, Montana State University, Bozeman, MT, USA
- 34** *A preliminary laser-based, non-invasive biomolecule monitoring technique*
Christian Aitchison,¹ Elliot Jaffe,¹ and Riley D. Logan^{1,2}
¹Electrical & Computer Engineering Department, Montana State University, Bozeman, MT, USA
²Optical Technology Center, Montana State University, Bozeman, MT, USA

- 35** *Underwater Wireless Optical Communications*
Garrett Kuntz,^{1,2} Bradley Whitaker,¹ Amy Brown²
¹Electrical & Computer Engineering Department, Montana State University, Bozeman, MT, USA
²Montana Space Grant Consortium, Montana State University, Bozeman, MT, USA
³Spectrum Labs, Montana State University, Bozeman, MT, USA
- 36** *Synthetic hyperspectral images for wildfire prevention*
Piper Hoxie, Ethan Glenn, Mahmad Isaq Karankot, Brad Whitaker
Electrical & Computer Engineering Department, Montana State University, Bozeman, MT, USA
- 37** *UAV-based multispectral optical sensing for AI-driven plant-level Potato Virus Y detection*
Muhammad Shehzore Hashmi,¹ Bradley M. Whitaker,¹ Paul W. Nugent²
¹Electrical and Computer Engineering Department, Montana State University, Bozeman, MT, USA
²Department of Land Resources and Environmental Sciences, Montana State University, Bozeman, MT, USA
- 38** *Smart unoccupied system hyperspectral imager (SUSHI)*
Nat Sweeney, Ross Snider
Electrical and Computer Engineering Department, Montana State University, Bozeman, MT, USA
- 39** *Single-sideband suppressed-carrier modulation on a photonic integrated circuit for lidar and communications*
Michael Menuet, Corey Pearson, Dennis Dempsey,
Spectrum Lab, Montana State University, Bozeman, MT, USA
- 40** *Development of a field-deployable optical frequency-domain reflectometer based on frequency-modulated continuous-wave lidar*
Mischa Gregory, Zachery Lakin, Krishna Rupavatharam
Spectrum Lab, Montana State University, Bozeman, MT, USA
- 41** *Exploration of lidar-enhanced sensing for autonomous UAS navigation in GNSS-denied environments.*
Owen Naberhaus,¹ Zachery Lakin,¹ Krishna Rupavatharam¹
Spectrum Lab, Montana State University, Bozeman, MT, USA

- 42** *Compositionally tuned thulium-doped mixed garnets for quantum signal processing applications*
Owen Wolfe, Joshua Dugre, Krishna Rupavatharam
Spectrum Lab, Montana State University, Bozeman, MT, USA
- 43** *Multichannel polarization-entangled photon distribution in a hybrid quantum-classical network*
Nathan Kuehl, Joshua Dugre, Ector Ayala, R. Krishna Mohan
Spectrum Lab, Montana State University, Bozeman, MT, USA
- 44** *Building integrated photonics capabilities at MSU*
Corey Pearson,¹ Parvinder Gill,² Andrew Lingley,² Krishna Rupavatharam,¹ Riley Logan,² Paul Nugent,³ Shilan Felehgari,³ Joseph Shaw²
¹Spectrum Lab, Montana State University, Bozeman, MT, USA
²Electrical and Computer Engineering Department, Montana State University, Bozeman, MT, USA
³Department of Land Resources and Environmental Sciences, Montana State University, Bozeman, MT, USA
- 45** *Micro-scale 3D-printed light coupling elements for photonic integrated circuits*
Zachary Rice, Corey Pearson, Dennis Dempsey, Krishna Rupavatharam
Spectrum Lab, Montana State University, Bozeman, MT, USA
- 46** *Aberration correction of an FSO system with 3D-printed fiber tip phase masks*
Thomas Ferrell, Trent Jackson, Krishna Rupavatharam
Spectrum Lab, Montana State University, Bozeman, MT, USA
- 47** *Design, fabrication, and characterization of fiber tip optics for beam steering*
Stetson Stocks,² Matthew Watson,³ Chris Zacher,³ Katerina Shabalin,¹ Krishna Rupavatharam,¹.
¹Spectrum Lab, Montana State University, Bozeman, MT, USA
²Bozeman High School, Bozeman, MT, USA
³Gallatin High School, Bozeman, MT, USA

- 48** *Design and simulation of a silicon nitride ring-resonator sensor for cortisol detection*
Matthew Treaster,¹ Isabelle Rogers,² Joseph Shaw,³ Riley Logan,³ Parvinder Gill³
¹Materials Science and Engineering Program, Montana State University, Bozeman, MT, USA
²Department of Physics, Montana State University, Bozeman, MT, USA
³Electrical and Computer Engineering Department, Montana State University, Bozeman, MT, USA
- 49** *Auger depth profiling of nanoscale multilayers for deep-ultraviolet optical filters*
Phillip Tran,¹ Owen Saltzman,¹ Bret Davis,² Wataru Nakagawa¹
¹Electrical and Computer Engineering Department, Montana State University, Bozeman, MT, USA
²Imaging and Chemical Analysis Laboratory, Montana State University, Bozeman, MT, USA
- 50** *Development and validation of an ellipsometry fitting method for characterizing protein surface layers on silicon nitride*
Isabelle Rogers,¹ Joshua Heinemann,² Matthew Treaster,³ Joseph Shaw,² Riley Logan,² Parvinder K. Gill²
¹Department of Physics, Montana State University, Bozeman, MT, USA
²Electrical and Computer Engineering Department, Montana State University, Bozeman, MT, USA
³Materials Science and Engineering Program, Montana State University, Bozeman, MT, USA