

MEREDITH K. KUPINSKI, Ph.D.

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Education:

2003-2008	Ph.D.	Optical Sciences, University of Arizona, Tucson, AZ “Estimating Signal Features from Noisy Images with Stochastic Backgrounds for Tomographic Nuclear Medicine” Advisor: Harrison Barrett, UA Regents Professor
2001-2003	M.S.	Optical Sciences, University of Arizona, Tucson, AZ
1998-2001	B.S.	Imaging and Photographic Technologies with Highest Honors Rochester Institute of Technology, Rochester, NY

Employment:

2022- Present	Associate Professor, Assistant Professor (2022-24) Wyant College of Optical Sciences, University of Arizona, Tucson, AZ
2010-2022	Full/Associate/Assistant Research Professor, Wyant College of Optical Sciences, University of Arizona, Tucson, AZ
2008-2010	Director of Education, Center for Integrated Access Networks National Science Foundation (NSF) Engineering Research Center University of Arizona, Tucson, AZ
2002-2008	Graduate Research Assistant, Center for Gamma-Ray Imaging, College of Optical Sciences, University of Arizona, Tucson, AZ
1999-2001	Image Quality Engineer, Eastman Kodak Company Rochester, NY

Honors and Awards:

- 2022 University of Arizona “Women of Impact” ([link](#))
Awarded by home institution to 30 female faculty from 400 nominees.
- 2017 Jean d’Alembert Visiting Scholar for “Binary Classification of Polarimetric Images for Cervical Cancer detection.”
Awarded by the French government to 3 applicants per year.
- 2013 NSF Fellow Science, Engineering and Education for Sustainability (SEES)
Supported crossing traditional disciplinary boundaries and allow early-career scientists to investigate topics beyond their core disciplinary expertise.
- 2010 Women in Science and Engineering (WiSE) Mentoring Award
Nominated by UA students to honor outstanding contributions to promoting the success of women in science and engineering.

- 2007 UA Foundation Outstanding Graduate Teaching Assistant
Based on a faculty nomination for assisting in new course development.
- 2006 Proposition 301 Imaging UA Fellowship
Awarded annually to select graduate students specializing in imaging.
- 2004 Rolyn Optics Graduate Teaching Assistant Award
Winners were chosen by student evaluations and faculty recommendations.
- 2002 MaryJo Lake Graduate Fellowship
Awarded to one incoming female graduate student each year.

Service/Outreach:

- 2009-Present Faculty advisor for Women in Optics (WiO) student group
- 2021-Present UA Wyant College of Optical Sciences Admissions Committee
- 2021-Present SPIE Conference Co-chair: Measurement, Analysis, and Remote Sensing, Optics and Photonics
- 2021-Present SPIE Conference Co-chair: Polarization Science and Remote Sensing, Defense and Commercial Sensing
- 2021 - 2022 Developed and Taught Winter School Polarization Demonstration

Publications, Peer-reviewed:

1. DeLeon CM, **Kupinski M.K.**, "*Ground-based ultraviolet polarimetry for imaging the Babinet polarization neutral point.*" Optical Review (accepted)
2. Seigo M., Fukui H., Kawano S., **Kupinski M.K.**, "*Inhomogeneous Birefringence Analysis Using a Tensor-Valued Backprojection.*" Optical Review (accepted)
3. McKenna L, **Kupinski M.K.**, "*Resolving Shape from Polarization Ambiguities.*" IEEE Trans. Image Processing, (submitted)
4. Jarecki Q, **Kupinski M.K.**, "*Sampling optimization and compact tabulation of isotropic polarized scattering,*" Opt. Express 32, 31683-31698 (2024)
5. Jarecki Q, **Kupinski M.K.**, "*Optimizing near-infrared polariscopic imaging for the living human eye,*" Opt. Express 32, 18113-18126 (2024)
6. Jarecki Q, **Kupinski M.K.**, "*Polarized representation for depolarization-dominant materials,*" Opt. Express 32, 8262-8283 (2024)

7. DeLeon CM, Kalashnikova O, Garay M, **Kupinski M.K.**, “GRASP Aerosol Retrievals from AirMSPI”, JQSRT Special issue “*Advancement of POLarimetric Observations: instruments, calibration, and improved aerosol, hydrosol and cloud retrievals*” 317, (2024)
8. Shanks K, John J, Wu D, **Kupinski M.K.**, “*High-altitude demonstration of LWIR polarimeter using uncooled microbolometers*”, JQSRT Special issue “*Advancement of POLarimetric Observations: instruments, calibration, and improved aerosol, hydrosol and cloud retrievals*” 315, (2024)
9. Jarecki Q, **Kupinski M.K.**, “*Underdetermined Polarimetric Measurements for Mueller Extrapolations*”, Opt Eng Vol. 61, Issue 12, 123104 (2022)
10. Omer K, **Kupinski M.K.**, “*Compression, Interpolation, and Importance Sampling for Polarized BRDF Models.*” Opt. Express 30, 25734-25752 (2022).
11. Clarkson E, **Kupinski M.K.** “*Effect on null spaces of list-mode imaging systems due to increasing the number of attributes*” JOSA A 39(5), 387-394 (2022).
12. Li L, **Kupinski M.K.** “*Merit functions and measurement schemes for single parameter depolarization models*” Opt. Express 29, 18382-18407 (2021).
13. Clarkson E, and **Kupinski M.K.** “*Effect on null spaces of list-mode imaging systems due to increasing the size of attribute space*” JOSA A 38(8) (2021).
14. E Clarkson and **Kupinski M.K.**, “*Quantifying the loss of information from binning list-mode data,*” J. Opt. Soc. Am. A 37, 450-457 (2020).
15. Omer K, Caucci L, **Kupinski M.K.**, “*Limitations of CNNs for Approximating the Ideal Observer Despite Quantity of Training Data or Depth of Network.*” J of Imag. Sci. and Tech 06; 64(6):60408 (2020).
16. **Kupinski M.K.**, Li L, “*Evaluating the Utility of Mueller Matrix Imaging for Diffuse Material Classification.*” J of Imag. Sci. and Tech. 64(6):60409 (2020).
17. Hart, K.A., **Kupinski, M.K.**, Wu, D.L. and Chipman, R., “*First results from a Uncooled LWIR Polarimeter for CubeSat Deployment*” Opt. Eng. 59(7) (2020).
18. Zhan, H., Voelz, D.G. and **Kupinski, M.K.**, “*Parameter-based imaging from passive multispectral polarimetric measurements.*” Optics Express, 27(20) (2019).
19. Bradley, C.L., Diner, D.J., Xu, F., **M.K. Kupinski** and Chipman, R.A., “*Spectral Invariance Hypothesis Study of Polarized Reflectance With the Ground-Based Multiangle SpectroPolarimetric Imager.*” IEEE Trans Geosci Remote Sens, 57(10) (2019).
20. **Kupinski, M.K.**, Bradley, C. L., Diner, D. J., Xu, F., & Chipman, R. A. “*Angle of linear polarization images of outdoor scenes.*” Opt Eng, 58(8) (2019).
21. **Kupinski, M.K.**, Bradley, C., Diner, D., Xu, F., & Chipman, R. “*Estimating surface orientation from microfacet Mueller matrix bidirectional reflectance distribution function models in outdoor passive imaging polarimetry.*” Opt Eng, 58(8) (2019).

22. **Kupinski, M.K.**, Boffety, M., Goudail, F., Ossikovski, R., Pierangelo, A., Rehbinder, J., Vizet, J. and Novikova, T., "*Polarimetric measurement utility for pre-cancer detection from uterine cervix specimens.*" Biomed. Opt. Exp, 9(11) (2018).
23. **Kupinski, M.K.**, Bankhead, J., Stohn, A., and Chipman, R. "*Binary classification of Mueller matrix images from an optimization of Poincaré coordinates.*" JOSA A, 34(6) (2017).
24. **Kupinski, M.K.**, and E. Clarkson. "*Optimal channels for channelized quadratic estimators*" JOSA A, 33(6) (2016).
25. A. Könik, **Kupinski, M.K.**, P. H. Pretorius, M. A. King, and H. H. Barrett. "*Comparison of the Scanning Linear Estimator (SLE) and ROI Uptake Estimation for Quantitative SPECT Imaging,*" Phy. in Med. and Bio. 60(16) (2015).
26. **Kupinski, M.K.**, and E. Clarkson. "*Method for optimizing channelized quadratic observers for binary classification of large-dimensional image datasets,*" JOSA A 32 (2015).
27. **Kupinski, M.K.**, R Chipman, and E Clarkson; "*Relating the statistics of the angle of linear polarization to measurement uncertainty of the Stokes vector,*" Opt Eng 53(11), 113108 (2014).
28. **Kupinski, M.K.**, E. Clarkson, and H. H. Barrett. "*Scanning linear estimation: improvements over region of interest (ROI) methods,*" Physics in Medicine and Biology 58, 1–19 (2013)
29. **Whitaker (Kupinski) M.**, E. Clarkson, and H. H. Barrett. "*Performance of linear and scanning-linear for signal location, size, and amplitude from noisy images with nuisance parameters*", Opt Express 16 (11) (2008).
30. H. H. Barrett, L. Furenlid, M. Freed, J. Hesterman, M. Kupinski, E. Clarkson, **M. Whitaker (Kupinski)**, "*Adaptive SPECT*", IEEE Trans on Med Imaging 27 (2008)
31. M.B. Abbott, Y.A. DeClerk, Y-C. Chen, L. Furenlid, D. Wilson, G. Stevenson, **M. Whitaker (Kupinski)**, J. Woolfenden, R.A. Moats, and H. Barrett. "*100-micron resolution SPECT imaging of a neuroblastoma tumor model,*" Molecular Imaging 5, 214 (2007).

Conference Proceedings (Other Scholarship):

1. DeLeon C., Long Y., **Kupinski M.K.**, "*Measurement Campaign for Tracking the Babinet Neutral Point Under Varying Atmospheric Conditions,*" Proc. SPIE, Polarization: Measurement, Analysis, and Remote Sensing XVII, (accepted, Aug 2025);
2. John J., Parkinson J., Gong J., Wu D., **Kupinski M.K.**, "*Cloud Top Observations of LWIR Spectro-Polarimetry,*" Proc. SPIE, Polarization: Measurement, Analysis, and Remote Sensing XVII, (accepted, Aug 2025);
3. Spitzer E., Anche R., Rubin N., Sullivan S., Wu D., **Kupinski M.K.**, "*Channeled Infrared Polarimeter (CHIRP) Performance Simulation,*" Proc. SPIE, Polarization: Measurement, Analysis, and Remote Sensing XVII, (accepted, Aug 2025);
4. McKenna L., **Kupinski M.K.**, "*Tolerancing Noise and Uncertainty in Shape-from-Polarization for Ambiguity Resolution,*" Proc. SPIE, Polarization: Measurement, Analysis, and Remote Sensing XVII, (accepted, Aug 2025);

5. Rosenbluth J., McCafferty S., **Kupinski M.K.**, "*Ex vivo Recreation of Haidinger's Brush*," Proc. SPIE, Polarization: Measurement, Analysis, and Remote Sensing XVII, (accepted, Aug 2025);
6. Tribble C., Kupinski M.A., **Kupinski M.K.**, "*Near Real-Time Polarization Rendering with a Triple Degeneracy pBRDF Model*," Proc. SPIE, Polarization: Measurement, Analysis, and Remote Sensing XVII, (accepted, Aug 2025);
7. Seigo M., Fukui H., Kawano S., **Kupinski M.K.**, "*Inhomogeneous Birefringence Analysis Using a Tensor-Valued Backprojection*." Proc. SPIE, Polarization: Measurement, Analysis, and Remote Sensing XVII, (accepted, Aug 2025);
8. **Kupinski M.K.**, Jarecki Q. "Observing Spatially-Varying Elliptical Retardance in the Living Human Eye," Optica Imaging Congress, (July 2024);
9. Seigo M., Fukui H., Kawano S., **Kupinski M.K.**, "Developing a Reconstruction Algorithm Using a Pseudo-inverse Operator for 3D Birefringence from Tomographic Polarimetry," Int. Conference on Optics-Photonics Design and Fabrication, (June 2024).
10. DeLeon C., **Kupinski M.K.**, "*Development of a Sun-Tracking Linear Stokes Imaging Polarimeter*," Int. Conference on Optics-Photonics Design and Fabrication, (June 2024).
11. Parkinson J., **Kupinski M.K.**, "*Design of compact thermal IR polarization calibration target using polarized emission from thin wires*," Proc. SPIE, Polarization: Measurement, Analysis, and Remote Sensing XVI, (April 2024);
12. Jarecki Q., Omer K., Tai, A., **Kupinski M.K.**, "*Full Mueller matrix imaging of human corneal birefringence*," Proc. SPIE, Polarization: Measurement, Analysis, and Remote Sensing XVI, (April 2024);
13. McKenna L., Jarecki Q., **Kupinski M.K.**, "*Disambiguation of surface normals using single-view Mueller shape-from-polarization*," Proc. SPIE, Polarization: Measurement, Analysis, and Remote Sensing XVI, (April 2024);
14. Gartman M., **Kupinski M.K.**, "*Dispersion of the birefringence of quartz, magnesium fluoride, and sapphire in the ultraviolet through near infrared*", Proc. SPIE, Polarization: Measurement, Analysis, and Remote Sensing XVI, (April 2024);
15. Jarecki Q., **Kupinski M.K.**, "*Analytic Shape from Polarization for Depolarization-Dominated Objects*," Proc. SPIE, Polarization: Measurement, Analysis, and Remote Sensing XVI, (Aug 2023);
16. John J., **Kupinski M.K.**, "*Spectral LWIR polarimetry of Ice and Water*," Proc. SPIE PC12690, Polarization Science and Remote Sensing XI, (Aug 2023);
17. Siego M., **Kupinski M.K.**, "*Developing a Reconstruction Algorithm for 3-D Birefringence from Tomographic Polarimetry*," Proc. SPIE PC12690, Polarization Science and Remote Sensing XI, (Aug 2023);
18. DeLeon C., **Kupinski M.K.**, "*Aerosol Retrievals from an Ultraviolet Stokes Imaging Polarimeter (ULTRASIP)*," Proc. SPIE PC12690, Polarization Science and Remote Sensing XI, (Aug 2023);

19. Parkinson J., Grievenkamp, J., Vukobratovich, D., **Kupinski M.K.**, "*Mueller Polarimetry for Quantifying the Stress Optic Coefficient in the Infrared*," Proc. SPIE PC12690, Polarization Science and Remote Sensing XI, (Aug 2023);
20. Omer K., Jarecki Q., Forschner, S., **Kupinski M.K.**, "*A Validation of Measured pBRDFs from Physics-Based Renderings and Mueller Imaging*," Proc. SPIE PC12690, Polarization Science and Remote Sensing XI, (Aug 2023);
21. DeLeon C., Kalashnikova O., Garay M., Espinosa R., Meredith K. **Kupinski**, "*Optical Properties of Smoke Aging from AirMSPI FIREX-AQ*," A26E-04 presented at 2022 Fall Meeting, AGU, Dec 2022.
22. John J., Parkinson J., Dong Liang Wu, Meredith K. **Kupinski**, "*Aircraft Deployment of LWIR Polarimeter for Clouds Observations*," A53C-07 presented at 2022 Fall Meeting, AGU, (Dec 2022).
23. Shanks, K.A, Chipman, R. John, J. Parkinson, J. Wu, D. **Kupinski M.K.**, "*Near space demonstration of a compact LWIR spectro-polarimeter for ice cloud measurements*," Proc. SPIE 12112, Polarization: Measurement, Analysis, and Remote Sensing XV, 121120L (June 2022);
24. Omer K., **Kupinski M.K.**, "*Physics-based rendering: simulated Mueller matrix imaging*," Proc. SPIE 12112, Polarization: Measurement, Analysis, and Remote Sensing XV, 121120F (June 2022);
25. Jarecki Q., **Kupinski M.K.**, "*Extrapolating Mueller matrices from linear Stokes images*," Proc. SPIE 12112, Polarization: Measurement, Analysis, and Remote Sensing XV, 121120D (June 2022);
26. Hart Shanks K., Chipman R., Wu D., **Kupinski M.K.**, "*Stokes resolved differential temperature: an important metric of polarimetric precision in the long-wave infrared*," Proc. SPIE 11833, Polarization Science and Remote Sensing X, (2021).
27. DeLeon C M., Heath J., Espinosa W.R., Wu D., **Kupinski, M.K.** "*UV linear stokes imaging of optically thin clouds*," Proc. SPIE 11833, Polarization Science and Remote Sensing X, (2021).
28. Omer K., Chipman, R., and **Kupinski, M.K.**, "*Detection enhancement using linear Stokes images on pre-trained neural networks*" Proc. SPIE Polarization: Measurement, Analysis, and Remote Sensing XIV (2020).
29. Li L., **Kupinski, M.K.**, and Chipman, R., "*Effects of Surface Roughness and Albedo on Depolarization in Mueller Matrices*" Proc. SPIE Polarization: Measurement, Analysis, and Remote Sensing XIV (2020).
30. Hart, K.A., **Kupinski, M.K.**, Wu, D.L. and Chipman, R., "*Linear Stokes measurement of thermal targets using compact LWIR spectropolarimeter*" Proc. SPIE Polarization: Measurement, Analysis, and Remote Sensing XIV (2020).
31. Omer K., Caucci, L., and **Kupinski, M.K.**, "*Comparing training variability of CNN and optimal linear data reduction on image textures.*" In IS&T International Symposium on Electronic Imaging, Computational Imaging Vol. 18.

32. Li, L. W., **Kupinski, M.K.**, Brown, M., & Chipman, R. A. "*Comparing classification performance of mueller matrix parameters for diffuse materials.*" In IS&T International Symposium on Electronic Imaging, Computational Imaging Vol. 18.
33. J. B. Breckinridge, J. E. Harvey, R. Irvin, R. Chipman, **Kupinski, M.K.**, J. Davis, D-W. Kim, E. Douglas, C. F. Lillie, T. Hull, "*ExoPlanet Optics: conceptual design processes for stealth telescopes,*" Proc. SPIE 11115, UV/Optical/IR Space Telescopes and Instruments: Innovative Technologies and Concepts IX, 111150H (Sept 2019).
34. Hart, K.A., De Amici, G., Horne, T., **Kupinski, M.K.**, Langworthy, K., Stohn, A., Wu, D.L. and Chipman, R., "*Demonstration of LWIR channeled spectro-polarimeter.*" In Polarization Science and Remote Sensing IX (Vol. 11132, p. 1113207). International Society for Optics and Photonics (Sept 2019).
35. Richter, J.M., Chipman, R., Daugherty, B., Diner, D.J., Eldering, A., Hyon, J.J., **Kupinski, M.K.**, Neu, J.L. and Fu, D., 2019. "*Specifying polarimetric tolerances of a high-resolution imaging multiple-species atmospheric profiler (HiMAP).*" In Photonic Inst Eng VI (10925). International Society for Optics and Photonics.
36. Davis, J., **Kupinski, M.K.**, Chipman, R.A. and Breckinridge, J.B., 2018. "*HabEx polarization ray trace and aberration analysis.*" In Space Telescopes and Instrumentation 2018: Optical, Infrared, and Millimeter Wave (Vol. 10698). International Society for Optics and Photonics.
37. **Kupinski, M.K.**, J. Reh binder, H. Haddad, S. Deby, J. Vizet, B. Teig, A. Nazac, A. Pierangelo, F. Moreau, and T. Novikova, "*Tasked-based quantification of measurement utility for ex vivo multi-spectral Mueller polarimetry of the uterine cervix,*" in Clinical and Preclinical Optical Diagnostics, J. Brown, ed., Vol. 10411 of SPIE Proceedings (OSA, 2017), paper 104110N.
38. Vanderbilt, V., Daughtry, C., **Kupinski, M.K.**, Bradley, C., French, A., Bronson, K., Chipman, R. and Dahlgren, R., 2017, August. "*Estimating the relative water content of leaves in a cotton canopy.*" In Polarization Science and Remote Sensing VIII (Vol. 10407, p. 104070Z). International Society for Optics and Photonics.
39. **Kupinski, M.K.**, Chipman, R. A., "*Power Spectra Trends in Imaging Polarimetry of Outdoor Solar Illuminated Scenes,*" Proc. SPIE Polarization: Measurement, Analysis, and Remote Sensing XII (2016).
40. **Kupinski, M.K.**, Clarkson, E., Ghaly, M. & Frey, E., "*Applying the J-Optimal Channelized Quadratic Observer to a SPECT Phantom for Myocardial Perfusion Defect Detection*" Medical Imaging: Image Perception, Observer Performance, and Technology Assessment. SPIE, Vol. 9787. 978708 (2016).
41. **Kupinski, M.K.**, Bradley, C. L., Diner, D. J., Xu, F., and Chipman, R. A., "*Estimating Surface Orientation in Imaging Polarimetry of Solar Illuminated Outdoor Scenes,*" Proc. American Geophysical Union (AGU) Fall Meeting (2015).
42. Bradley, C. L., **Kupinski, M.K.**, Diner, D. J., Xu, F., and Chipman, R. A., "*Polarization Ray Tracing Calculation of Polarized Bidirectional Reflectance Distribution Function*

- (pBRDF) of Microfaceted Surfaces to Investigate Multiple Reflection Effects,*” Proc. American Geophysical Union (AGU) Fall Meeting (2015).
43. Diner D., Bradley C., Bull M., Chipman R., Davis A., Garay M., Jovanovic V., Kalashnikova O., **Kupinski M.K.**, Rheingans B., Seidel F., van Harten G., and Xu F., “*Progress in Photoelastic Modulator-Based Spectropolarimetric Imaging of Aerosols and Clouds,*” Proc. Am Geophysical Union (AGU) Fall Meeting (2015).
 44. Vanderbilt V., Daughtry C., **Kupinski M.K.**, Bradley C., Dahlgren R., “*Coming of Age: Polarization as a Probe of Plant Canopy Water Status,*” Proc. American Geophysical Union (AGU) Fall Meeting (2015).
 45. **Kupinski, M.K.**, Bradley, C. L., Diner, D. J., Xu, F., and Chipman, R. A., “*Applying a Microfacet Model to Polarized Light Scattering Measurements of the Earths Surface,*” Proc. SPIE Polarization Science and Remote Sensing VII (9613) (2015).
 46. Bradley, C. L., **Kupinski, M.K.**, Diner, D. J., Xu, F., and Chipman, R. A., “*Spectral invariance hypothesis study of polarized reflectance with Ground-based Multiangle Spectro Polarimetric Imager (GroundMSPI),*” Proc. SPIE Polarization Science and Remote Sensing VII (9613) (2015).

Patents (Other Scholarship):

- 2024 Liquid Phase Discrimination Using Polarimetry (pending)
- 2021 Incoherent Addition to Generalize Depolarization in Light Scattering Models (pending)
- 2021 Method for Determining Fractional Contribution by Fresnel Reflection Using Two Measurements (pending)

Scholarly Presentations:

1. “Tracking the Sky’s Neutral Point Positions for Atmospheric Turbidity,” Montana State University Colloquium, February (2025).
2. “Selection for NASA Instrument Incubator Program: CHanneled Infrared Polarimeter”, University of Arizona Industrial Affiliates Keynote, October (2024).
3. “Analytic Shape from Polarization for Depolarization Dominant Objects,” Optica Imaging Congress, Boston, August (2023). Invited Talk.
4. “Instrument Design for Radiative Atmospheric Processes,” University of Rochester Colloquium, October (2022). Invited Talk.
5. “Deployment of Prototype Instruments for Observing Earth’s Atmosphere,” American Indian Science and Engineering Society (AISES), Palm Springs, CA (2022).
6. “First High-Altitude LWIR of Measurement of Cloud Top Polarization,” Gordon Conference on Emerging Imaging Techniques at the Intersection of Physics and Data Science, Newry, ME, (2022). Invited Talk.
7. “Polarization in Nature,” Guest Lecture for University of Rochester (2022). Invited Talk.