Roarke Horstmeyer

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Biomedical Engineering Department
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EDUCATION

Doctorate, Electrical Engineering Department
California Institute of Technology, Pasadena, CA — June 2016
THESIS - Computational microscopy: turning megapixels into gigapixels
ADVISOR - Dr. Changhuei Yang

Master of Science, MIT Media Lab
Massachusetts Institute of Technology, Cambridge, MA — August 2011
THESIS - Towards a unified treatment of 3D display using partially coherent light
ADVISOR - Dr. Ramesh Raskar

Bachelor of Science, Physics, Japanese (second major)
Duke University, Durham, NC — December 2006

PROFESSIONAL EXPERIENCE

Duke University Biomedical Engineering Department, Durham, NC — July 2018 – Current
Assistant Professor
- Leading the Computational Optics Lab at Duke University
- Secondary appointment in Electrical and Computer Engineering department
- Pursuing research in computational microscopy, machine learning and imaging, Fourier ptychography, and non-invasive imaging with diffuse correlation spectroscopy

Ramona Optics Inc., Durham, NC — March 2018 – Current
Co-founder and Scientific Director
- Co-founder of growing start-up that develops microscope hardware and machine learning software for biomedical imaging applications

MIRA Inc., New York, NY — Jan 2018 – Current
Co-founder and Scientific Director
- Co-founder of start-up applying optical technology for artwork authentication

Kernel Inc., Venice, CA — Jan 2018 – June 2018
Interim CTO
- Acted as Interim CTO for late-stage start-up performing high-risk research and development
- Advised a team of 15 scientists developing a device for non-invasive detection of brain activity

Univ. of Erlangen School of Advanced Optical Technologies, Erlangen, Germany — 2018 – 2023
Guest Professor and Young Researcher Awardee
- Led research projects related to computational imaging

- Collaborated with several research groups, lectured on optics, microscopy, optical scattering

Bioimaging and Neurophotonics Lab, Berlin, Germany March 2016 – Dec 2017
Einstein International Postdoctoral Fellow
- Worked with Prof. Benjamin Judkewitz to apply digital optical phase conjugation in neuroscience
- Fully-funded Einstein Fellow at Charité Medical School and Humboldt University of Berlin

Nanotronics Imaging, Hollister, CA Nov 2015 – March 2016
Technical Consultant
- Developed a new computational microscope for semiconductor wafer inspection

California Institute of Technology, Pasadena, CA Aug 2011 – Nov 2015
Graduate research assistant, Electrical Engineering Department
- Research towards PhD degree on computational imaging, super-resolution microscopy and biophotonics

Massachusetts Institute of Technology, Cambridge, MA Aug 2009 – Aug 2011
Graduate research assistant, MIT Media Lab
- Research towards Masters degree on computational imaging, computer vision and optimization

The MITRE Corporation, Mclean, VA Nov 2007 – Aug 2009
Emerging Technologies Department
- Multi-discipline engineer, performed experimental research on unconventional optical techniques with Dr. Ravi Athale. Main topics included light fields, coded apertures, and computational imaging
- Other research: chip-to-chip interconnects, silicon waveguides, compressive imaging, phase-space optics

PEER-REVIEWED PAPERS

1. A. Mühlberg, P. Ritter, S. Langer, C. Goossens, S. Nübler, D. Schneidereit, O. Taubmann, F. Denzinger, D. Nörenberg, M. Haug, S. Schürmann, R. Horstmeyer, A Maier, W. Goldmann, O Friedrich and L. Kreiss, "SEMPAI: a Self-Enhancing Multi-Photon Artificial Intelligence for Prior-Informed Assessment of Muscle Function and Pathology," Advanced Science 10(28), 2206319 (2023).
2. Liheng Bian, Haoze Song, Lintao Peng, Xuyang Chang, Xi Yang, Roarke Horstmeyer, Lin Ye, Chunli Zhu, Tong Qin, Dezhi Zheng, Jun Zhang, "High-resolution single-photon imaging with physics-informed deep learning," Nature Communications 14, 5902 (2023).
3. K. C. Zhou, M. Harfouche, C. L. Cooke, J. Park, P. C. Konda, L. Kreiss, K. Kim, J. Jonsson, T. Doman, P. Reamey, V. Saliu, C. B. Cook, M. Zheng, J. P. Bechtel, A. Begue, M. McCarroll, J. Bagwell, G. Horstmeyer, M. Bagnat and R. Horstmeyer, "Parallelized computational 3D video microscopy of freely moving organisms at multiple gigapixels per second," Nature Photonics 17, 442-450 (2023).
4. M. Harfouche, K. Kim, P. C. Konda, S. Sharma, E. E. Thomson, K. C. Zhou, C. Cooke, S. Xu, X. Yang, X. Yao, V. Pathak, R. Appel. C. Cooke, J. Doman, G. Horstmeyer, J. Park, P. Reamey, V. Saliu, E. Naumann and R. Horstmeyer , "Multi-scale gigapixel microscopy using a multi-camera array microscope," Optica 10(4), 471-480 (2023).
5. X. Yang, M. Harfouche, K. C. Zhou, L. Kreiss, S. Xu, K. Kim, R. Horstmeyer, "Multimodal imaging using a cascaded microscope design," Optics Letters 4 8 (7), 1658-1661 (2023).
6. E. E. Thomson, M. Harfouche, P. C Konda, C. Seitz, K. Kim, C. Cooke, S. Xu, R. Blazing, Y. Chen, W. S. Jacobs, S. Sharma, T. W. Dunn, J. Park, R. Horstmeyer* and E. A. Naumann*, "Gigapixel imaging with a novel multi-camera array microscope," eLife 11, e74988 (2023) (*co-corresponding authors).
7. C. L. Cooke, K. Kim, S. Xu, A. Chaware, X. Yao, X. Yang, J. Neff, P. Pittman, C. McCall, C. Glass, X. S. Jiang and R. Horstmeyer, "A multiple instance learning approach for detecting COVID-19 in peripheral blood smears," PLOS Digital Health 1(8), e0000078 (2022).

8. T. Aidukas, F. Wechsler, L. Loetgering, K. C. Zhou, R. Horstmeyer, "Applications and Extensions of Fourier Ptychography," Microscopy Today 30 (6), 40-45 (2022).
9. L. Loetgering, T. Aidukas, K. C. Zhou, F. Wechsler, R. Horstmeyer, "Fourier Ptychography Part II: Phase Retrieval and High-Resolution Image Formation," Microscopy Today 30 (5), 36-39 (2022).
10. K. C. Zhou, T. Aidukas, L. Loetgering, F. Wechsler, R. Horstmeyer, "Introduction to Fourier Ptychography: Part I," Microscopy Today 30 (3), 36-41 (2022).
11. H. Ayaz et al., "Optical imaging and spectroscopy for the study of the human brain: status report," Neurophotonics 9(S2), S24001 (2022).
12. X. Dai, S. Xu, X. Yang, K. C. Zhou, C. Glass, P. C. Konda and R. Horstmeyer, "Quantitative Jones matrix imaging using vectorial Fourier ptychography," Biomedical Optics Express 13(3), 1457-1470 (2022).
13. X. Yao, V. Pathak, H. Xi, A. Chaware, C. Cooke, K. Kim, S. Xu, Y. Li, T. Dunn, P. C. Konda, K. C. Zhou, R. Horstmeyer, "Increasing a microscope's effective field of view via overlapped imaging and machine learning," Optics Express 30(2), 1745-1761 (2022).
14. S. Xu, X. Yang, W. Liu, J. Jonsson, R. Qian, P. C. Konda, K. C Zhou, Q. Dai, H. Wang, E. Berrocal and R. Horstmeyer, "Imaging dynamics beneath turbid media via parallelized single-photon detection," Advanced Science 9(24), 2201885 (2022).
15. X. Yang, P. C. Konda, S. Xu, L. Bian and R. Horstmeyer, "Quantized Fourier ptychography with binary images from SPAD cameras," Photonics Research **9**, 1958–1969 (2021).
16. C.L. Cooke, F. Kong, A. Chaware, K.C. Zhou, K. Kim, R. Xu, D.M. Ando and R. Horstmeyer, "Physics-enhanced machine learning for virtual fluorescence microscopy," International Conference on Computer Vision ICCV 2021 (2021).
17. W. Liu, R. Qian, S. Xu, P. C. Konda, M. Harfouche, D. Borycki, J. Jonsson, E. Berrocal, C. L. Cooke, H. Wang, Q. Dai and R. Horstmeyer, "Fast and sensitive diffuse correlation spectroscopy with highly parallelized single photon detection," APL Photonics **6**, 026106 (2021).
18. C.M. Fontes, B.D. Lipes, J. Liu, K.N. Agans, A. Yan, P. Shi, D.F. Cruz, G. Kelly, K.M. Luginbuhl, D.Y. Joh, S.L. Foster, J. Heggestad, A. Hucknall, M.H. Mikkelsen, C.F. Pieper, R.W. Horstmeyer, T.W. Geisbert, M.D. Gunn and A. Chilkoti, "Ultrasensitive point-of-care immunoassay for secreted glycoprotein detects Ebola infection earlier than PCR," Sci. Trans. Med. **13**, 588 (2021).
19. K. C. Zhou, C. Cooke, J. Park, R. Qian, R. Horstmeyer, J.A. Izatt and S. Farsiu, "Mesoscopic photogrammetry with an unstabilized phone camera," Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 7535–7545 (2021).
20. T. Vu, A. DiSpirito,D. Li, Z. Wang, X. Zhu, M. Chen, L. Jiang, D. Zhang, J. Luo, Y. Zhang, Q. Zhou, R. Horstmeyer and J. Yao, "Deep image prior for undersampling high-speed photoacoustic microscopy," Photoacoustics **22**, 100266 (2021).
21. A. DiSpirito, D. Li, T. Vu, M. Chen, D. Zhang, J. Luo, R. Horstmeyer and J. Yao, "Reconstructing undersampled photoacoustic microscopy images using deep learning," IEEE Trans. Med. Imaging **40**, 562–570 (2020).
22. K. Kim, P. C. Konda, C. L. Cook, R. Appel and R. Horstmeyer, "Multi-element microscope optimization by a learned sensing network with composite physical layers," Optics Letters **45**, 5684–5687 (2020).
23. P. C. Konda, L. Loetgering, K. C. Zhou, S. Xu, A. R. Harvey and R. Horstmeyer, "Fourier ptychography: current applications and future promises," Optics Express **28**(7), 9603–9630 (2020).
24. K. C. Zhou and R. Horstmeyer, "Diffraction tomography with a deep image prior," Opt. Express **28**(9), 12872–12896 (2020).
25. A. Chaware, C.L. Cooke, K. Kim and R. Horstmeyer, "Towards an Intelligent Microscope: adaptively learned illumination for optimal sample classification," ICASSP 2020 (2020).

26. L. Loetgering, M. Baluktsian, K. Keskinbora, R. Horstmeyer, T. Wilhein, G. Schutz, K. Eikema and S. Witte, "Generation and characterization of focused helical x-ray beams," Science Advances **6**(7), eaax8836 (2020).
27. A. Muthumbi, A. Chaware, K. Kim, K. C. Zhou, P. C. Konda, B. Judkewitz, A. Erdmann, B. Kappes and R. Horstmeyer, "Learned sensing: jointly optimized microscope hardware for accurate image classification," Biomed. Opt. Express **10**(12), 6351-6369 (2019).
28. P. del Hougne, M. F. Imani, A. V. Diebold, R. Horstmeyer and D. R. Smith, "Learned Integrated Sensing Pipeline: Reconfigurable Metasurface Transceivers as Trainable Physical Layer in an Artificial Neural Networkng," Advanced Science 1901913 (2019).
29. R. Horstmeyer, R. Y. Chen, B. Kappes and B. Judkewitz, "Convolutional neural networks that teach microscopes how to image," arXiv:1709.07223 (2018).
30. M. Kadobianskyi, I. N. Papadopoulos, T. Chaigne, R. Horstmeyer, B. Judkewitz, "Scattering correlations of time-gated light," Optica **5**, 389–394 (2018).
31. G. Osnabrugge*, R. Horstmeyer*, I. Papadopoulos, B. Judkewitz and I. M. Vellekoop, "The generalized optical memory effect," Optica **4** 886–892 (2017) (*shared first authorship).
32. Z. Wang, D. Ryu, K. He, R. Horstmeyer, A Katsaggelos and O. Cossairt, "High-speed holographic imaging using compressed sensing and phase retrieval," Biomedical Optics Express **8**, 1981–1995 (2017).
33. R. Horstmeyer, J. Chung, X. Ou, G. Zheng and C. Yang, "Diffraction tomography with Fourier ptychography," Optica **8**, 827–835 (2016).
34. R. Horstmeyer, R. Heintzmann, G. Popescu, L. Waller and C. Yang, "Standardizing the resolution claims for coherent microscopy," Nature Photonics **9**, 68–71 (2016).
35. X. Ou, J. Chung, R. Horstmeyer and C. Yang, "Aperture scanning Fourier ptychographic microscopy," Biomedical Optics Express **7**, 3140–3150 (2016).
36. J. Chung, J. Kim, X. Ou, R. Horstmeyer and C. Yang, "Wide field-of-view fluorescence image deconvolution with aberration estimation from Fourier ptychography," Biomedical Optics Express **7**, 352–368 (2016).
37. J. Holloway, M. S. Asif, M. K. Sharma, N. Matsuda, R. Horstmeyer, O. Cossairt and A. Veeraraghavan, "Toward long distance, sub-diffraction imaging using coherent camera arrays," IEEE Trans. Computational Imaging (2016).
38. R. Horstmeyer, H. Ruan and C. Yang, "Guidestar-assisted wavefront-shaping methods for focusing light into biological tissue," Nature Photonics **9**, 563–571 (2015).
39. B. Judkewitz*, R. Horstmeyer*, I. M. Vellekoop, I. N. Papadopoulos and C. Yang, "Translation correlations in anisotropically scattering media," Nature Physics **11**, 684–689 (2015) (*shared first authorship).
40. R. Horstmeyer, R. Y. Chen, X. Ou, B. Ames, J. A. Tropp and C. Yang, "Solving ptychography with a convex relaxation," New Journal of Physics **15**, 053044 (2015).
41. R. Horstmeyer, S. Assawaworrarit, U. Ruhrmair and C. Yang, "Physically secure and fully reconfigurable data storage using optical scattering," IEEE Hardware Oriented Security and Trust, 157–162 (2015).
42. X. Ou, R. Horstmeyer, G. Zheng and C. Yang, "High numerical aperture Fourier ptychography: principle, implementation and characterization," Optics Express **23**, 3472–3491 (2015).
43. R. Horstmeyer, X. Ou, G. Zheng, P. Willems and C. Yang, "Digital pathology with Fourier ptychography," Computerized Medical Imaging and Graphics **42**, 38-43 (2015).
44. R. Horstmeyer, X. Ou, J. Chung, G. Zheng and C. Yang, "Overlapped Fourier coding for optical aberration removal," Optics Express **22**, 24062–24080 (2014).
45. S. Dong*, R. Horstmeyer*, R. Shiradkar, K. Guo, X. Ou, Z. Bian, H. Zin and G. Zheng, "Aperture-scanning Fourier ptychography for 3D refocusing and super-resolution macroscopic imaging," Optics Express 22, 13586–13599 (2014) (*shared first authorship).

46. R. Horstmeyer and C. Yang, "A phase space model of Fourier ptychographic microscopy," Optics Express **22**, 338–358 (2014).

47. J. L. Hollmann, R. Horstmeyer, C. Yang and C. A. DiMarzio, "Diffusion model for ultrasound-modulated light," Journal of Biomedical Optics **19**, 035005 (2014).

48. G. Zheng, X. Ou, R. Horstmeyer, J. Chung and C. Yang, "Fourier ptychographic microscopy: a gigapixel microscope for biomedicine," Optics & Photonics News **25**, 26–33 (2014, Cover paper).

49. X. Ou*, R. Horstmeyer*, C. Yang and G. Zheng, "Quantitative phase imaging via Fourier ptychographic microscopy," Optics Letters **38**, 4845–4848 (2013) (*shared first authorship).

50. G. Zheng, R. Horstmeyer and C. Yang, "Wide-field, high-resolution Fourier ptychographic microscopy," Nature Photonics **7**, 739–745 (2013).

51. G. Zheng, X. Ou, R. Horstmeyer and C. Yang, "Characterization of spatially varying aberrations for wide field-of-view microscopy," Optics Express **21**, 15131–15143 (2013).

52. B. Judkewitz, Y. M. Wang, R. Horstmeyer, A. Mathy and C. Yang, "Speckle-scale focusing in the diffusive regime with time-reversal of variance-encoded light (TROVE)," Nature Photonics **7**, 300–305 (2013).

53. R. Horstmeyer, B. Judkewitz, I. M. Vellekoop, S. Assawaworrarit and C. Yang, "Physical key-protected one-time pad," Scientific Reports **3**, 3543 (2013).

54. J. L. Hollmann, R. Horstmeyer, C. Yang and C. A. DiMarzio, "Analysis and modeling of an ultrasound-modulated guide star to increase the depth of focusing in a turbid medium," Journal of Biomedical Optics **18**(2), 025004 (2013).

55. R. Horstmeyer, R. Y. Chen, B. Judkewitz and C. Yang, "Markov speckle for efficient random bit generation," Optics Express **20**, 26394–26410 (2012).

56. R. Horstmeyer, S. B. Oh, O. Gupta and R. Raskar, "Partially coherent ambiguity functions for depth-variant point spread function design," Progress in Electromagnetics Research Symposium (PIERS) **7**(1), 95–100 (2011).

57. T. Cuypers, R. Horstmeyer, S. B. Oh, P. Bekaert and R. Raskar, "Validity of the Wigner distribution function for ray-based imaging," IEEE Int. Conf. Computational Photography (ICCP), 1-9 (2011).

58. J. Kim, R. Horstmeyer, I. J. Kim and R. Raskar, "Highlighted depth-of-field photography: Shining light on focus," ACM Transactions on Graphics (TOG) **30**(3), 24 (2011).

59. R. Horstmeyer, S. B. Oh and R. Raskar, "Iterative aperture mask design in phase space using a rank constraint," Optics Express **18**, 22545–22555 (2010).

60. R. Horstmeyer, R. A. Athale, and G. W. Euliss, "Modified light field architecture for reconfigurable multimode imaging," Proc. SPIE 7468, 746804 (2009).

61. R. Horstmeyer, G. W. Euliss, R. A. Athale, and M. Levoy, "Flexible Multimodal Camera Using a Light Field Architecture," IEEE Int. Conf. Computational Photography (ICCP), 1–7 (2009).

62. R. Horstmeyer, G. W. Euliss, R. A. Athale, R. L. Morrison, R. A. Stack, and J. Ford, "Pupil plane multiplexing for multi-domain imaging sensors," Proc. SPIE 7096, 709605 (2008).

63. R. H. Rubin, G. J. Ferland, E. E. Chollet, and R. Horstmeyer, "$^{12}C/^{13}C$ Ratio in Planetary Nebulae from the IUE Archives," The Astrophysical Journal **605**, 784–792 (2004).

CONFERENCE PUBLICATIONS & INVITED TALKS

1. R. Horstmeyer, "New Biophotonic Imaging Opportunities with Multi-Camera Arrays". Keynote Presentation, SPIE Advanced Biophotonics Conference 2023.
2. R. Horstemeyer, "Computational 3D video microscopy with multi-camera arrays," Invited Talk, Johns Hopkins University (2023).
3. R. Horstmeyer, "Fourier ptychography and its extensions into 3D polarimetry," Invited Talk, Ptychography over all wavelengths (Oxford UK, 2023).
4. R. Horstmeyer, "Computational 3D video microscopy with multi-camera arrays," Invited Talk, Optics 3D Image Acquisition and Display (2023).
5. R. Horstmeyer, "Multi-aperture methods for 3D tomographic optical imaging," Invited Talk, Radiographic Imaging and Tomography Meeting (2023).
6. R. Horstmeyer, "Imaging Across Multiple Spatial Scales with the Multi-camera Array Microscope," Invited Talk, Optica Webinar Series (2023).
7. KC Lee, H Chae, S Xu, K Lee, R Horstmeyer, BW Hong, SA Lee, "Fourier Ptychographic Iterative Engine Based on Alternating Direction Method of Multipliers with Anisotropic Total-Variation Regularization," Optica Computational Optical Sensing and Imaging, CM4B.4 (2023)
8. KC Zhou, M Harfouche, M Zheng, J Jönsson, KC Lee, R Appel, P Reamey, R Horstmeyer, "Computational 3D surface microscopy from terabytes of data with a self-supervised reconstruction algorithm," Optica Computational Optical Sensing and Imaging, JM1B.2 (2023)
9. S Xu, X Yang, K Kim, P Reamey, C Cook, KC Lee, V Saliu, M Harfouche, R Horstmeyer, "Multiscale speckle-plethysmography with a multi-camera array microscope," Optica Computational Optical Sensing and Imaging, CW5B.5 (2023)
10. S Xu, X Dai, X Yang, KC Lee, L Kreiss, KC Zhou, K Kim, A Chaware, R Horstmeyer, "Anisotropic intensity diffraction tomography, Optica Computational Optical Sensing and Imaging, CM4B.4 (2023)
11. C Cook, KC Zhou, R Horstmeyer, "Fourier Light Field Camera Array Microscope for Mesoscale 3D Imaging," Optica 3D Image Acquisition and Display DTu2A. 4 (2023)
12. L Kreiss, K Zhou, K Kim, M Harfouche, S Xu, J Jönsson, KC Lee, C Cook, R Horstmeyer, "High-throughput imaging across multiple spatial scales with the multi-camera array microscope (MCAM)," SPIE Optical Methods for Inspection, Characterization, and Imaging of Biomaterials (2023).
13. KC Zhou, J Jönsson, C Cook, KC Lee, X Yang, S Xu, J Bagwell, R Horstmeyer, "High-throughput tomographic fluorescence imaging with a synchronized camera array," SPIE High-Speed Biomedical Imaging and Spectroscopy PC123900C (2023).
14. K Kim, K Zhou, M Harfouche, R Horstmeyer, "Multi-modal imaging with a parallelized 16-gigapixel microscope," SPIE Imaging, Manipulation, and Analysis of Biomolecules, Cells, and Tissues PC1238303 (2023).
15. K Kim, KC Zhou, M Harfouche, R Horstmeyer, "Parallelized 16-gigapixel microscopy for rapid imaging of multiple whole slides," OSA Imaging Systems and Applications, IW1C.3 (2022).
16. KC Zhou, M Harfouche, C Cooke, J Park, P Konda, J Doman, P Reamey, R Horstmeyer, "Gigapixel-per-second, wide-field 3D topographic imaging with physics-supervised learning," OSA Computational Optical Sensing and Imaging, JW4C.4 (2022).
17. S Xu, X Yang, J Jonsson, H Chang, R Horstmeyer, "Speckle contrast diffuse correlation spectroscopy with parallelized single photon detection," OSA Optics and the Brain, BTu2C.3 (2022).
18. S. Xu, X. Dai, X. Yang, K. Zhou, P.C. Konda and R. Horstmeyer, "Imaging anisotropy with vectorial Fourier ptychography," SPIE Optical Systems Design, Computational Optics 11875-12 (2021).
19. R. Horstmeyer, "Designing intelligent biomedical imaging devices", Georgia Tech Biomedical Imaging and Photonics Society (BiPS), Invited Talk (2021).

20. K. Kim, C. L. Cooke, P. C. Konda and R. Horstmeyer "Multi-channel virtual fluorescence microscopy with a learned sensing network", Proc. SPIE 11804, Emerging Topics in Artificial Intelligence (ETAI), 1180412 (2021).
21. S. Xu, X. Yang, P.C. Konda and R. Horstmeyer, "Rapid imaging of deep-tissue motion with parallelized diffuse correlation spectroscopy," OSA Optics and the Brain, BTh1B. 3 (2021).
22. R. Horstmeyer, "Designing intelligent biomedical imaging devices," University of Florida ECE Seminar (Invited Talk, 2021).
23. C. L. Cooke, K. Kim, S. Xu, A. Chaware, X. Yao, X. Yang, J. Neff, P. Pittman, C. McCall, C. Glass, X. S. Jiang and R. Horstmeyer, "Deep Optical Blood Analysis: COVID-19 Detection as a Case Study in Next Generation Blood Screening," United States and Canadian Academy of Pathology (USCAP) Annual Meeting, Platform Presentation (2021).
24. R. Horstmeyer, "Intelligent biomedical imaging methods," University of Illinois CSL Student Conference (Keynote Speaker, 2021).
25. R. Horstmeyer, "Mesoscopic 3D imaging with computational microscope arrays," OSA Biophotonics Conference (Invited Speaker, 2021).
26. R. Horstmeyer, "Designing Intelligent Biomedical Imaging Devices," University of Erlangen, Optical Imaging in Medicine Workshop (Invited Talk, 2021).
27. R. Horstmeyer, "Augmenting Fourier ptychography for new imaging applications", Quantitative Phase Imaging, SPIE Photonics West (Invited Talk, 2021).
28. X. Dai, P. C. Konda, S. Xu and R. Horstmeyer, "Polarization and phase imaging using an LED array microscope", Proc. SPIE 11646, Polarized Light and Optical Angular Momentum for Biomedical Diagnostics, 116460U (2021).
29. C. Cooke, P.C. Konda, K. Kim and R. Horstmeyer "A fast and adaptable approach to virtual fluorescence microscopy", Proc. SPIE 11655, Label-free Biomedical Imaging and Sensing, 1165504 (2021).
30. X. Yang, P.C. Konda, J. Park, M. Harfouche and R. Horstmeyer "Snapshot gigapixel-scale imaging at high resolution using a micro-camera array microscope", Proc. SPIE 11622, Multiscale Imaging and Spectroscopy, 1162207 (2021).
31. K. C. Zhou, C. Cooke, J. Park, P. Konda, M. Harfouche and Roarke Horstmeyer "Snapshot 3D imaging with a gigapixel-scale multi-aperture microscope", Proc. SPIE 11649, Three-Dimensional and Multidimensional Microscopy, 116490C (2021).
32. S. Xu, X. Yang, W. Liu, R. Qian, P. C. Konda and R. Horstmeyer "Imaging decorrelation via deep learning and SPAD array detection", Proc. SPIE 11629, Optical Techniques in Neurosurgery, Neurophotonics, and Optogenetics, 116292A (2021).
33. R. Horstmeyer, "Fourier ptychography, machine learning and the future of microscopy", International Online Lecture (IOL), Nanjing University (NJUST) – Invited Talk (2020).
34. R. Horstmeyer, "Intelligent biomedical imaging devices", KAIST Healthcare/Brain+ Webinar Series (Invited Speaker, 2020).
35. R. Horstmeyer, "Deep learning and smart microscopy", Duke +DS Lecture Series (Invited Talk, 2020).
36. R. Horstmeyer, "Computational microscopy - allowing us to 'see more'", Duke Physics Graduate Student Seminar (2020).
37. R. Horstmeyer, "Smart microscopes for digital pathology", Duke AI and Computational Pathology Meeting (Invited Talk, 2020).
38. R. Horstmeyer, "Automated Optical Detection of COVID-19 from Peripheral Blood Smears," Harvey Mudd Micro-Workshop on Computational Imaging (Invited Talk, 2020).
39. X. Dai, P. C. Konda, S. Xu, R. Horstmeyer, "Towards a vectorial treatment of Fourier ptychographic microscopy," OSA Computational Optical Sensing and Imaging (2020).

40. W. Liu, S. Xu, R. Qian, P. C. Konda, R. Horstmeyer, "Classifying decorrelation events hidden beneath scattering media via SPAD array detection, " OSA Computational Optical Sensing and Imaging (2020).
41. R. Horstmeyer, "Using machine learning to design intelligent computational microscopes," Duke Fitzpatrick Institute for Photonics Annual Symposium (Invited Talk, 2020).
42. R. Horstmeyer, "Fourier ptychography: principles and applications," Southern Methodist University (Invited Lecture, 2020).
43. W. Liu, R. Qian, S. Xu, P. C. Konda, R. Horstmeyer, "Fast sensitive diffuse correlation spectroscopy with a SPAD array," OSA Biophotonics Conference, Optical Tomography and Spectroscopy (2020).
44. R. Horstmeyer, "Highly parallelized diffuse correlation spectroscopy with a SPAD array," Kernel Inc. (Invited Talk, 2020).
45. R. Horstmeyer, "Using machine learning to design intelligent microscopes," Caltech (Invited Lecture, 2020).
46. X. Yang, P. C. Konda, R. Horstmeyer, "Towards high-speed fourier ptychographic imaging using binary measurements on a SPAD camera," SPIE Photonics West (2020).
47. R. Horstmeyer, A. Chaware, C. Cooke and K. Kim, "Using machine learning to design intelligent computational microscopes," Quantitative Bioimaging Society 2020, Oxford University (Invited Talk, Invited Plenary Discussion Panelist, 2020).
48. R. Horstmeyer, "Using machine learning to design intelligent computational microscopes," University of Minnesota Seminar Series (Invited Talk, 2019).
49. R. Horstmeyer et al., "Designing intelligent gigapixel-scale microscopes," HHMI Janelia Optics and Machine Learning Seminar Series (Invited Talk, 2019).
50. M. Harfouche et al., "Imaging the behavior and neural activity of freely moving organisms with a gigapixel microscope," OSA Optics and the Brain (Invited talk, 2019)
51. R. Horstmeyer, "Using machine learning to design intelligent microscopes," Southeast Ultrafast Laser Conference (Invited Talk, 2019).
52. K. Zhou et al, "Improving diffraction tomography with intensity-only images," Face2Phase Optics Conference (Invited Talk, 2019)
53. R. Horstmeyer, "Towards Intelligent Computational Microscopes", Stanford University Computational Imaging Lecture Series (Invited Talk, 2019)
54. R. Horstmeyer, "Computational microscopy for improved biomedical research", University of Georgia SPIE Seminar Talk (Invited Talk, 2019)
55. L. Zhong et al., "Depth tracking using a multi-aperture microscope," OSA Computational Optical Sensing and Imaging (Invited talk, 2019)
56. R. Horstmeyer, "Imaging freely moving organisms at high resolution using a gigapixel microscope", Duke Fitzpatrick Institute for Photonics Annual Symposium (Invited Talk, 2019)
57. R. Horstmeyer, "A deep learning approach to design new kinds of microscopes," Duke Teer Talk (Invited Talk, 2019)
58. R. Horstmeyer, "Using Machine Learning to Optimize how Microscopes Detect Infectious Disease," University of Erlangen School of Advanced Optical Technologies, Annual SAOT Conference (Invited Talk, 2019)
59. R. Horstmeyer, "Scattering at the microscopic scale," BIRS Computational Light Transport Workshop, Banff (Invited Talk, 2019)
60. R. Horstmeyer, "Using machine learning to optimize how microscopes detect infectious disease," BMES Conference (Invited talk, 2018)
61. R. Horstmeyer, "Expediting research with the power of computational microscopes," MIT Media Lab E14 Startup Showcase (Invited talk, 2018)

62. R. Horstmeyer, "Optimized deep-tissue imaging with the optical memory effect," Duke Physics Colloquium (Invited talk, 2018)
63. R. Horstmeyer, "Redesigning microscopes for improved image classification," OSA Imaging Congress (Invited talk, 2018)
64. R. Horstmeyer, "A gigapixel camera array for high-throughput microscopy," SPIE DCS (Invited talk, 2018)
65. R. Horstmeyer, "Volumetric imaging using Fourier ptychography," Face2Phase Conference, TU Delft (Invited talk, 2017)
66. R. Horstmeyer, "Memory effect correlations in random scattering media over space, angle and time," ICERM Waves and Imaging in Random Media (Invited talk, 2017)
67. R. Horstmeyer, "Computational microscopes for gigapixel 3D imaging and inspection," Fraunhofer IISB Lithography Simulation Workshop (Invited talk, 2017)
68. R. Horstmeyer, "The generalized optical memory effect," Complex Nanophotonics Summer Camp (2017)
69. R. Horstmeyer, "A microscope array for imaging over an unbounded field-of-view with cellular-scale resolution," Neurotuscany Conference (2017)
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72. J. Chung, J. Kim, X. Ou, R. Horstmeyer and C. Yang, "Simultaneous fluorescence and high-resolution bright-field imaging with aberrations correction over a wide field-of-view with FPM," SPIE BiOS (2016).
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74. R. Horstmeyer, G. Zheng, X. Ou and C. Yang, "Modeling extensions of Fourier ptychographic microscopy," Microscopy and Microanalysis 20, 370-371 (2014)
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76. R. Horstmeyer, B. Judkewitz, I. M. Vellekoop and C. Yang, "Secure storage of cryptographic keys within random volumetric materials," Proc. OSA CLEO (2013)
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79. R. Horstmeyer, S. B. Oh, H. Gao and R. Raskar, "Alternative models of the rotating beam," Proc. OSA Conference on Digital Holography (2011)
80. M. Henninger, R. Horstmeyer, A. Zorzos, J. Scholvin, D. Lanman, C. Fonstad, R. Raskar and E. S. Boyden, "A novel concept for an implantable probe for deep-brain optical measurement of the activity of large populations of neurons," Society for Neuroscience (2011)
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BOOK CHAPTERS

1. R. Horstmeyer, "Roadmap on Wavefront Shaping and deep imaging in complex media," in *Journal of Physics: Photonics* edited by S. Gigan (2022).
2. R. Horstmeyer, H. Ruan, M. Hoffmann and C. Yang, "Imaging deep in the brain with wavefront engineering," in *Handbook of Neurophotonics*, edited by F. S. Pavone and S. Shoham (2020)
3. R. Horstmeyer, I. M. Vellekoop and B. Judkewitz, "Transmission matrix correlations," in *Wavefront Shaping*, edited by J. Cubby (2020)

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2. X Yang, PC Konda, R Horstmeyer, C Cook. Re-imaging microscopy with micro-camera array. US Patent App. 18/295,078 (2023).
3. X Dai, R Horstmeyer, XU Shiqi, PC Konda. Method and system of polarization microscopy imaging. US Patent App. 18/073,759 (2023).
4. R Horstmeyer, M Harfouche. Multiple camera microscope imaging with patterned illumination. US Patent App. 18/079,226 (2023).
5. H Ruan, A Marblestone, R Horstmeyer, Y Shen, H Zhou, J Alford. Non-invasive optical detection system and method of multiple-scattered light with swept source illumination. US Patent 11,547,303 (2023).
6. R. Horstmeyer, H. Zhou, H. Ruan, Y. Shen, J. Alford. Interferometric frequency-swept source and detector in a photonic integrated circuit. US Patent 11,490,817 (2022).
7. J. Alford, A. Marblestone, I. Vellekoop, D. Sobek, M. Henninger, B. Robinson, Y. Shen and R. Horstmeyer. Time-of-flight optical measurement and decoding of fast-optical signals. US Patent 11,412,930 (2022).
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14. R. Horstmeyer, R. Horstmeyer, M. Harfouche, R. Appel. System and method to optically authenticate physical objects, US Patent App. 16/630431 (2020).

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17. H. Zhou, R. Horstmeyer, H. Ruan, Y. Shen, J. Alford. Non-invasive optical measurement system and method for neural decoding. US Patent 11,096,585
18. H. Ruan, A. Marblestone, R. Horstmeyer, Y. Shen, H. Zhou, J. Alford. Non-invasive optical detection system and method of multiple-scattered light with swept source illumination. US Patent App. 16/393,002 (2019)
19. R. Horstmeyer, H. Zhou, Y. Shen and H. Ruan. Spatial and temporal-based diffusive correlation spectroscopy systems and methods. US Patent 11,213,245 (2019)
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23. R. Horstmeyer and C. Yang. Epi-Illumination Fourier Ptychographic Microscopy for Thick Biological Samples. US Patent Application US 14/979154 (2016)
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25. R. Horstmeyer, R. Y. Chen, J. A. Tropp and C. Yang. Ptychographic Imaging Systems and Methods with Convex Relaxation. US Patent Application US 14/710947 (2015)
26. J. Chung, R. Horstmeyer and C. Yang. Fourier ptychographic retinal imaging methods and systems. US Patent 9,993,149 (2015)
27. R. Horstmeyer, G. Zheng, X. Ou and C. Yang. Aperture Scanning Fourier Ptychographic Imaging. US Patent 9,983,397 (2015)
28. X. Ou, J. Chung, R. Horstmeyer, G. Zheng and C. Yang. Embedded Pupil Function Recovery for Fourier Ptychographic Imaging Devices. US Patent Application US Patent 9,892,812 (2015)
29. R. Horstmeyer, X. Ou, G. Zheng and C. Yang. Variable Illumination Fourier Ptychographic Imaging Systems, Devices, and Methods. US Patent 9,998,658 (2015)
30. G. Zheng, C. Yang and R. Horstmeyer. Fourier Ptychographic Imaging Systems, Devices, and Methods. US Patent Application US 14/065,280 (2014)
31. G. Zheng, C. Yang and R. Horstmeyer. Fourier Ptychographic X-ray Imaging Systems, Devices, and Methods. US Patent Application US Patent 9,892,812 (2014)
32. B. Judkewitz, Y. M. Wang, R. Horstmeyer and C. Yang. Time-reversal of variance-encoded light (TROVE). US Patent 9,354,116 (2014)
33. R. Horstmeyer, B. Judkewitz, C. Yang and I. M. Vellekoop. Physical key-protected one-time pad. US Patent 9,054,871 (2015)

RELEVANT NEWS

- "Imaging Behavior with a Camera Array" (link) *Nature Methods* (2023)
- "High-speed gigapixel microscope images, records in high-res 3D" (link) *Laser Focus World* (2023)
- "Gigapixel Microscope Captures Tiny Motions in 3D" (link) *Optics and Photonics News* (2023)
- "Harnessing Light to Measure Brain Function" (link) *Duke Health* (2021)
- "Artificial intelligence is the future for pathology at Duke through new program" (link) *WRAL TechWire* (2021)
- "Sotheby's to auction Picasso painting together with NFT" (link) *Mashable* (2021)
- "Illuminating the Future of Biomedical Imaging Tools" (link) *Duke BME Digital Magazine* (2021)
- "2020 Photo Contest Winners" (link) *Optics and Photonics News* (2020)
- "2020 Incubation Fund Awards Support Seven Early-Stage Innovations Across Duke" (link) *Innovation at Duke* (2020)
- "Machine-Learning Microscope Speeds Malaria Diagnosis" (link) *Optics and Photonics News* (2019)
- "Machine Learning Microscope Adapts Lighting to Improve Diagnoses" (link) *Duke University Engineering News* (2019)
- "Machine Learning Microscope Adapts Lighting to Improve Diagnoses" (link) *Phys.org* (2019)
- "Roarke Horstmeyer: Visualizing New Biomedical Imaging Tools and Techniques" (link) *Duke University Engineering News* (2017)
- "Young Researcher Award in Optical Technologies to Roarke Horstmeyer" (link) *University of Erlangen Nuremberg News* (2017)
- "Meet Pratt's New Faculty for 2016-2018" (link) *Duke University Engineering News* (2016)
- "Roarke Horstmeyer wins Charles Wiltz Prize" (link) *Caltech Electrical Engineering News* (2016)
- "Multiple scattering: Unravelling the tangle" (link) *Nature Physics* (2015)
- "Spotlight on graduate research" (link) *Caltech News* (2015)
- "Software: The computer will see you now" (link) *Nature* (2013)
- "One-Time Pad Reinvented to Make Electronic Copying Impossible" (link), *MIT Technology Review* (2013)
- "Digital camera add-on means the light's fantastic" (link), *New Scientist* (2013)

SCHOLARSHIPS and AWARDS

- 2023: Optica Fellow
- 2021-2024: Hartwell Foundation Young Investigator Award
- 2021-2024: 3M Non-tenured Faculty Award ($45,000 Prize)
- 2020: Duke Incubator Award ($20,000 Prize)
- 2019: Duke Start-up Microsoft Award (SafineAI Inc)
- 2018: SAOT Young Researcher Award in Optical Technologies ($100,000 Prize)
- 2016–2018: Einstein International Postdoctoral Fellowship (full funding)
- 2016: Caltech Charles Wiltz Doctoral Prize (for outstanding doctoral research)
- 2015: Caltech Everhart Lecture Award (for outstanding research and presentation)
- 2013–2015: California Institute of Technology I-Grant Program (2 years, $125,000/year)
- 2011: MIT 100K Business Competition Linked Data Prize

- 2009–2012: National Defense Science and Engineering Graduate Fellowship (3 years, full funding)

PROFESSIONAL SERVICE

- Associate Editor, Biomedical Optics Express
- Official Panelist: Optical Society of America, Spotlight on Optics
- Program committee: SPIE Photonics West, Computational Optical Imaging and Artificial Intelligence in Biomedical Sciences, 2022, 2023
- Program committee: IEEE Int. Conf. Computational Photography, Optics Committee Chair 2022, 2023
- Program committee: Optical Society of America Computational Optical Sensing and Imaging 2020, 2021, 2022, 2023
- Program committee: SPIE Optical Systems Design 2021, 2022, 2023
- Program committee: Optical Society of America Biophotonics Congress 2020, 2021, 2022
- Program committee: IEEE International Conference Computational Photography 2021, 2022
- Program committee: Optical Society of America Imaging and Applied Optics Congress 2018–2021
- Program committee: SPIE Computational Optics 2018
- Program committee: Computational Cameras and Displays (CCD) 2014–2018