

Robert R. McLeod

Richard and Joy Dorf Endowed Professor of
Electrical, Computer and Energy Engineering
and Materials Science and Engineering Program

Contact Information

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Education

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| 1995 | University of Colorado <i>Doctorate of Philosophy in Electrical Engineering</i> | Boulder, CO |
| 1989 | University of California <i>Masters of Science in Engineering Applied Science</i> | Davis, CA |
| 1984 | Montana State University <i>Bachelors of Science summa cum laude, Honors Program</i> | Bozeman, MT |
| 1985 | <i>Masters of Science in Electrical Engineering</i> | |

Professional Experience

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| 2017-2021 | University of Colorado <i>Director, Materials Science and Engineering Program</i> | Boulder, CO |
| 2015-2017 | <i>Department Chair</i> | |
| 2015- | <i>Full Professor</i> | |
| 2014- | <i>Richard and Joy Dorf Endowed Professor</i> | |
| 2013-2015 | <i>Materials Science Program Graduate Director</i> | |
| 2012-2015 | <i>ECEE Graduate Director</i> | |
| 2010-2015 | <i>Associate Professor</i> | |
| 2006-2007 | <i>Director, Colorado Center for Information Storage</i> | |
| 2003-2010 | <i>Assistant Professor</i> | |
| 2001-2003 | JDS Uniphase <i>Director, Photonic Subsystems</i> | San Jose, CA |
| 1999-2001 | <i>Senior Manager, Passive Components</i> | |
| 1997-1999 | Siros Technologies <i>Manager of Head/Media Group</i> | San Jose, CA |
| 1996-1997 | <i>Systems Engineer</i> | |
| 1993 - 1996 | Optoelectronic Data Systems <i>Vice President</i> | Boulder, CO |

1986-1991 Lawrence Livermore National Lab Livermore, CA
Member of Technical Staff

Consulting Services specializing in design, analysis, IP generation and IP litigation for optoelectronics, optical materials, data storage and telecommunications

2017 Align Technologies
2017 Thalmic Labs
2017 Park, Vaughan, Fleming & Dowler
2015 [RealD vs. MasterImage Inc](#)
2011 Neurok Technologies
2010 Townsend, Townsend and Crew
2007 dBm Optics
2006 Vescent Photonics
2005 Science Applications International Corporation
2004 Ball Aerospace
2003 InPhase Technologies
2003 StorageTek

Honors and Awards

2021 **Lab Venture Challenge Award and People's Choice Award**, Camila Uzcategui and John Hergert at the CU Venture Partners Lab Venture Challenge
2020 **Chancellor's Research Innovation Award and People's Choice Award**, Camila Uzcategui and John Hergert at the CU Venture Partners Lab Venture Challenge
2020 **Best Student Poster Award**, Archish Muralidharan at the CPIA Photonics Research in Colorado annual meeting
2020 **Dick Aubin Distinguished Paper Award**, Archish Muralidharan at the RAPID + TCT conference
2017 **Emil Wolf Outstanding Student Paper Award**, David Miller at the OSA Frontiers in Optics Conference, Washington DC
2016 **Best Poster Award**, Jacob Friedlein at the Asilomar Bioelectronics Symposium
2015 **Nature Materials Prize**, Jacob Friedlein at the BioEl2015 International Winter School on Bioelectronics
2015 **Best Student Poster Award**, Callie Fiedler at the CPIA Photonics Research in Colorado annual meeting
2015 **Outstanding Performance Award**, ECEE Department, UC Boulder
2014 **Provost Faculty Achievement Award**, University of Colorado
2014 **Richard and Joy Dorf Endowed Professorship**
2014 **Holland Teaching Award** from the University of Colorado
2014 **Best Paper Award**, Adam Urness at the SPIE Advanced Fabrication Technologies for Micro/Nano Optics and Photonics
2013 **Intel Outstanding Researcher Award** in Optoelectronics
2013 **Topical Editor**, Optics Letters, Optical Society of America
2013 **Fellow**, CU Materials Science and Engineering program

- 2012 **Best Student Poster Award**, Chunfang Ye at the CPIA Photonics Research in Colorado annual meeting
- 2012 **Best Student Poster Award**, Callie Fiedler at the CPIA Photonics Research in Colorado annual meeting
- 2010 **NSF CAREER Award**, Electrical, Communications and Cyber Systems Division of the Engineering Directorate.
- 2010 **General Chair** IEEE/OSA/SPIE Optical Data Storage Conference
- 2010 **Best Student Poster Award**, Adam Urness at the CPIA Photonics Research in Colorado annual meeting
- 2010 **Best Student Poster Award**, Eric Moore at the CPIA Photonics Research in Colorado annual meeting
- 2009 **Dean's Performance Award**, College of Engineering and Applied Science
- 2009 **Provost Achievement Award**, University of Colorado
- 2008 **Best Student Paper Award**, Benjamin Kowalski at the International Symposium on Optical Memory and Optical Data Storage
- 2007 **Best Student Paper Award**, Amy Sullivan at the OSA topical meeting on Controlling Light with Light: Photorefractive Effects, Photosensitivity, Fiber Gratings, Photonic Materials and More
- 2007 **Best Student Poster Award**, Eric Moore at the CPIA Photonics Research in Colorado annual meeting
- 2007 **Faculty Fellowship**, CU College of Engineering and Applied Science
- 2004 **Best Student Poster Award**, Amy C. Sullivan at the CPIA Photonics Research in Colorado annual meeting
- 2004 **Junior Faculty Development Award**, CU Boulder Council on Research and Creative Work
- 2002 **Award for Excellence**, JDS Uniphase
- 1992 **Defense Science and Engineering Fellow**
- 1982 **Phi Kappa Phi**

Selected Press Coverage

1. "Nanopatterning: What diffraction limit?," *Nature Nanotechnology*, April 24, 2009
2. "Two Beams Squeeze Feature Sizes in Optical Lithography," *Science*, May 15, 2009
3. "Two-Laser Lithography Shrinks Transistors," *IEEE Spectrum*, June 2009
4. "Novel technique shrinks size of nanotechnology circuitry," *ScienceWeek*, April 16, 2009
5. "Double-laser approach makes one thin line," *Science News*, April 10, 2009

Publications

Google Scholar [Profile](#)

Peer-Reviewed Journal Papers

1. Strand, E. J., Bihar E., Gleason, S. M., Han, S., Schreiber, S. W., Renny, M. N., Malliaras, G. G., McLeod, R. R., Whiting, G. L., "Printed Organic Electrochemical Transistors for Detecting Nutrients in Whole Plant Sap,"

- Advanced Electronic Materials **2021**, 2100853, 2021.
<https://doi.org/10.1002/aelm.202100853>
2. Rackson, Charles M., Champley, Kyle M., Toombs, Joseph T., Fong, Erika J., Bansal, Vishal, Taylor, Hayden K., Shusteff, Maxim, McLeod, Robert R., “Object-space optimization of tomographic reconstructions for additive manufacturing,” Additive Manufacturing **48**, Part A, 102367, 2021.
<https://doi.org/10.1016/j.addma.2021.102367>
 3. Schoonraad, S. A., Fischenich, K. M., Eckstein, K., Crespo-Cuevas, V., Savard, L. M., Muralidharan, A., Tomaschke, A. A., Uzcategui, A. C., Randolph, M. A., McLeod, R. R., Ferguson, V. L., Bryant, S. J. “Biomimetic and Mechanically Supportive 3D Printed Scaffolds for Cartilage and Osteochondral Tissue Engineering using Photopolymers and Digital Light Processing,” Biofabrication **13**, 044106, 2021
 4. Muralidharan, A., McLeod, R.R. Bryant, S.J., “Hydrolytically degradable Poly (β -amino ester) resins with tunable degradation for 3D printing by projection micro-stereolithography”, Adv. Funct. Mater. **2021**, 2106509, 2021
<https://doi.org/10.1002/adfm.202106509>
 5. Carberry, B. J., Hergert, J. E., Yavitt, F. M., Hernandez, J. J., Speckl, K. F., Bowman, C. N., McLeod, R. and Anseth, K., “3D printing of sacrificial thioester elastomers using digital light processing for templating 3D organoid structures in soft biomatrices,” Biofabrication **13**, 044104, 2021.
<https://doi.org/10.1088/1758-5090/ac1c98>
 6. Chen, S.-T., Renny, M. N., Tomé, L. C., Olmedo-Martínez, J. L., Udabe, E., Jenkins, E. P. W., Mecerreyes, D., Malliaras, G. G., McLeod, R. R., Proctor, C. M., “Reducing Passive Drug Diffusion from Electrophoretic Drug Delivery Devices through Co - Ion Engineering,” Adv. Sci. **2021**, 2003995.
<https://doi.org/10.1002/advs.202003995>
 7. Uzcategui, A.C., Higgins, C.I., Hergert, J.E., Tomaschke, A.E., Crespo-Cuevas, V., Ferguson, V.L., Bryant, S.J., McLeod, R.R. and Killgore, J.P.,” Microscale Photopatterning of Through - Thickness Modulus in a Monolithic and Functionally Graded 3D Printed Part,” Small Sci., 1: 2000017.
<https://doi.org/10.1002/smsc.202000017>
 8. McLeod, R.R., “Numerical Technique for Study of Noise Grating Dynamics in Holographic Photopolymers,” Polymers 2020, 2744, 2020. DOI: 10.3390/polym12112744
 9. Hu, Y., Kowalski, B.A., Mavila, S., Podgórski, M., Sinha, J., Sullivan, A.C., McLeod, R.R., Bowman, C.N., “Holographic Photopolymer Material with High Dynamic Range (Δn) via Thiol–Ene Click Chemistry,” ACS Applied Materials & Interfaces **12** (39), 44103-44109, 2020. DOI: 10.1021/acsami.0c08872
 10. Cook, C. C., Fong, E. J., Schwartz, J. J., Porcincula, D. H., Kaczmarek, A. C., Oakdale, J. S., Moran, B. D., Champley, K. M., Rackson, C. M., Muralidharan, A., McLeod, R. R., Shusteff, M., “Highly Tunable Thiol - Ene Photoresins for Volumetric Additive Manufacturing.” Adv. Mater. **2020**, 2003376, 2020. <https://doi.org/10.1002/adma.202003376>

11. D. B. Miller, A. Jones, R.R. McLeod, "Contrast analysis in two-beam laser interference lithography," *Applied Optics* **59** (18), 5399-5407, 2020
12. C.I. Higgins, J. Killgore, F.W. DelRio, S. Bryant, R. R. McLeod, "Photo-tunable hydrogel mechanical heterogeneity informed by predictive transport kinetics model," *Soft Matter* **2020**, 4131-4141, 2020. PMID: [PMC7489306](https://pubmed.ncbi.nlm.nih.gov/32489306/), DOI: [10.1039/d0sm00052c](https://doi.org/10.1039/d0sm00052c)
13. M. D. Alim, K. K. Childress, N. J. Baugh, A. M. Martinez, A. Davenport, B. D. Fairbanks, M. K. McBride, B. T. Worrell, J. W. Stansbury, R. R. McLeod, C. N. Bowman, "A photopolymerizable thermoplastic with tunable mechanical performance," *Materials Horizons* **7**, 835-842, 2020.
14. D. B. Miller, M.D. Alim, R. R. McLeod, "Reflection suppression via elastomeric films," *Optics Letters* **44**, 6021-6024, 2019
15. A. Muralidharan, A. C. Uzcategui, R. R. McLeod, S. J. Bryant, "Stereolithographic 3D Printing for Deterministic Control over Integration in Dual - Material Composites," *Advanced Materials Technologies* **4**, 1900592, 2019.
16. M. D. Alim, S. Mavila, D. B. Miller, S. Huang, M. Podgórski, L.M. Cox, A. C. Sullivan, R. R. McLeod, C. N. Bowman, "Realizing High Refractive Index Thiol-X Materials: A General and Scalable Synthetic Approach," *ACS Materials Letters* **2019**, 582-588, 2019.
17. D. B. Miller, A. M. Jones, R. R. McLeod, "Super-resolved critical dimensions in far-field I-line photolithography," *Journal of Micro/Nanolithography, MEMS and MOEMs* **18**, 013505, 2019.
18. J. H. Hergert, D. J. Glugla, A.C. Sullivan, M. D. Alim, R. R. McLeod, "High efficiency Fresnel Lens design and fabrication in a two-stage photopolymer." *Optics Letters* **44**(7), 1540-1543, 2019.
19. J. T. Friedlein, R. R. McLeod, J. Rivnay, "Device Physics of Organic Electrochemical Transistors," *Organic Electronics* **63**, pp. 398-414, 2018.
20. A. C. Uzcategui, A. Muralidharan, V. L. Ferguson, S. J. Bryant, and R. R. McLeod, "Understanding and Improving Mechanical Properties in 3D printed Parts Using a Dual-Cure Acrylate-Based Resin for Stereolithography," *Advanced Engineering Materials* **2018**, 1800876, 2018.
21. V. Venkatraman, J. Friedlein, I. McCulloch, R. R. McLeod, J. Rivnay, "Subthreshold operation of organic electrochemical transistors for bio-amplification," *Advanced Science* **5**, 1800453, 2018.
22. D. J. Glugla, M. B. Chosy, M. D. Alim, K. K. Childress, A. C. Sullivan, R. R. McLeod, "Multiple patterning of holographic photopolymers for increased refractive index contrast," *Optics Letters* **43**, pp. 1866-1869, 2018.
23. D. J. Glugla, M. B. Chosy, M. D. Alim, A. C. Sullivan, R. R. McLeod, "Transport-of-Intensity-Based Phase Imaging to Quantify the Refractive Index Response of 3D Direct-Write Lithography," *Optics Express* **26**, pp. 1851-1869, 2018.
24. M. D. Alim, D. J. Glugla, S. Mavila, C. Wang, P. D. Nystrom, A. C. Sullivan, R. R. McLeod, C. N. Bowman, "High dynamic range (Δn) two-stage photopolymers via enhanced solubility of a high refractive index acrylate

- writing monomer,” *ACS Applied Materials & Interfaces* 10, pp. 1217-1224, 2018.
25. Elizabeth A Aisenbrey, Andrew Tomaschke, Eric Kleinjan, Archish Muralidharan, Cecilia Pascual-Garrido, Robert R McLeod, Virginia L. Ferguson, Stephanie J Bryant, “A Stereolithography-based 3D printed Hybrid Scaffold for In Situ Cartilage Defect Repair,” *Macromol. Biosci.* 2017, 1700267, 2017
 26. Mary Donahue, Adam Williamson, Xenofon Strakosas, Jacob Friedlein, Robert McLeod, Helena Gleskova, George G. Malliaras, “High Performance Vertical Organic Electrochemical Transistors,” *Advanced Materials* 2017, 1705031, 2017
 27. J. T. Friedlein, J. Rivnay, D. H. Dunlap, I McCulloch, S. E. Shaheen, R. R. McLeod, George G. Malliaras, “Influence of disorder on transfer characteristics of organic electrochemical transistors,” *Applied Physics Letters* **111**, 023301 (2017)
 28. C. I. Fiedler, E. A. Aisenbrey, J.A. Wahlquist, C. M. Heveran, V. L. Ferguson, S. J. Bryant, and R. R. McLeod, “Enhanced mechanical properties of photo-clickable thiol-ene PEG hydrogels through repeated photopolymerization of in-swollen macromere,” *Soft Matter* **12**, 9095 – 9104, 2016
 29. D. J. Glugla, M. Alim, K. Byars, D. P. Nair, C. N. Bowman, K.K. Maute, R. R. McLeod, “Rigid Origami via Optical Programming and Deferred Self-Folding of a Two-Stage Photopolymer,” *ACS Applied Materials & Interfaces*, *ACS Applied Materials & Interfaces* **8**, 29658-29667, 2016
 30. Z. D. Marks, D. Glugla, J. T. Friedlein, S. M. Shaheen, R. R. McLeod, M. Y. Kahook and D. P. Nair, “Switchable diffractive optics using patterned PEDOT/PSS based electrochromic thin-films,” *Organic Electronics* **37**, 271-279, 2016
 31. J. T. Friedlein, M. J. Donahue, S. E. Shaheen, G. G. Malliaras, and R. R. McLeod, “Microsecond Response in Organic Electrochemical Transistors: Exceeding the Intrinsic Speed Limit,” *Advanced Materials* **28**, 8398–8404, 2016.
 32. B. A. Kowalski, R. R. McLeod, “Design concepts for diffusive holographic photopolymers,” *J. Polymer Science Part B: Polymer Physics* **54**, 1021-1035, 2016
 33. M. I. Bodine, R. R. McLeod, “Superresolved swept wavelength interferometry using frequency estimation methods,” *Optics Letters* **41**, 159-162, 2016
 34. J. T. Friedlein, S. E. Shaheen, G. G. Malliaras, R. R. McLeod, “Optical measurements revealing non-uniform hole mobility in organic electrochemical transistors,” *Advanced Electronic Materials* **2015**, pp. 1500189 (9 pages), 2015.
 35. A. Aguirre-Soto, A. T. Hwang, D. Glugla, J. W. Wydra, R. R. McLeod, C. N. Bowman, J. W. Stansbury, “Coupled UV-Vis/FT-NIR Spectroscopy for Kinetic Analysis of Multiple Reaction Steps during polymerizations,” *Macromolecules* **48**, pp. 6781-6790, 2015.

36. Darren L. Forman, Robert R. McLeod, Parag K. Shah, Jeffrey W. Stansbury, "Evaporation of low volatility components in polymeric dental resins," *Dental Materials* **31**, pp. 1090-1099, 2015.
37. A.C. Urness, K. Anderson, W. L. Wilson and R. R. McLeod, "Arbitrary 2D GRIN lens fabrication in diffusive photopolymers," *Optics Express* **23**, pp. 264–273, 2015.
38. H. Peng, C. Wang, W. Xi, B. A Kowalski, T. Gong, X. Xie, W. Wang, D. P. Nair, R. R. McLeod, C. N. Bowman, "Facile Image Patterning via Sequential Thiol-Michael/Thiol-Yne Click Reactions," *Chemistry of Materials* **26**, pp. 6819–6826, 2014.
39. R. R. McLeod and K. H. Wagner, "Vector Fourier Optics of Anisotropic Materials," *Advances in Optics and Photonics* **6**, pp. 368-412, 2014.
40. S. Shajee, L. Y. Pao, and R. R. McLeod, "Optimizing the Layout of Heaters for Distributed Active De-icing of Wind Turbine Blades," *Wind Engineering* **38**, pp. 587-600, 2014.
41. B. A. Kowalski, A. C. Urness, M-E. Baylor, M. C. Cole, W. L. Wilson, R. R. McLeod, "Quantitative modeling of the reaction/diffusion kinetics of two-component diffusive photopolymers," *Optics Materials Express* **4**, pp. 1668-1682, 2014.
42. H. Peng, D. P. Nair, B. A. Kowalski, W. Xi, T. Gong, C. Wang, M. Cole, N. B. Cramer, X. Xie, R. R. McLeod, and C. N. Bowman, "High performance graded rainbow holograms via two-stage sequential orthogonal thiol-click chemistry," *Macromolecules* **47**, no. 7, pp. 2306–2315, 2014.
43. D. L. Forman, M C. Cole and R. R. McLeod, "Radical diffusion limits to photoinhibited superresolution lithography," *Phys. Chem. Chem. Phys.* **15** (36), 14862 – 14867, 2013.
44. A. Linnenberger, M. I. Bodine, C. Fiedler, J. J. Roberts, S. C. Skaalure, S. J. Bryant M. Cole, R. R. McLeod, "Three Dimensional Live Cell Lithography," *Optics Express* **21**, 10269-10277, 2013. **Selected for co-publication in the Virtual Journal for Biomedical Optics, vol 8 (2013).**
45. M.R. Gleeson, Y. Tomita, S. Gallego, and R. McLeod, "Advances in Novel Optical Materials and Devices," *Physics Research International* **2013**, Article ID 430947, 2 pages, 2013.
46. Adam C. Urness, Eric D. Moore, Keith K. Kamysiak, Michael C. Cole, Robert R. McLeod, "Liquid Deposition Photolithography for sub-micron resolution three-dimensional index structuring with large throughput," *Light: Science and Applications* **2**, e56, 2013.
47. Martha-Elizabeth Baylor, Benjamin W. Cerjan, Charlotte R. Pfeifer, Robert W. Boyne, Charles L. Couch, Neil B. Cramer, Christopher N. Bowman, Robert R. McLeod, "Monolithic integration of optical waveguide and fluidic channel structures in a Thiol-ene/Methacrylate photopolymer," *Optical Materials Express* **2**, 1548-1555, 2012.
48. C. Ye, K. T. Kamysiak, A. C. Sullivan, R. R. McLeod, "Mode profile imaging and loss measurement for uniform and tapered single-mode 3D waveguides in diffusion-based photopolymer," *Optics Express* **20**, 6575-6583, 2012.

49. D. P. Nair, N. B. Cramer, J. C. Gaipa, M. K. McBride, R. R. McLeod, R. Shandas, C.N. Bowman, "Two-Stage Reactive Polymer Network Forming Systems," *Advanced Functional Materials* **2012**, 1-9, 2012.
50. T.F. Scott, C. Kloxin, D. Forman, R. R. McLeod, C. Bowman, "Principles of voxel refinement in optical direct write lithography," *J. Mater. Chem* **21**, 14150-14155, 2011.
51. E. D. Moore, R. R. McLeod, "Phase-sensitive swept-source interferometry for absolute ranging with application to measurements of group refractive index and thickness," *Optics Express* **19**, 8117-8126, 2011. Selected for co-publication in the *Virtual Journal for Biomedical Optics* **3**, 2011.
52. M. R. Gleeson, S. Liu, R. R. McLeod, J. T. Sheridan, "Nonlocal Photo-Polymerization Kinetics Including Multiple Termination Mechanisms and Dark Reactions: Part II. Experimental Validation," *JOSA B* **26**, 1746-1754, 2009.
53. T. F. Scott, B. A. Kowalski, A. C. Sullivan, C.N. Bowman, R. R. McLeod, "Two-Color Single-Photon Photoinitiation and Photoinhibition for Sub-diffraction Photolithography," *Science* **324**, 913-917, 2009.
54. M. R. Ayres, R. R. McLeod, "Medium consumption in holographic memories," *Applied Optics* **48**, 3626-3637, 2009.
55. R. R. McLeod, "Impact of phase aberrations caused by multilayer optical data storage in weakly inhomogeneous media," *JOSA B* **26**, 308-317, 2009.
56. C. Ye, R. R. McLeod, "GRIN lens and lens array fabrication with diffusion-driven photopolymer," *Optics Letters* **33**, 2575-2577, 2008.
57. E. D. Moore, R. R. McLeod, "Correction of sampling errors due to laser tuning rate fluctuations in swept-wavelength interferometry," *Optics Express* **16**, 13139-13149, 2008. **Selected for co-publication in the Virtual Journal for Biomedical Optics, vol 3 (2008)**
58. R. R. McLeod, A. J. Daiber, T. Honda, M. E. McDonald, T. L. Robertson, T. Slagle, S. L. Sochava, and L. Hesselink, "Three-dimensional optical disk data storage via the localized alteration of a hologram," *Applied Optics* **47**, 2696-2707, 2008.
59. L. Gao, K. H. Wagner, R. R. McLeod, "All-Optical TBits/S 3R Wavelength Conversion Using Dispersion-Managed Light Bullets," *IEEE Journal of Selected Topics in Quantum Electronics* **14**, 625-634, 2008.
60. S. Kim, R. R. McLeod, M. Saffman, and K. H. Wagner, "Doppler-free, multiwavelength acousto-optic deflector for two-photon addressing arrays of Rb atoms in a quantum information processor," *Applied Optics* **47**, 1816-1831, 2008.
61. A. C. Sullivan and R. R. McLeod, "Tomographic reconstruction of weak, replicated index structures embedded in a volume," *Optics Express* **15**, 14202-14212, 2007.
62. A. C. Sullivan, M. W. Grabowski, R. R. McLeod, "Three-dimensional direct-write lithography into photopolymer," *Applied Optics* **46**, 295-301, 2007.
63. M. R. Ayres and R. R. McLeod, "Scanning transmission microscopy using a position-sensitive detector," *Applied Optics* **45**, 8410-8418, 2006.

64. R. R. McLeod and S. K. Walter, "Acousto-optic parallel read/write head for optical disk data storage," *Applied Optics* **45**, 7065-7072, 2006.
65. R. R. McLeod and T. Honda, "Improving the spectral resolution of wedged etalons and linear variable filters with incidence angle," *Optics Letters* **30**, 2647-2649, 2005.
66. R. R. McLeod, A. J. Daiber, M. E. McDonald, T. L. Robertson, T. Slagle, S. L. Sochava, and L. Hesselink, "Microholographic multilayer optical disk data storage," *Applied Optics* **44**, 3197-3207, 2005.
67. T. Honda, A.C. Liu, J. Valera, J. Colvin, K. Sawyer, R.R. McLeod, "Diffraction-compensated free-space WDM add-drop module with thin-film filters," *IEEE Photonics Technology Letters* **15**, 69 -71, 2003.
68. R. McLeod, S. Blair, and K. Wagner, "Variational approach to orthogonally-polarized optical soliton interaction with cubic and quintic nonlinearities", *Physica Scripta* **59**, 365-373, 1999.
69. R. McLeod, K. Wu, K. Wagner, and R.T. Weverka, "Acousto-optic photonic crossbar switch, Part I: Design", *Applied Optics* **35**, 6331-6353, 1996.
70. S. Blair, K. Wagner and R. McLeod, "Material figures-of-merit for spatial soliton interactions in the presence of absorption", *Journal of the Optical Society of America B* **13**, 2141-2153, 1996.
71. R. McLeod, K. Wagner and S. Blair, "3+1 dimensional optical soliton dragging logic", *Physical Review A* **52**, 3254-3278, 1995.
72. S. Blair, K. Wagner, R. McLeod, "Asymmetric spatial soliton dragging," *Optics Letters* **19**, 1943-1945, 1994.
73. M. J. Barth, R. R. McLeod, and R.W. Ziolkowski, "A near and far-field projection algorithm for finite-difference time-domain codes," *Journal of Electromagnetic Waves and Applications* **6**, 5-18, 1992.
74. A. Gautesen, R.W. Ziolkowski, and R.R. McLeod, "Solution to the Scattering of Electromagnetic Waves from a Dielectric Semi-Cylinder," *SIAM Journal on Applied Mathematics* **51**, p. 1556, 1991.

Peer-Reviewed Book Chapters

1. Shervin Shajiee, Lucy Y. Pao, and Robert R. McLeod, "Monitoring Ice Accumulation and Active De-icing Control of Wind Turbine Blades," in *Wind Turbine Control and Monitoring*, Ningsu Luo, Yolanda Vidal and Leonardo Acho (Editors), Springer, 2014.
2. R. R. McLeod, "Optical Disk Data Storage, Distribution and Retrieval," in *Encyclopedia of Computer Science and Engineering*, Benjamin W. Wah (Editor), Wiley, 2008.
3. T. Weverka, K. Wagner, R.R. McLeod, K. Wu, "Low-Loss Acousto-Optic Photonic Switch," in *Acousto-Optic Signal Processing*, Marcel Dekker, NY, 1994.

Patents

1. K. A. Payne, S. Bryant, V. Ferguson, N. Hadley-Miller, R. McLeod, "Biodegradable biomimetics of growth plate cartilage for the treatment of physical injuries," Filed November 8, 2017

2. G. J. Tearney, B. E. Bourma, J. A. Gardecki, L. Liu, R. R. McLeod, "Systems, Methods and Computer-Accessible Medium Which Provide Microscopic Images of at Least One Anatomical Structure at a Particular Resolution," US Patent 9,081,148 Jan 12, 2016
3. R. R. McLeod, A. Urness, M. Cole, E. Moore, "Liquid Deposition Photolithography," US Patent 9,034,568, May 19, 2015.
4. E.D. Moore, R. R. McLeod, "Spectral Phase Analysis For Precision Ranging," US Patent 9025160 May 5, 2015
5. R. R. McLeod, M. C. Cole, "Systems and methods for creating aberration-corrected gradient index lenses," US Patent 8,944,594, April 13, 2015.
6. R. R. McLeod, "Three-Dimensional Direct-Write Lithography," US Patent 8,895,233, Nov 25, 2014
7. R. R. McLeod, C. N. Bowman, T. F. Scott, A. C. Sullivan, "Diffraction Unlimited Photolithography," US Patent 8,697,346, April 15, 2014.
8. R. R. McLeod, Three-Dimensional Direct-Write Lithography, US Patent 8,597,871, Dec 3, 2013
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2. R.R. McLeod, “Mechanical and optical property modification via mass transport in photo-responsive polymer gels,” Frontiers of Photoactive Soft Matter 2017, Boulder Colorado
3. R. R. McLeod, A. C. Sullivan, D. J. Glugla, M. D. Alim, “Self-actuated origami via optically patterned photopolymer gels,” XXVI International Materials Research Congress, Cancun, Aug 21, 2017.
4. R. R. McLeod, “Multiple patterning lithography far beyond the diffraction limit,” 2016 Lithography Workshop, Kamuela, HI.
5. R. R. McLeod, “Control of photopolymer properties through structured illumination,” Photopolymerization: Past, Present and Future, Estes Park 2016
6. D. J. Glugla, R. R. McLeod, D. P. Nair, K. D. Byars, X. Mu, H. J. Qi, K. Maute, “Diffusive Photopolymer Structuring of RAFT Materials for Pre-Programmed Origami,” Materials Research Society Spring Meeting, 2014.
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79. K. Wagner, R. McLeod, "Spatial soliton dragging gates and light bullets," in *Optical Computing*, Vol. 7 of 1993 OSA Technical Digest Series (Optical Society of America, Washington, D.C., 1993), pp. 305–307.
80. R. Mcleod, R.T. Weverka, K.Y. Wu, K. Wagner, A. Mickelson, R. Roth, "Acoustooptic Crossbar Photonic Switch," *OSA Topical Mtg. on Photonics in Switching*, Palm Springs CA, March 1993.
81. R. R. McLeod, R. J. Hawkins, "Using the Finite Difference Time Domain Method as a Design Tool," *Integrated Photonics Research, OSA Technical Digest Series Vol. 10*, 38-39, paper MB17, New Orleans, LA, April 1992.
82. R. J. Hawkins, R. R. McLeod, J.S. Kallman, R.P. Ratowsky, M.D. Feit, J. A. Fleck, Jr., "New Directions in Photonics Simulations: Lanczos Recursion and Finite-Difference Time-Domain," *Seventh IMACS International Conference on Computer Methods for Partial Differential Equations*, New Brunswick, New Jersey, June 1992.
83. R. J. Hawkins and R. McLeod, "Finite-difference time-domain simulations of linear integrated photonic devices," *IEEE Antennas Propagation Society. International Symposium Digest*, vol. 1, 261., New York, July 1992,
84. R. McLeod, R.J. Hawkins, J.S. Kallman, "Simulation of planar integrated photonics devices with the LLNL time-domain finite-difference code suite," *Integrated Photonic Research/Gradient Index Optic System (IPR/GIOS) Workshop*, Monterey, CA, April 1991.
85. Barth, Marvin; Pennock, Steve; Ziolkowski, Richard; McLeod, R., "Modeling pulse driven antenna systems with finite differences," *6th Annual Review of Progress in Applied Computational Electromagnetics*, Monterey, CA, March 1990.

86. B. K. Cabral, G. W. Laguna, R. R. McLeod, S. L. Ray, S. T. Pennock, R. L. Berger, and M. F. Bland, "Interactive pre and post-processing tools for finite-difference time-domain codes," *IEEE Antennas and Propagation Society International Symposium*, 1098-1099, San Jose, CA, June 1989.
87. J.F. DeFord, G.D. Craig, R. McLeod, "The AMOS (Azimuthal Mode Simulator) Code," *Proceedings of the 1989 IEEE Particle Accelerator Conference*, 1181-1183, Chicago, IL, March 1989.
88. S. T. Pennock, R. R. McLeod, and H. G. Hudson, "Finite-difference time-domain modeling of electromagnetic radiation from an electron beam," *5th Annual Review of Progress in Applied Computational Electromagnetics*, volume 1, 360-372, Monterey, CA, March 1989.
89. R. R. McLeod, S. T. Pennock, and M. J. Barth, "Time domain analysis of waveguide fed antennas," in *Proceedings of the 1989 URSI Radio Science Meeting.*, p. 269, June 1989.
90. McLeod, R. R.; Berger, R. L.; Bacon, L. D. "Time domain modeling of electromagnetic coupling," *4th National Conference on High Power Microwave (HPM) Technology for Defense Applications*, Monterey, CA, May 1988.
91. McLeod, R. R.; Hudson, H. G.; King, R. J., "Magnitude and phase calibration of microwave sensors," *National Radio Science Meeting*, Boulder, CO, January 1986.
92. B.R. McLeod, R.R. McLeod, "Experimental Measurements on a large-scale Helmholtz Coil – Broken Bone Model," *5th Annual BRAGS*, Boston, Massachusetts, October 1985

Peer-Reviewed Conference Proceedings (in review)

Seminars and Tutorials

1. R. R. McLeod, "Structuring Material with Light: Photolithography Beyond Moore's Law," Montana State University College of Engineering Seminar, Bozeman, MT, Feb 2011.
2. R. R. McLeod, "Structuring Material with Light: Photolithography Beyond Moore's Law," Optical, Electronic and Quantum Systems Seminar, Boulder CO, Feb 2011.
3. R. R. McLeod, "3D optical manipulation of photopolymers," ICAM Summer School, Brisbane Australia, June 2010
4. R. R. McLeod, "3D single-mode, hybrid integrated optics in solid photopolymers," Fraunhofer Institute, Würzburg Germany, June 2010
5. R. R. McLeod, Susanna Orlic, "Microholographic recording", *Optical Data Storage Topical Meeting 2010*, Boulder, CO, May 2010
6. R. R. McLeod, Susanna Orlic, "Microholographic recording", *Optical Data Storage Topical Meeting 2009*, Lake Buena Vista, FL, May 2009
7. R. R. McLeod, "Two color lithography beyond the diffraction limit," CU IEEE Student Chapter, Boulder CO, May 2009
8. R. R. McLeod, C. Anderson, E. Moore, M. W. Grabowski, A. C. Sullivan, "Hybrid Integrated Photonics," on-site seminar, Lockheed Martin, Louisville, CO, May 2006.

9. R. R. McLeod, E. Moore, A. C. Sullivan, M. Grabowski, C. Anderson, "Hybrid Integrated Photonics in 3D Photopolymers: Integrating nanophotonics into complex systems," NIST Nanoscience and Applications Conference, Boulder, CO October 2005.
10. R. R. McLeod, "Hybrid Integrated Photonics in 3D Photopolymer," on-site seminar, Lawrence Livermore National Laboratory, Livermore, CA August 2005.
11. R. R. McLeod, "Hybrid Integrated Photonics in 3D Photopolymer," on-site seminar, Intel Corporation, San Jose, CA August 2005.
12. R. R. McLeod, "Hybrid Integrated Photonics," on-site seminar, JDS Uniphase, San Jose, CA, June 2004.
13. R. R. McLeod, "Hybrid Integrated Photonics Development at CU," on-site seminar, Coherent Technologies, Louisville, CO, October 2003.
14. "CDMA Search of holographic digital data storage," on-site seminar, StorageTek, Louisville, CO, October 2003.
15. R. R. McLeod, "Optical Data Storage and Communications Devices in 3D Photopolymers," Optical Sciences and Engineering Program Seminar, Boulder, CO, September 2003.
16. R. R. McLeod, "Next Generation Telecom Components", Stanford Center for Novel Opto-Electronic Materials Annual Meeting, Stanford, CA, September 2000.

Unclassified Government Reports

1. R. J. Hawkins, R.R. McLeod, J.S. Kallman, R.P. Ratowsky, M.D. Feit, J.A. Fleck Jr. "New directions in photonics simulation: Lanczos recursion and finite-difference time-domain," 1992.
2. R. R. McLeod, "Temporal scattering and reflection software users manual, version 2.3" Report UCRL-MA--104861-Ver.2-3, Lawrence Livermore National Laboratories, Livermore, CA, 1992.
3. J.F. Deford, G. D. Craig, R.R. McLeod, "The AMOS (Azimuthal Mode Simulator) wakefield code," Report UCRL-102731;CONF-900163—4, 1990.
4. R. R. McLeod, "Temporal scattering and reflection software, Users Manual," Report UCID-21637, Lawrence Livermore National Laboratories, Livermore, CA, 1989.
5. B.K. Cabral, G.W. Laguna, R.R. McLeod, S.L. Ray, S. T. Pennock, R.L. Berger, M.F. Bland, "Interactive pre- and post-processing tools for finite-difference time-domain codes," Report UCRL-100237; CONF-890660—11, 1989.
6. R.R. McLeod, R.L. Berger, L.D. Bacon, "Time domain modeling of electromagnetic coupling," Report UCRL-97831;CONF-8805132-14, 1989.
7. R.J. King, H.G. Hudson, R.R. McLeod, "EM laboratories for linear coupling," Report UCID-20954, 8 pages, Lawrence Livermore National Lab, Livermore, CA, 1987.
8. R.R. McLeod, H.G. Hudson, H.S. Cabayan, R.J. King, "Experiments in high power microwave susceptibility simulation issues," Report UCID-20851, 16 pages, Lawrence Livermore National Lab, Livermore, CA, 1986.
9. R.R. McLeod, H.G. Hudson, R.J. King, "Magnitude and phase calibration of microwave sensors," Report UCRL-95475;CONF-860198-1, 1986.

Research Grants and Contracts (University of Colorado only)

Research Equipment and Facilities Grants Awarded, (all as PI except where noted)

1. CU Provost and College of Engineering, "Office space and lab renovation", Total: \$21,408, Award Date May 2013.
2. National Science Foundation, "EAGER: Shared Materials Plotter for Organic Robotics," Total: \$30,000, Award Date Aug 2012
3. College of Engineering, "Expansion of Nanolithography Laboratories," Total: \$12,000, Award Date: June 2011.
4. CU Provost and College of Engineering, "Augmentation of Shared Nano-Scale Characterization Facility for Advanced Materials and Biological Systems," Total: \$80,000, Award Date: November, 2006, *Co-PI with Rafael Piestun*
5. CU Provost and College of Engineering, "Recirculated Chilled Water for Lasers in ECE and Optics Research and Teaching," \$260,000, Award Date: November 2006
6. Engineering Excellence Fund, "Undergraduate Optics Lab Computer and Remote Instrumentation," Total \$25,750, February 2006
7. CU College of Engineering: "Photopolymer Testing and Packaging," Total: \$15,000, Award date: March 2005.
8. ILX Lightwave University Donation Program: "Optical Circuits Lab Instrumentation," Total \$10,000, Award date: August 2005.
9. InPhase Technologies: "Optical data storage equipment donation", Total: \$53,000, Award date: January 2005
10. JDS Uniphase: "Integrated Optics Research Facility," Total: \$871,612, Award date: August 2003.

Research Grants and Contracts Awarded (all as PI except where noted)

1. CU Venture Partners Chancellor's Research Innovation Award, "Vitro3D - Biomimetic 3D Printed Scaffolds for Drug Discovery," PI, \$50K, Jan 2020 – Dec 2022
2. CU AB Nexus Program, "Biophysical Cues Governing Growth Plate Organization: A Computational & Experimental Approach," Co-I, 125K\$, Dec 2020 – Dec 2021
3. NIH NINDS R01 NS118188, "Optimization of a Minimally-Invasive Bidirectional Optogenetic Peripheral Nerve Interface with Single Axon Read-in & Read-out Specificity ", \$624K, Co-I, Sept 2020-Aug 2025
4. NSF 1935594, "SitS NSF-UKRI: Phytoelectronic Soil Sensing," \$800K, PI, Jan 2020 – Dec 2022
5. CU Research and Innovation Office, "Touchless stereolithography of 3D heterogeneous tissues within sealed microfabricated platforms to enable *in vitro* biomedical research," 50K\$, PI, July 2019 – Dec 2020
6. Quantum Explorations in Science & Technology, "Ultrastable spatial light modulators for quantum state assembly with neutral atoms and entanglement-assisted clocks," \$50,000, co-PI. Jan 2019 – Dec 2019

7. Lawrence Livermore National Lab, “Advanced Photopolymer Materials Engineering for Multiscale Additive Fabrication,” \$200,000, Dec 2018 – Nov 2021
8. Facebook Reality Labs, “High Performance Holographic Photopolymers,” \$1,555,000, Nov 2018 – Dec 2020
9. DoEd P200A180070 “Graduate Program in Soft Materials,” \$895,500, Oct 2018 – Sept 2021
10. NSF 1826454, “GOALI: Projection Stereolithography of Gradient Viscoelastic Polymer Nanocomposites,” \$399,199, Oct 2018 – Sept 2021
11. NIH, “Mechanically Stiff Hydrogels for Osteochondral Tissue Engineering,” \$462,486, co-PI, July 2016 – June 2019
12. NIH SPARC 1 OT2 OD023852-01, “Development of a Bidirectional Optogenetic Minimally Invasive Peripheral Nerve Interface with single axon read-in & read-out specificity,” \$120,699 (McLeod portion), co-PI, Oct 2017 – Sept 2019
13. NSF “MRI: Acquisition of a 4D High-Resolution X-Ray Micro-Computed Tomography System for the Rocky Mountain Region,” \$801,508, co-PI, Sept 2017 – Aug. 2018
14. Sandia National Labs, “Super-resolution Near UV Projection Lithography,” \$117,000, PI, Oct. 2017 – Sept 2019
15. NSF 1721055, “STTR Phase 1: On-demand optical printing of high-performance personalized eyeglass lenses,” \$100,000, PI, July 2017 – June 2018.
16. CU Innovative Seed Grant Program, “Liquid Crystal Polymer masks: A new optical element,” \$50,000, July 2016 – June 2017
17. Photopolymerizations Center, “Improving 3D Photocured Systems,” \$35,000, Jan 2016 – Dec 2018
18. Colorado Advanced Industries Accelerator Program, “High Throughput Additive Manufacturing,” \$100,000, Feb 2016 – Jan 2018
19. National Science Foundation, “Precision Organic Electrochemical Transistors for Single-Cell Electrophysiology,” \$389,985, June 2015 – May 2018
20. Konica Minolta, “Modeling of Holographic Photopolymers,” \$80,000, co-PI with Christopher Bowman, Aug 14 – July 15
21. National Science Foundation, “MRSEC: Soft Materials Research Center,” \$12,000,000, McLeod portion \$772,000. Nov 2014 – Oct 2020. *Co-investigator.*
22. National Science Foundation, “GOALI: Two-photon optical origami of intraocular lenses,” \$75,000, Aug 2014 – July 2015.
23. NIH SBIR, “Three Dimensional Living Neural Networks,” Grant # 1R43MH102946-01, \$116,357, Duration: July 2014 – June 2016
24. CU Innovative Seed Grant Program (Steve George, PI), “High Resolution Lithography using Molecular Layer Deposition with Photoremovable Protecting Groups,” \$50,000, Duration: July 2013 – June 2014.
25. National Science Foundation, “STTR Phase 1: Multistatic Spectral Interferometry for Precision Profilometry,” \$37,192, Jan 2013 – June 2013.
26. National Science Foundation, “GOALI: Holographic Passive Solar Concentration and Lighting,” \$375,000, Aug 2013 – July 2016.
27. Oracle Corporation, “Super Resolution Optical Storage,” \$200,000. 2012-2015

28. National Science Foundation, "EFRI-ODISSEI: Photo-Origami," Total \$2,000,000, McLeod portion: \$465,116, Duration Aug 2012 – July 2016
29. National Science Foundation, "TECP: 3D Lithography of Thick Photopolymers for Imaging and Photonic Crystal Waveguides," Total: \$38,375, Duration Aug 2012 – Jan 2013
30. Department of Education Graduate Assistance in Areas of National Need, "Graduate Program in Functional Materials," \$666,330, Duration Aug 2012 – Aug 2015, award number P200A120063.
31. National Science Foundation, "GOALI supplement: 3D Optoelectronic Devices Fabricated via 2-Color Photo-Inhibition/Initiation Lithography," \$75,000, Duration July 2012 – June 2013
32. CU Innovative Seed Grant Program, "Micro-fabrication of Living Systems," \$44,000, Duration: July 2011 – June 2012.
33. National Institutes of Health, "R01: Natural History of Vulnerable Coronary Plaques," subcontract to the Massachusetts General Hospital, total \$231,257, Duration: Feb 2011 – Jan 2014
34. National Science Foundation, "SBIR/STTR and ERC Collaboration: 3D Lithography of Thick Photopolymers for Imaging and Photonic Crystal Waveguides," Total \$69,968, Duration: July 2010 – July 2012
35. National Science Foundation, "SBIR Phase I: Structural properties of carbon nanotube polymer composites," Phase I Total: \$50,000, Duration: July 2010 – June 2011
36. Center for Research and Education in Wind, "Feasibility Study of Control of Novel Active Coating Materials for Preventing Icing on Wind Turbine Blades," \$40,000, Duration: June 2010 – May 2011, *Co-PI with Lucy Pao*
37. National Science Foundation, "CAREER: 3D optoelectronic devices fabricated via 2-color photo-inhibition/initiation lithography," \$400,000, Duration: Feb 2010 – Jan 2015. REU Supplement of \$6,000. Duration: May 2011 – April 2012.
38. Intel Corporation, "Plastic PHY Interconnect Technology Phase II," Total: \$462,281, Duration: Nov 2009 – Oct 2012
39. Air Force Office of Scientific Research MURI, "Polymeric Optical Sensor Meshes and Composite Meta-Materials," \$745,500, Duration: Sept 2009 – Aug 2014
40. CU Innovative Seed Grant Program (Lucy Pao, PI), "High - Speed Precision Motion Control for Near - Field Optical Microscopy and Lithography," \$43,500, Duration: Sept 2008 – May 2011.
41. National Science Foundation, "3D Lithography of Thick Photopolymers for Imaging and Photonic Crystal Waveguides," Phase II Total: \$250,000, matched with \$20,000 gift from prime contractor. REU Supplement of 6000\$. Duration: July 2008 – Aug 2010
42. National Science Foundation, "3D Lithography of Thick Photopolymers for Imaging and Photonic Crystal Waveguides," Phase IB Total: \$25,000, matched with \$50,000 gift from prime contractor. Duration: January 2008 – June 2008
43. National Science Foundation, "Hybrid integrated optoelectronic systems," Phase II Total: \$250,000, matched with \$38,217 of CU funds. REU Supplement of 6000\$. Duration: January 2008 – Dec 2009.

44. CU Innovative Seed Grant Program, “Diffraction Unlimited Photolithography,” \$49,926, Duration: July 2007 – July 2008.
45. CU Tech Transfer Office, “Tape casting of high performance polymer optical imaging arrays,” \$24,964, Duration: June 2007 – November 2007.
46. National Science Foundation, “Hybrid integrated optoelectronic systems,” Phase IB Total: \$25,000, Duration: January 2007 – June 2007.
47. National Science Foundation, “3D Lithography of Thick Photopolymers for Imaging and Photonic Crystal Waveguides,” Phase I Total: \$89,921. Duration: January 2007 – December 2007
48. National Science Foundation, “Hybrid RF/Optical ICs for High-Bandwidth Spread-Spectrum Communications,” Total: \$499,996, Co-PIs Z. Popovic and D. Anderson, McLeod portion: \$432,808, REU Supplement of \$6,000. Duration: January 2007 – December 2010.
49. Intel Corporation, “Plastic PHY Interconnect Technology,” Total: \$231,000, Duration: August 2006 – July 2009
50. dBm Optics, “Design of system and development of algorithms for interferometric measurement of chromatic dispersion and polarization mode dispersion,” Total: \$25,000, May 2006 – December 2007
51. National Science Foundation, “Hybrid integrated optoelectronic systems,” Phase I Total: \$50,000, Duration: January 2006 – December 2006.
52. Science Applications International Corporation, “Parallel Polymer Waveguide Array Development,” Total: \$50,000, Duration: July 2005 – December 2006.
53. Engineering Excellence Fund, “Optical Circuits Lab Instrumentation,” Total: \$15,000, Duration: July 2005 – July 2007
54. CU Council on Research and Creative Work, “Imaging via Flexible Polymer Fiber Arrays,” Total: \$7,000, Duration: May 2005 – May 2006
55. US Army Medical Research and Materiel Command, “Innovative portable human computer interface system for performance monitoring prediction and eye movement robotic control,” Phase I Total: \$39,899, Duration: January 2005 – October 2005
56. CU Council on Research and Creative Work, “Hybrid Integrated Photonics,” Total: \$5,000, Duration: July 2004 – July 2005
57. Colorado Center for Information Storage, “Parallel Track and Layer Read/Write Head for Optical Disks,” Total: \$64,963, Duration: July 2004 – July 2005
58. StorageTek, Inc, “CDMA Search of Holographic Databases,” Total: \$40,867, Duration: January 2004 – January 2005
59. Philip Anthony Charitable Trust, “Hybrid Integrated Photonics,” Total: \$50,000, Duration: January 2004 – January 2005

Graduate student advising

Graduated students

1. Benjamin Kowalski, Doctor of Philosophy in Electrical Engineering 2014, *Quantitative Modeling of the reaction/diffusion kinetics of two-chemistry photopolymers*

2. Darren Forman, Doctor of Philosophy in Electrical Engineering 2014, *Photoinhibition superresolution lithography*
3. Anna Linnenberger, Doctor of Philosophy in Electrical Engineering 2014, *Live cell lithography and non-invasive mapping of neural networks*, now with Meadowlark Optics
4. Adam Urness, Doctor of Philosophy in Electrical Engineering 2012, *Liquid Deposition Photolithography for Efficient Three Dimensional Structuring*, now with Akonia Holographics
5. Chunfang Ye, Doctor of Philosophy in Electrical Engineering 2012, *Three-dimensional Gradient Index Optics Fabricated in Diffusive Photopolymers*
6. Eric D. Moore, Doctor of Philosophy in Electrical Engineering, *Advances in Swept-Wavelength Interferometry for Precision Measurements*, University of Colorado, May 2011. Co-Founder of Chiaro Technologies.
7. Pat Wagner, M.S. in Electrical Engineering
8. Amy C. Sullivan, Doctor of Philosophy in Physics, *Tomographic Characterization of Volume Photopolymers for Integrated Optics*, University of Colorado, May 2008.
9. Mark R. Ayres, Doctor of Philosophy in Electrical Engineering, *Signal Modulation for Holographic Memories*, University of Colorado, Dec 2007. Now Founder of Akonia Holographics, Longmont Colorado.
10. Charles D. Anderson, Master of Science in Electrical Engineering, *Photopolymer waveguide to fiber coupling via 3D direct-write lithography*, University of Colorado, August 2006. Now at Research Electro-optics, Boulder.
11. Sarah K. Walter, Master of Science in Electrical Engineering, *Parallel read/write system for optical data storage*, University of Colorado, May 2005. Technical Sales Manager at Encoder Products Company, Sagle, ID.

Postdoctoral scholars

1. Kimberly Urness, 2014 – 2015. Now at NIST, Boulder.
2. Adam Urness, 2012-2014. Now with Akonia Holographics
3. Eric Moore, 7/11-6/12. Now Founder of Chiaro Technologies, Boulder.
4. Martha-Elizabeth Baylor, 8/1/08 –6/30/10. Now an Assistant Professor of Physics, Carlton College.
5. Timothy Scott (co-advised with Dr. Christopher Bowman). 6/07 – 7/08, Topic: *Diffraction unlimited photolithography*. Now an Assistant Research Professor of Chemical Engineering, Michigan

Current graduate students

1. Martha Bodine, Ph.D. in Electrical Engineering
2. Callie Fiedler, Ph.D. in Electrical Engineering
3. Jake Friedlein, Ph.D. in Electrical Engineering
4. David Glugla, Ph.D. in Electrical Engineering
5. Marvin Alim, Ph.D. in Materials Science and Engineering
6. David Miller, Ph.D. in Electrical Engineering
7. Charles Rackson, Ph.D. in Electrical Engineering

Ph.D. student research rotations hosted (outcome)

1. Libby Heeb, Ph.D. Chemistry, Topic: *Thiol-ene polymers for volume phase lithography*, Fall 2004
2. Eric Moore, Ph.D. ECE, Topic: *3D parallel waveguide arrays in photopolymer*, Fall 2004. **(Two conference presentations including one Best Poster award)**
3. David Goldstein, Ph.D. Chemistry, Topic: *Measurement of Polymerization Kinetics of thiol-ene photopolymers* Spring 2005
4. Laura Haynes, Ph.D. Chemistry, Topic: *2D and 3D waveguide arrays in photopolymer*, Fall 2005
5. Kimberly Kester, Ph.D. Chemistry, Topic: *Termination kinetics for optimization of thiol-ene polymerization*, Fall 2005
6. Matthew Kirchner, Ph.D. Physics, Topic: *Parallel-write waveguide to fiber coupling in volume photopolymers*, Fall 2006 **(Three conference presentations including one Best Paper award).**
7. Kristen Vogelhuber, Ph.D. Chemistry, Topic: *Holographic metrology of epoxy-based volume photopolymers*, Spring 2007
8. Greg Berman, Ph.D. ECE, Topic: *Diffraction Unlimited Lithography*, Spring 2007
9. Michael Gleeson, Ph.D. EE University College Dublin, Topic: *Photopolymer waveguide integration with thin film filters*, Fall 2007. **(One conference presentation & JOSA publication)**
10. April Kloxin, Ph.D. Chemical and Biological Engineering, Topic: *3D patterning of hydrogel tissue scaffolds*, Fall 2007. **(Science publication: DOI: 10.1126/science.1169494)**
11. Seyitriza Tigrek, Ph. D. Mechanical Engineering, Topic: *Tape casting of photopolymer waveguide arrays*, Summer 2007
12. Adam Urness, Ph. D. ECE, Topic: *Microstereolithography of photopolymer index structures*, Fall 2007 – Summer 2008.
13. Matthew Titus, Ph.D. ECE Topic: *Tape casting of photopolymer waveguide arrays*, Fall 2007
14. Ginni Sharma, Ph.D. ECE, Topic: *Antiresonant optical waveguides in 3D photopolymer*, Spring/Summer 2008.
15. Eric Dudley, Ph.D. ECE, Topic: *Solid Immersion Optics for lithography*, Fall 2008.
16. Betsy Hall, Ph.D. ECE, Topic: *Optical Diffraction Tomography and Photopolymer Materials Optimization*, Fall 2008.
17. Qing Chao, Ph.D. ECE, Topic: *3D Polymer Hybrid Circuits*, Fall 2008.
18. Sebastian Köber, Ph.D in Physical Chemistry, University of Cologne, Topic: *Photorefractive Polymers*, Fall 2008-Spring 2009.
19. Kevin Zekis, Ph.D ECE, Topic: *Photo-initiation/photo-termination for 3D index polymer distributions in a host matrix*. Fall 2009.
20. Farhad Majdteimouri, M.S. ECE, Topic: *Polymer waveguide Bragg grating sensor arrays*. Summer 2009
21. Kevin Gemp, Ph.D. ECE, Topic: *Analysis of novel photopolymerizable materials*
22. Darren Forman, Ph.D. ECE, Topic: *Swept-wavelength interferometry of 3D polymer waveguide arrays and Bragg gratings*. Spring 2010.

23. Dawei Liu, Ph.D. ECE, Topic: *Performance of polymer waveguide to single-mode fiber interconnects*, Spring 2011

Undergraduate research associates 2003-present: Mrnal Shukla (DLA), Devin Mayer, Wei-Chu Liao (DLA), Wei-Shen Liao (DLA), Ben Mauser, Matanya Horowitz, John Chen, Dominic Boiko, David Jorgensen (DLA), Filip Maksimovic, Takako Hirokawa, Robert Boyne (DLA), Niket Sheth (DLA), Drew Schiltz (REU), Gregory Scranton (REU), Seth Miers.

Pre-college research associates: John Chen (SURE program)

Teaching

Courses taught

1. ECEN 2250, *Circuits I*
Fall 08
2. ECEN 3400, *Electromagnetic Fields and Waves*
Fall 2005
3. **Developed:** ECEN 4606, *Undergraduate Optics Lab*
Spring 07, Fall 09, Fall 12, Spring 13
4. ECEN 4616/5616, *Optoelectronic System Design*
Fall 03, Spring 05, Fall 06, Fall 07, Spring 12
5. ECEN 5606, *Advanced Optics Lab*
Spring 04, Spring 14
6. ECEN 4606/5166, *Guided Wave Optics*
Spring 06, Spring 10
7. **Developed:** ECEN 6006, *Numerical Methods in Photonics*
Fall 04, Spring 07, Spring 09, Fall 11, Spring 15
8. **Redeveloped:** ECEN 1400, *Introduction to Analog and Digital Electronics*
Fall 12, Fall 13, Fall 14

Faculty Course Questionnaire Results (all out of 6.0)

| Term | ECEN Title | Students | Course | Instructor |
|-----------------------------------|--------------------------------------|--------------------------------------|------------|------------|
| 2003 Fall | 5616 OE System Design | 14 | 5.4 | 5.9 |
| 2004 | Spring 5606 Advanced Optics Lab | 28 | 5.1 | 4.9 |
| | Fall 6006 Numerical Methods | 11 | 5.7 | 5.9 |
| 2005 | Spring 5616 OE System Design | 8 | 5.6 | 5.8 |
| | Fall 3400 EM fields & waves | 56 | 5.5 | 5.9 |
| 2006 | Spring 4006 Guided wave optics | 2 | 6 | 6 |
| | Fall 5166 | 4 | 5.4 | 6 |
| | Fall 5616 OE System Design | 27 | 5.3 | 5.6 |
| 2007 | Spring 4606 UG Optics Lab | 22 | 5.4 | 5.8 |
| | Fall 6006 Numerical Methods | 8 | 5.1 | 5.6 |
| | Fall 5616 OE System Design | 17 | 5.7 | 5.7 |
| 2008 | Spring | Faculty Fellowship | | |
| | Fall 2250 Circuits/Electronics 1 | 97 | 4.6 | 5.1 |
| 2009 | Spring 6006 Numerical Methods | 12 | 5.7 | 5.9 |
| | Fall 4606 UG Optics Lab | 14 | 5.2 | 5.6 |
| 2010 | Spring 5166 Guided wave optics | 7 | 4.8 | 5.5 |
| | Fall | Sabbatical | | |
| 2011 | Spring | Sabbatical | | |
| | Fall 6006 Numerical Methods | 10 | 5.6 | 5.6 |
| 2012 | Spring 4/5616 OE System Design | 21 | 5.1 | 5.3 |
| | Fall 1400 Intro to A&D Electron. | 76 | 4.7 | 4.8 |
| | Fall 4606 UG Optics Lab | 16 | 4.6 | 5.6 |
| 2013 | Spring 6006 Optics and Cellular Biol | 4 | 6 | 6 |
| | Fall 1400 Intro to A&D Electron. | 84 | 5.2 | 5.3 |
| | Fall 4606 UG Optics Lab | 9 | 5.5 | 5.5 |
| 2014 | Spring 5606 Advanced Optics Lab | <i>No individual faculty ratings</i> | | |
| | Fall 1400 Intro to A&D Electron. | 78 | 5.2 | 5.4 |
| 2015 Spring | 6006 Numerical Methods | 7 | 5 | 5.6 |
| Undergrad weighted average | | | 5.0 | 5.3 |
| Graduate weighted average | | | 5.4 | 5.7 |

Notes:

- Upper division undergrad course and instructor ratings are **0.7** and **0.9** standard deviations above the mean for tenure track professors in the College of Engineering
- Graduate course and instructor ratings are **0.7** and **0.9** standard deviations above the mean for tenure track professors in the College of Engineering
- ECEN 5606 in Spring 04 and Spring 14 was co-taught and no individual scores were collected. This course is not included in the weighted averages.

Professional Service

External

1. **Topical Editor**, Optics Letters, (2013-2019).
2. **Program Committee Member**, SPIE Advanced Fabrication Technologies for Micro/Nano Optics and Photonics Conference, (2010-present).
3. **Guest Editor**, “Advances in Optical Materials and Devices” in Physics Research International, (2011).
4. **Advisory Committee Chair**, IEEE/OSA/SPIE Optical Data Storage Conference, (2011).
5. **General Chair** IEEE/OSA/SPIE Optical Data Storage Conference, (2010).
6. **Program Committee Co-Chair** (with In-Ho Choi, LG Electronics), IEEE/OSA/SPIE Optical Data Storage Conference, (2009).
7. **Faculty Tenure Evaluation**, (name withheld) (2009).
8. **Technical Program Committee** Member and Session Chair, IEEE/OSA/SPIE Optical Data Storage Conference, (2005-2008).
9. **General Co-chair** (with Susanna Orlic, Technische Universitaet Berlin), SPIE Organic Holographic Materials and Applications Conference, (2007-2009).
10. **Technical Program Committee** Member and Session Chair, SPIE Organic Holographic Materials and Applications Conference, (2004-2008).
11. **Panel Member**, NSF Proposal Review, ECCS, (2005, 2009).
12. **Resource Volunteer** to science teachers in Colorado disadvantaged schools through the NSF/OSA/SPIE/MESA Hands On Optics program, (2005-2008).
13. **Board of Directors** Member, Colorado Photonics Industry Association, (2004-2010).
14. **General Chair**, SPIE/CPIA Photonics Research in Colorado Annual Meeting, (2004-2009).
15. **Technical Program Committee Member**, IEEE LEOS Workshop on Fiber Optic Passive Components, (2002).
16. **Reviewer** for: Nature, Applied Optics, Journal of Quantum Electronics, Optics Communications, Optics Letters, Optics Express, Journal of Applied Physics A & B, Journal of Communications, Journal of Polymer Science A, Computer Methods and Programs in Biomedicine, Materials, Advanced Optical Materials, ASME Journal of Mechanical Design, Applied Science, the DOE SBIR program, Research Corporation for Scientific Advancement

Internal

1. **Graduate Director and Executive Committee Member**, ECEE Department, (2012-present)
2. **Fellow, Executive Committee Member and Graduate Director**, Materials Science and Engineering Program (2012-present)
3. **Chair**, ad-hoc hiring committee for RASEI faculty hire. (2013).
4. **Member**, Search Committees for ECEE office administrator and accountant. (2013).
5. **Member**, Search Committee in Bioengineering, ECEE department (2012).
6. **Member**, Future Leaders Advisory Group (FLAG), College of Engineering (2011-).
7. **Member**, Office of Contracts and Grants oversight committee (2011-2013)

8. **Member**, Search Committee in Manufacturing, ME department (2012).
9. **Member**, Search Committee in Materials, MSE program (2012-2013)
10. **Member**, Search Committee for second college research administrator, (2009).
11. **Chair**, Optics prelim exam, (2009, 2011).
12. **Member**, Search Committee for three junior optics faculty, (2008-2009).
13. **Chair**, graduate recruiting for optics, 2008
14. **Member**, Search Committee for junior nano/optics faculty, (2007-2008).
15. **Member**, Search Committee for college grants administrator, (2007).
16. **Member**, Search Committee for two junior materials faculty, (2007-2008).
17. **Director**, Colorado Center for Information Storage, (2006-2007).
18. **Member**, Search Committee for senior optics faculty, (2006).
19. **Chair**, Campus-wide Optics Initiative Strategy Committee, (2006).
20. **Member**, College Nano Characterization Facility advisory board, (2006-2007).
21. **Member**, ECE Executive Committee, (2005-2007 and 2012-present)
22. **Member**, NSF I/UCRC Photopolymerization Center, (2004-present).
23. **Member**, Executive Committee for Hybrid Signal Electronics GAANN fellowship program, (2004-2008) and Functional Materials GAANN (2012-present)
24. **Faculty Reappointment Evaluation**, (name withheld) (2004).
25. **Co-chair** of Optics, Materials, Devices and Solid State prelim exam (2003, 2005)
26. **Member**, Optical Sciences and Engineering Program, (2003-2008).
27. **Member or Chair** of >50 graduate student committees in ECEE, Mech. E, Chem. E, and Physics, EE Dublin Ireland (2003-present).

Professional Memberships

1. **Optical Society of America (OSA)**
2. **Society of Photo-Optical Instrumentation Engineers (SPIE)**
3. **Materials Research Society (MRS)**
4. **Institute of Electrical and Electronics Engineers (IEEE)**