

## Robert R. McLeod

Director, Materials Science and Engineering Program  
 Richard and Joy Dorf Endowed Professor of  
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### Contact Information

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### Education

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

2017-	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

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 (citations from Scholar)

1. J. T. Friedlein, R. R. McLeod, J. Rivnay, "Device Physics of Organic Electrochemical Transistors," *Organic Electronics* **63**, pp. 398-414, 2018.
2. 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.
3. 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.
4. 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.

5. 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.
6. 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 ( $\Delta n$ ) two-stage photopolymers via enhanced solubility of a high refractive index acrylate writing monomer," *ACS Applied Materials & Interfaces* **10**, pp. 1217-1224, 2018.
7. 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
8. 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
9. 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)
10. 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
11. 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
12. 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
13. 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.
14. B. A. Kowalski, R. R. McLeod, "Design concepts for diffusive holographic photopolymers," *J. Polymer Science Part B: Polymer Physics* **54**, 1021-1035, 2016
15. M. I. Bodine, R. R. McLeod, "Superresolved swept wavelength interferometry using frequency estimation methods," *Optics Letters* **41**, 159-162, 2016
16. 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.
17. 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.
  18. 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.
  19. 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.
  20. 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.
  21. R. R. McLeod and K. H. Wagner, “Vector Fourier Optics of Anisotropic Materials,” *Advances in Optics and Photonics* **6**, pp. 368-412 ,2014.
  22. S. Shajjee, 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.
  23. 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.
  24. (21) 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.
  25. (3) 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.
  26. (2) 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).**
  27. 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.
  28. (7) 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.
  29. (6) 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.
30. (1) 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.
31. (52) 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.
32. (5) 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.
33. (4) 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.
34. (65) 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.
35. (206) 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.
36. M. R. Ayres, R. R. McLeod, "Medium consumption in holographic memories," *Applied Optics* **48**, 3626-3637, 2009.
37. (7) R. R. McLeod, "Impact of phase aberrations caused by multilayer optical data storage in weakly inhomogeneous media," *JOSA B* **26**, 308-317, 2009.
38. (48) C. Ye, R. R. McLeod, "GRIN lens and lens array fabrication with diffusion-driven photopolymer," *Optics Letters* **33**, 2575-2577, 2008.
39. (39) 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)**
40. (8) 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.
41. (4) 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.
42. (5) 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.
43. (7) A. C. Sullivan and R. R. McLeod, "Tomographic reconstruction of weak, replicated index structures embedded in a volume," *Optics Express* **15**, 14202-14212, 2007.

44. (75) A. C. Sullivan, M. W. Grabowski, R. R. McLeod, "Three-dimensional direct-write lithography into photopolymer," *Applied Optics* **46**, 295-301, 2007.
45. (11) M. R. Ayres and R. R. McLeod, "Scanning transmission microscopy using a position-sensitive detector," *Applied Optics* **45**, 8410-8418, 2006.
46. (2) R. R. McLeod and S. K. Walter, "Acousto-optic parallel read/write head for optical disk data storage," *Applied Optics* **45**, 7065-7072, 2006.
47. (20) 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.
48. (160) 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.
49. (12) 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.
50. (6) 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.
51. (10) R. McLeod, K. Wu, K. Wagner, and R.T. Weverka, "Acousto-optic photonic crossbar switch, Part I: Design", *Applied Optics* **35**, 6331-6353, 1996.
52. (29) 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.
53. (149) R. McLeod, K. Wagner and S. Blair, "3+1 dimensional optical soliton dragging logic", *Physical Review A* **52**, 3254-3278, 1995.
54. (42) S. Blair, K. Wagner, R. McLeod, "Asymmetric spatial soliton dragging," *Optics Letters* **19**, 1943-1945, 1994.
55. (33) 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.
56. (1) 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 (citations from Scholar)

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. (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. (13) 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 (citations from Scholar)**

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
9. E. D. Moore, R. R. McLeod, "System and method for correcting sampling errors associated with radiation source tuning rate fluctuations in swept-wavelength interferometry," US Patent 8,392,138, March 5, 2013.
10. Guillermo J Tearney, Brett E Bouma, Joseph A Gardecki, Linbo Liu, Robert R McLeod, "System, methods and computer-accessible medium which provide microscopic images of at least one anatomical structure at a particular resolution," EP 2542153, Jan 9, 2013
11. L. Hesselink, R.R. McLeod, S.L. Sochava, W. Phillips, EP 1051667, "Optical data storage by selective localized alteration of a format hologram," Dec 9, 2009.
12. (3) P. E. X. de Silveira, R. R. McLeod, US Patent 7,292,516, "Sensor optimized for phase detection in page-based optical data storage," November 6, 2007
13. R. R. McLeod, E. D. Moore, US Patent 7,212,723, "Monolithic Waveguide Arrays", May 1, 2007.
14. (8) J. Shen, R. R. McLeod, D. E. Crafts, B. Fondeur, Y. Ding, P-C Sun, US Patent 7,035,505, "Optical performance monitor," April 25, 2006
15. (2) S. P. Weaver, R. R. McLeod, K. R. Curtis, A. J. Hill, US 20060082850, "Covert surface relief hologram design, fabrication and optical reconstruction for security applications," April 20, 2006.
16. S. P. Weaver, R. McLeod, K. R. Curtis, A. J. Hill, EP 1647415, "Surface relief holographic recording medium and optical system for its reading," May 19, 2006
17. (1) T. Honda, R. R. McLeod, US Patent 7,031,610, "Diffraction-compensated integrated WDM," April 18, 2006



18. (1) S. P. Weaver, R. R. McLeod, K. R. Curtis, A. J. Hill, US 20050248817, "Covert hologram design, fabrication and optical reconstruction for security applications," Nov 10, 2005.
19. (1) B.L. Heffner; R. McLeod, US Patent 6,765,665 , "Optical bit rate detector," July 20, 2004
20. R. R. McLeod, W.H. Loh, US Patent App. 10/295,365, "Optical channel monitoring device," May 20, 2004
21. (10) L. Hesselink, R.R. McLeod, S.L. Sochava, US Patent 6,614,741, "Optical data storage by selective localized alteration of a format hologram in a holographic storage disk," Sept 2, 2003
22. (6) R. R. McLeod, G. Lei, L. Yang, K. Tai, US 20030098982, "Truncated series-based resonant cavity interferometer," May 29, 2003
23. (27) M. McDonald, R. McLeod A. Daiber, US Patent 6,563,779, "Tracking error signal generation using confocally filtered detection", May 13, 2003
24. (63) A. Daiber, R. McLeod, R. Snyder, US Patent 6,549,664, "Sparse modulation codes for holographic data storage", April 15, 2003
25. (4) X.D. He, R. McLeod, H.W. Mao, Q. Guo, K. Tai, K.W. Chang, US Patent 6,545,805, "Polarization-dependent retroreflection mirror device", April 8, 2003
26. (24) M. Lipson, S. Sochava, L. Hesselink; B. Cumpston, R. McLeod, C. Claude, US Patent 6,512,606, "Device comprising photopolymer medium with recorded format hologram, including data writing polymerization initiator comprising light absorbing nanoparticles which initiate thermal chemistry, for permitting data writing over hologram", Jan 28, 2003
27. (11) R. McLeod, A. Cohen, US Patent 6,437,916, "Strain-stabilized birefringent crystal", Aug 20, 2002
28. R. McLeod, A. Cohen, EP 1197764, "Strain-stabilized birefringent crystal", May 17, 2002.
29. (57) A. Daiber, R. McLeod, T. Honda, US Patent 6,322,933, "Volumetric track definition for data storage media used to record data by selective alteration of a format hologram", Nov 27, 2001
30. (12) M. McDonald, R. McLeod, US Patent 6,288,986, "Focus error signal generation using a birefringent plate with confocal detection", Sept 11, 2001
31. (1) M. McDonald, R. McLeod, US Patent 6,269,057, "Focus error signal generation using a birefringent lens with confocal detection", July 31, 2001
32. (6) R. McLeod, US Patent 6,256,271, "Focus error signal generation using two polarizers in confocal configuration", Jul. 3, 2001
33. (29) L. Hesselink, R. McLeod, S. Sochava, W. Phillips, US Patent 6,212,148, "Optical data storage by selective localized alteration of a format hologram", Apr. 3, 2001
34. (27) R. McLeod, M. McDonald, US Patent 6,111,828, "Focus error signal generation using confocally filtered detection", Aug. 29, 2000
35. (18) R. McLeod, M. McDonald, WO 2000042607, "Focus error signal generation using confocally filtered detection", July 21, 2000.

36. (29) R. McLeod, S. Sochava, A. Daiber, M. McDonald, L. Hesselink, I. Sander, T. Slagle, US Patent 6,020,985, "Multilayer reflection microhologram storage in tape media", Feb. 1, 2000
37. (11) L. Hesselink, R. McLeod, S. Sochava, W. Phillips, WO 1999039248, "Optical data storage by selective localized alteration of a format hologram", Aug 6, 1999.

### Patents, Pending

38. H. Schaub, K. Maute, R. McLeod, D.F. Moorer, Jr., "Electrostatic Lightweight and Deployable Spacecraft Structures," US Patent filed May 12, 2010

### Invited Conference Presentations

1. R.R. McLeod, "Micron-scale stereolithography of cytocompatible hydrogels," Photopolymerization Fundamentals 2017, Boulder Colorado
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. K. Maute, "Diffusive Photopolymer Structuring of RAFT Materials for Pre-Programmed Origami," Materials Research Society Spring Meeting, 2014.
7. R. R. McLeod, B. A. Kowalski, and M. R. Cole, "Rational design of photopolymer materials for holographic data storage," presented at the 2013 IEEE Photonics Conference (IPC), pp. 661–662. 2013.
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### 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
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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.
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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. 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
2. Lawrence Livermore National Lab, "Advanced Photopolymer Materials Engineering for Multiscale Additive Fabrication," \$200,000, Dec 2018 – Nov 2021
3. Facebook Research Labs, "High Performance Holographic Photopolymers," \$1,555,000, Nov 2018 – April 2020

4. DoEd P200A180070 “Graduate Program in Soft Materials,” \$895,500, Oct 2018 – Sept 2021
5. NSF 1826454, “GOALI: Projection Stereolithography of Gradient Viscoelastic Polymer Nanocomposites,” \$399,199, Oct 2018 – Sept 2021
6. NIH, “Mechanically Stiff Hydrogels for Osteochondral Tissue Engineering,” \$462,486, co-PI, July 2016 – June 2019
7. NIH, “Minimally Invasive Peripheral Nerve Interface with Single Axon Read-In & Read-Out Specificity,” \$120,699 (McLeod portion), co-PI, Oct 2017 – Sept 2019
8. 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
9. Sandia National Labs, “Super-resolution Near UV Projection Lithography,” \$117,000, PI, Oct. 2017 – Sept 2019
10. NSF 1721055, “STTR Phase 1: On-demand optical printing of high-performance personalized eyeglass lenses,” \$100,000, PI, July 2017 – June 2018.
11. CU Innovative Seed Grant Program, “Liquid Crystal Polymer masks: A new optical element,” \$50,000, July 2016 – June 2017
12. Photopolymerizations Center, “Improving 3D Photocured Systems,” \$35,000, Jan 2016 – Dec 2018
13. Colorado Advanced Industries Accelerator Program, “High Throughput Additive Manufacturing,” \$100,000, Feb 2016 – Jan 2018
14. National Science Foundation, “Precision Organic Electrochemical Transistors for Single-Cell Electrophysiology,” \$389,985, June 2015 – May 2018
15. Konica Minolta, “Modeling of Holographic Photopolymers,” \$80,000, co-PI with Christopher Bowman, Aug 14 – July 15
16. National Science Foundation, “MRSEC: Soft Materials Research Center,” \$12,000,000, McLeod portion \$772,000. Nov 2014 – Oct 2020. *Co-investigator.*
17. National Science Foundation, “GOALI: Two-photon optical origami of intraocular lenses,” \$75,000, Aug 2014 – July 2015.
18. NIH SBIR, “Three Dimensional Living Neural Networks,” Grant # 1R43MH102946-01, \$116,357, Duration: July 2014 – June 2016
19. 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.
20. National Science Foundation, “STTR Phase 1: Multistatic Spectral Interferometry for Precision Profilometry,” \$37,192, Jan 2013 – June 2013.
21. National Science Foundation, “GOALI: Holographic Passive Solar Concentration and Lighting,” \$375,000, Aug 2013 – July 2016.
22. Oracle Corporation, “Super Resolution Optical Storage,” \$200,000. 2012-2015
23. National Science Foundation, “EFRI-ODISSEI: Photo-Origami,” Total \$2,000,000, McLeod portion: \$465,116, Duration Aug 2012 – July 2016
24. National Science Foundation, “TECP: 3D Lithography of Thick Photopolymers for Imaging and Photonic Crystal Waveguides,” Total: \$38,375, Duration Aug 2012 – Jan 2013

25. 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.
26. National Science Foundation, "GOALI supplement: 3D Optoelectronic Devices Fabricated via 2-Color Photo-Inhibition/Initiation Lithography," \$75,000, Duration July 2012 – June 2013
27. CU Innovative Seed Grant Program, "Micro-fabrication of Living Systems," \$44,000, Duration: July 2011 – June 2012.
28. 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
29. 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
30. National Science Foundation, "SBIR Phase I: Structural properties of carbon nanotube polymer composites," Phase I Total: \$50,000, Duration: July 2010 – June 2011
31. 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*
32. 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.
33. Intel Corporation, "Plastic PHY Interconnect Technology Phase II," Total: \$462,281, Duration: Nov 2009 – Oct 2012
34. Air Force Office of Scientific Research MURI, "Polymeric Optical Sensor Meshes and Composite Meta-Materials," \$745,500, Duration: Sept 2009 – Aug 2014
35. 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.
36. 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
37. 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
38. 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.
39. CU Innovative Seed Grant Program, "Diffraction Unlimited Photolithography," \$49,926, Duration: July 2007 – July 2008.
40. CU Tech Transfer Office, "Tape casting of high performance polymer optical imaging arrays," \$24,964, Duration: June 2007 – November 2007.

41. National Science Foundation, "Hybrid integrated optoelectronic systems," Phase IB Total: \$25,000, Duration: January 2007 – June 2007.
42. National Science Foundation, "3D Lithography of Thick Photopolymers for Imaging and Photonic Crystal Waveguides," Phase I Total: \$89,921. Duration: January 2007 – December 2007
43. 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.
44. Intel Corporation, "Plastic PHY Interconnect Technology," Total: \$231,000, Duration: August 2006 – July 2009
45. 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
46. National Science Foundation, "Hybrid integrated optoelectronic systems," Phase I Total: \$50,000, Duration: January 2006 – December 2006.
47. Science Applications International Corporation, "Parallel Polymer Waveguide Array Development," Total: \$50,000, Duration: July 2005 – December 2006.
48. Engineering Excellence Fund, "Optical Circuits Lab Instrumentation," Total: \$15,000, Duration: July 2005 – July 2007
49. CU Council on Research and Creative Work, "Imaging via Flexible Polymer Fiber Arrays," Total: \$7,000, Duration: May 2005 – May 2006
50. 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
51. CU Council on Research and Creative Work, "Hybrid Integrated Photonics," Total: \$5,000, Duration: July 2004 – July 2005
52. Colorado Center for Information Storage, "Parallel Track and Layer Read/Write Head for Optical Disks," Total: \$64,963, Duration: July 2004 – July 2005
53. StorageTek, Inc, "CDMA Search of Holographic Databases," Total: \$40,867, Duration: January 2004 – January 2005
54. 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 Majdeteimouri, 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	2	6	6
		5166 Guided wave optics	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
		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
		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
		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
<b>Undergrad weighted average</b>				<b>5.0</b>	<b>5.3</b>
<b>Graduate weighted average</b>				<b>5.4</b>	<b>5.7</b>

**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-present).
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)**