

CURRICULUM VITÆ¹

JOHN ZWECK

Education

- Ph.D. 1993 Rice University, Mathematics
B.Sc. 1988 University of Adelaide, Mathematical Sciences (*Honours*)

Experience in Higher Education

- Spring 2007 Research Scholar, Department of Mathematics, University of Texas at Austin
2006–2009 University of Maryland Baltimore County, Affiliate Associate Professor, Department of Computer Science and Electrical Engineering
2006– University of Maryland Baltimore County, Associate Professor with tenure, Department of Mathematics and Statistics
2003–2006 University of Maryland Baltimore County, Assistant Professor, Department of Mathematics and Statistics
2003 University of Maryland Baltimore County, Research Associate Professor, Department of Computer Science and Electrical Engineering
2000–2002 University of Maryland, Baltimore County, Research Associate, Department of Computer Science and Electrical Engineering
1998–2000 University of New Mexico, Postdoctoral Researcher, Department of Computer Science and Albuquerque High Performance Computing Center
1995–1998 University of Nevada Reno, Assistant Professor, Department of Mathematics
1996–1997 University of Texas at Austin, Visiting Lecturer, Department of Mathematics
1994–1995 State University of New York at Stony Brook, Visiting Assistant Professor, Department of Mathematics
1993–1994 Rice University, Lecturer, Department of Mathematics
1988–1993 Rice University, Graduate Teaching Assistant, Department of Mathematics

Research Support and Fellowships

- 2009–2010 \$31,769 (direct), \$46,700 (total), Subgrant from National Science Foundation: Engineering Research Center on Mid InfraRed Technologies for Health and the Environment “*Development, verification, and validation of three-dimensional models for QEPAS and ROTADE sensors*”, P.I., (Collaboration with S.E. Minkoff, Math&Stat UMBC, and A. Kosterev, Rice University)

¹April 29th, 2009

- 2009 \$19,842 (direct) \$25,000 (total), Subcontract from John Hopkins Applied Physics Laboratory “*Laser Modeling Analysis*”, co-P.I. (Collaboration with Curtis Menyuk (P.I.), CSEE, UMBC)
- 2009–2010 \$59,121 (direct) \$87,500 (total), Subcontract from John Hopkins Applied Physics Laboratory “*Format Independent Receiver for Digital Optical Data Systems, Phase II*”, co-P.I. (Collaboration with Curtis Menyuk (P.I.), CSEE, UMBC)
- 2008 \$34,014 \$50,000 (total), Subcontract from John Hopkins Applied Physics Laboratory “*Format Independent Receiver for Digital Optical Data Systems, Phase I*”, co-P.I. (Collaboration with Curtis Menyuk (P.I.), CSEE, UMBC)
- 2008–2009 \$32,653 (direct), \$48,000 (total), Subgrant from National Science Foundation: Engineering Research Center on Mid InfraRed Technologies for Health and the Environment “*Computational Modeling of Quartz-Enhanced Photoacoustic and Optothermal Spectroscopy Sensors*”, P.I., (Collaboration with S.E. Minkoff, Math&Stat UMBC, A. Kosterev, Rice University, and C.R. Menyuk CSEE, UMBC)
- 2007–2008 \$34,014 \$50,000 (total), Technion Foundation, “*Frequency Metrology with Short Pulse Lasers*”, co-P.I. (Collaboration with Curtis Menyuk (P.I.), CSEE, UMBC)
- 2007–2008 \$48,000 (direct), \$48,000 (total), Subgrant from National Science Foundation: Engineering Research Center on Mid InfraRed Technologies for Health and the Environment “*Computational Modeling of Quartz-Enhanced Photoacoustic Spectroscopy Sensors*”, P.I., (Collaboration with S.E. Minkoff, Math&Stat UMBC, A. Kosterev, Rice University, and C.R. Menyuk CSEE, UMBC)
- 2006–2007 \$27,211 (direct), \$40,000 (total), Subgrant from National Science Foundation: Engineering Research Center on Mid InfraRed Technologies for Health and the Environment “*Computational Modeling of Quartz-Enhanced Photoacoustic Spectroscopy Sensors*”, P.I., (Collaboration with S.E. Minkoff, Math&Stat UMBC, A. Kosterev, Rice University, and C.R. Menyuk CSEE, UMBC)
- 2004–2007 \$169,949 (direct), \$232,800 (total), National Science Foundation: Division of Electrical and Communications Systems, Award ECS-0400535 “*Accurate calculation of bit-error ratios in optical fiber communications systems*”, co-P.I., (Collaboration with C.R. Menyuk (P.I.), G.M. Carter, and J.M. Morris, CSEE, UMBC)
- 2002–2003 \$25,000 (direct), \$34,937 (total), NASA Goddard/UMBC Center for Advanced Study of Photonics Research: “*Numerical simulation and analysis of fiber optic compensators*”, co-P.I., (Collaboration with S.E. Minkoff (P.I.), Mathematics and Statistics, UMBC)
- 2002–2005 \$173,050 (direct), \$210,000 (total), National Science Foundation, Division of Electrical and Communications System, Award ECS-020019: “*Polarization effects in long-haul wavelength-division multiplexed optical communica-*

- tions systems*", co-P.I., (Collaboration with L. Yan (P.I.), B.S. Marks, G.M. Carter, and C.R. Menyuk, CSEE, UMBC)
- 2001–2002 Science Applications International Corporation: "*Modeling optical fiber transmission systems*", Scientific Liaison, (Contract awarded to G.M. Carter (P.I.) and C.R. Menyuk, CSEE, UMBC)
- 1995–1997 \$218,898 (direct), \$300,000 (total), National Science Foundation, Division of Mathematical Sciences, Award DMS-9505174: "*Cycles, residues and global problems in geometry*", co-P.I., (Collaboration with B. Lawson (P.I.) and M-L. Michelsohn (P.I.))
- 1991–1992 Schlumberger Foundation Fellowship, Rice University

Ph.D. Students

1. Noemi Petra (Math&Stat), mentor
2. Justin Jacobs (Math&Stat), member
3. Jiping Wen, (CSEE), July 2007, "Investigation of performance statistics in a high bit-rate terrestrial WDM system", member
4. Hua Jiao, (CSEE), March 2007, "Investigation of the combined effect of polarization-mode dispersion and polarization-dependent loss on system performance", co-mentor
5. Aurenice O. Lima, (CSEE), July 2005, "Advanced Monte Carlo methods for computation of penalties induced by polarization-mode dispersion in optical fiber transmission systems", member and reader
6. Hai Xu, (CSEE), June 2005, "Investigation of polarization mode dispersion effects in recirculating loop systems", member
7. Wenze Xi, (CSEE), May 2005, "Maximum likelihood electrical equalization and integrated coding and equalization for optical communications systems", member
8. Ivan T. Lima, Jr., (CSEE), December 2003, "Investigation of the performance degradation due to polarization effects in optical fiber communications systems", member
9. Ronald Holzlöhner, (CSEE), May 2003, "A covariance matrix method for the computation of bit errors in optical transmission systems", member

Master's Students

1. Stephen Thompson, (Math&Stat), March 2009, "A generalization of Browder's non-ejective fixed point theorem", member
2. John Kloetzli (CSEE), November 2008, "Real-time high quality volume isosurface rendering", member
3. Sean Griffith, (Math&Stat), July 2008, "Use of operator upscaling for seismic inversion: computationally feasible forward and adjoint calculations", member

4. Venkatakrishnan Veerasubramanian, (CSEE), December 2007, “Propagation analysis of an 80 Gb/s wavelength-converted signal utilizing cross-phase modulation”, member
5. Anshul Kalra, (CSEE), January 2006, “Comparative study of receiver models for optical communications systems”, member
6. Walter Pellegrini, (University of Padua, Italy), December 2004, “Comparison of the covariance matrix and multicanonical Monte Carlo methods for computing bit error ratios for wavelength division multiplexed systems”, [*Primary advisor of Masters-level thesis work performed at UMBC*]

Undergraduate Research Students

1. Michael Reid, 2008, ”Computational modeling of a quartz-enhanced thermal wave spectroscopy sensor”, mentor
2. Austin Rochford, 2006–2008, “Statistical study of local area and curvature of the cingulate gyrus”, mentor, [*Senior Thesis in Mathematics and Statistics, May 2008*]
3. Brian Krummel, 2004–2006, “Analysis of curvature of discrete surfaces”, mentor, [*UMBC Undergraduate Research Award, 2005, Senior Thesis in Mathematics and Statistics, May 2006*]
4. Lawrence Fomundam, 2004–2005, “Modeling uncertainty in optical communications systems”, mentor, [*UMBC Undergraduate Research Award, 2004, Senior Thesis in Mathematics and Statistics, June 2005*]
5. Kevin Li, 2003–2004, Performed research on discrete differential geometry and computational anatomy, mentor

PUBLICATIONS²

Peer-Reviewed Works

Chapters in Books (Photonics)

1. C.R. Menyuk, B.S. Marks, I.T. Lima, Jr., **J. Zweck**, Y. Sun, G.M. Carter, and D. Wang, “Polarization effects in long-haul undersea systems”, in *Undersea Fibre Communication Systems*, José Chesnoy, ed., Elsevier Press, 2002

Articles (Photonics)

2. H. Jiao, **J. Zweck***, L. Yan, C.R. Menyuk, and G.M. Carter, “Receiver model for depolarized signal due to polarization-mode dispersion and partially polarized noise due to polarization-dependent loss in an optical fiber communication system”, *Journal of Lightwave Technology*, **27** (18) pp. 4124-4315, 2009

²On photonics papers for which a student is the primary author, the first faculty author is indicated with a *.

3. N. Petra, **J. Zweck***, A.A. Kosterev, S.E. Minkoff, and D. Thomazy, “Theoretical analysis of a quartz-enhanced photoacoustic spectroscopy sensor”, *Applied Physics B: Lasers and Optics*, **94** (4) pp. 673-680, 2009
4. **J. Zweck** and C.R. Menyuk, “Validity of the additive white Gaussian noise model for quasi-linear long-haul return-to-zero optical fiber communications systems”, *Journal of Lightwave Technology*, **27** (16) pp. 3324-3335, 2009
5. P. Griggio, J. Hu, J. Wen, G. E. Tudury*, **J. Zweck**, B. S. Marks, L. Yan, G. M. Carter, and C. R. Menyuk, “Characterizing pattern dependence in transmitters and receivers for optical communications systems”, *Optics Communications*, **272** (1), pp. 107-110, 2007
6. **J. Zweck** and S.E. Minkoff, “Modeling compensation for optical fiber communication systems”, *SIAM Journal on Optimization*, **17** (3), pp. 738–775, 2006
7. H. Xu, B.S. Marks*, **J. Zweck**, L. Yan, C.R. Menyuk, and G.M. Carter, “Statistical properties of the DGD in a long-haul optical fiber system with temporally drifting birefringence”, *Journal of Lightwave Technology*, **24** (3), pp. 1165–1175, 2006
8. W. Xi, T. Adali*, and **J. Zweck**, “A MAP equalizer for the optical communications channel”, *Journal of Lightwave Technology*, **23** (12), pp. 3989–3996, 2005
9. O.V. Sinkin, V.S. Grigoryan*, **J. Zweck**, C.R. Menyuk, A. Docherty, and M. Ablowitz, “Calculation, characterization, and application of the time-shift function in wavelength-division-multiplexed return-to-zero systems”, *Optics Letters*, **30** (16), pp. 2056–2058, 2005
10. W. Pellegrini, **J. Zweck***, C.R. Menyuk, and R. Holzlöhner, “Computation of bit error ratios for a dense WDM system using the noise covariance matrix and multicanonical Monte Carlo methods”, *Photonics Technology Letters*, **17** (8), pp. 1644–1646, 2005
11. I.T. Lima Jr., A.O. Lima, Y. Sun, H. Jiao, **J. Zweck***, C.R. Menyuk, and G.M. Carter, “A receiver model for optical fiber communication systems with arbitrarily polarized noise”, *Journal of Lightwave Technology*, **23** (3), pp. 1478–1490, 2005
12. R. Holzlöhner, A. Mahadevan, C.R. Menyuk*, J.M. Morris, and **J. Zweck**, “Evaluation of the very low BER of FEC codes using dual adaptive importance sampling”, *IEEE Communications Letters* **9** (2), pp. 163-165, 2005
13. H. Xu, **J. Zweck***, L. Yan, C.R. Menyuk, and G.M. Carter, “Quantitative experimental study of intra-channel nonlinear timing jitter in a 10 Gb/s terrestrial WDM return-to-zero system”, *Photonics Technology Letters*, **16** (1), pp. 314–316, 2004
14. Y. Sun, I.T. Lima Jr., A.O. Lima, H. Jiao, **J. Zweck***, L. Yan, C.R. Menyuk, and G.M. Carter, “System performance variations due to partially polarized noise in a receiver”, *Photonics Technology Letters*, **15** (11), pp. 1648–1650, 2003
15. T. Wanner, B.S. Marks, C.R. Menyuk, and **J. Zweck**, “Polarization decorrelation in optical fibers with randomly varying elliptical birefringence”, *Optics Letters*, **28** (19), pp. 1799-1801, 2003

16. Y. Sun, A.O. Lima, I.T. Lima Jr., **J. Zweck***, L. Yan, C.R. Menyuk, and G.M. Carter, “Statistics of the system performance in a scrambled recirculating loop with PDL and PDG”, *Photonics Technology Letters*, **15** (8), pp. 1067–1069, 2003
17. I.T. Lima, Jr., A.O. Lima, **J. Zweck***, and C.R. Menyuk, “Performance characterization of chirped return-to-zero modulation format using an accurate receiver model”, *Photonics Technology Letters*, **15**, (4), pp. 608–610, 2003
18. **J. Zweck** and C.R. Menyuk, “Reduction of intra-channel four-wave mixing using subchannel multiplexing”, *Photonics Technology Letters*, **15**, (2), pp. 323–325, 2003
19. I.T. Lima, Jr., A.O. Lima, **J. Zweck***, and C.R. Menyuk, “Efficient computation of outage probabilities due to polarization effects in a WDM system using a reduced Stokes model and importance sampling”, *Photonics Technology Letters*, **15**, (1), pp. 45–47, 2003
20. O.V. Sinkin, R. Holzlohner, **J. Zweck***, and C.R. Menyuk, “Optimization of the split-step Fourier method in modeling optical fiber communications systems”, *Journal of Lightwave Technology*, **21**, (1), pp. 61–68, 2003
21. **J. Zweck** and C.R. Menyuk, “Analysis of four-wave mixing between pulses in high-data-rate quasi-linear subchannel-multiplexed systems”, *Optics Letters*, **27**, (14), pp. 1235–1237, 2002
22. O.V. Sinkin, **J. Zweck***, and C.R. Menyuk, “A comparative study of pulse interactions in optical fiber transmission systems with different modulation formats”, *Optics Express*, **9**, (7), pp. 339–352, 2001

Articles (Computational Anatomy and Discrete Differential Geometry)

23. S. Zhang, L. Younes, **J. Zweck**, and T. Ratnanather, “Diffeomorphic surface flows: A novel method of surface evolution”, *SIAM Journal on Applied Mathematics*, **68**, (3), pp. 806–824, 2008

Articles (Human and Computer Vision)

24. **J.W. Zweck** and L.R. Williams, “Euclidean group invariant computation of stochastic completion fields using shiftable-twistable functions”, *Journal of Mathematical Imaging and Vision*, **21**, (2), pp. 135–154, 2004
25. L.R. Williams and **J. Zweck**, “A rotation and translation invariant discrete saliency network”, *Biological Cybernetics*, **88**, (1), pp. 2–10, 2003
26. L.R. Williams, **J. Zweck**, T. Wang, and K.K. Thornber, “Computing stochastic completion fields in linear-time using a resolution pyramid”, *Computer Vision and Image Understanding*, **76**, (3), pp. 289–297, 1999

Articles (Differential Geometry)

27. R. Harvey, B. Lawson (*First Author*), and **J. Zweck**, “The de Rham-Federer theory of differential characters and character duality”, *American Journal of Mathematics*, **125**, (4), pp. 791–847, August 2003

28. R. Harvey and **J. Zweck** (*First Author*), “Divisors and Euler sparks of atomic sections”, *Indiana University Mathematics Journal*, **50**, (1), pp. 243–298, 2001
29. “The Stiefel–Whitney spark”, *Houston Journal of Mathematics*, **27**, (2), pp. 325–351, 2001
30. R. Harvey and **J. Zweck** (*First Author*), “Stiefel–Whitney currents”, *The Journal of Geometric Analysis*, **8**, (5), pp. 809–844, 1998
31. “Chern currents of singular connections associated with a section of a compactified bundle”, *Indiana University Mathematics Journal*, **44**, pp. 341–384, 1995
32. “Euler and Pontrjagin currents of a section of a compactified real bundle”, *Journal of Differential Geometry and its Applications*, **5**, pp. 277–309, 1995

Conference Proceedings (Computational Anatomy)

33. J.T. Ratnanather, L. Younes, **J. Zweck**, L. Wang, M. Hosakere, J.G. Csernansky, and M.I. Miller, “Statistical analysis of surface roughness via local area maps: Application to the cingulate gyrus in healthy and schizophrenic subjects”, *2007 International Congress on Schizophrenia Research*, Colorado Springs, Colorado, 2007, paper 99, [poster]

Conference Proceedings (Photonics)

34. V. Veerasubramanian, J. Hu, **J. Zweck***, C. R. Menyuk, “Propagation analysis of an 80-Gb/s wavelength-converted signal utilizing XPM”, *Optical Fiber Communications 2008*, San Diego, CA, paper JWA69, [poster]
35. **J. Zweck** and C.R. Menyuk, “Detection and mitigation of soft failure due to polarization-mode dispersion in optical networks”, *Optical Fiber Communications 2006*, Anaheim, CA, paper OFG5
36. O.V. Sinkin, V.S. Grigoryan*, **J. Zweck** and C.R. Menyuk, “Calculation of the bit-error ratio in wavelength-division-multiplexed return-to-zero systems when the non-linear penalty is dominated by collision-induced timing jitter”, *Optical Fiber Communications 2006*, Anaheim, CA, paper JThB3
37. L. Fomundam, **J. Zweck***, H. Xu, H. Jiao, and G.M. Carter, “Probability density functions of rotations in loop-synchronous polarization scrambling for recirculating loop experiments”, *Optical Fiber Communications 2006*, Anaheim, CA, paper OWI16
38. W. Xi, T. Adali*, and **J. Zweck**, “Electrical estimation of conditional probability for maximum-likelihood based PMD mitigation”, *Optical Fiber Communications 2005*, Anaheim, CA, paper OWJ5
39. A.O. Lima, I.T. Lima Jr., C.R. Menyuk*, and **J. Zweck**, “Performance evaluation of single-section and three-section PMD compensators using extended Monte Carlo methods”, *Optical Fiber Communications 2005*, Anaheim, CA, paper OME27
40. H. Xu, B.S. Marks*, **J. Zweck**, L. Yan, C.R. Menyuk, and G.M. Carter, “The long-term distribution of differential group delay in a recirculating loop”, *Symposium on Optical Fiber Measurements, SOFM 2004*, Boulder Colorado, paper V3, pp. 95–98

41. W. Wang, O.V. Sinkin, T. Adali*, **J. Zweck**, and C.R. Menyuk, "Prior-based line-coding for WDM RZ systems", *Conference on Lasers and Electro-Optics* San Francisco, CA, 2004, paper CFN5
42. A. Kalra, **J. Zweck***, and C.R. Menyuk, "Comparison of bit-error ratios for receiver models with integrate-and-dump and realistic electrical filters using the Gaussian approximation", *Conference on Lasers and Electro-Optics* San Francisco, CA, 2004, paper CWA24, [poster]
43. W. Xi, T. Adali*, and **J. Zweck**, "A MAP equalizer for the optical communications channel", *International Conference on Acoustics, Speech, and Signal Processing*, Montreal, Canada, 2004, paper SPCOM-P10, [poster]
44. O.V. Sinkin, V.S. Grigoryan*, R. Holzlohner, A. Kalra, **J. Zweck**, and C.R. Menyuk, "Calculation of error probability in WDM RZ systems in presence of bit-pattern-dependent nonlinearity and of noise", *Optical Fiber Communications 2004*, Los Angeles, CA, paper TuN4
45. O.V. Sinkin, R. Holzlohner, V.S. Grigoryan*, **J. Zweck**, and C.R. Menyuk, "Probabilistic description of nonlinear penalties in WDM RZ systems using multicanonical Monte Carlo simulations", *IEEE Lasers and Electro-optics Society (LEOS) 2003 Annual Meeting*, Tuscon AZ, paper ThI5
46. A.O. Lima, I.T. Lima Jr., **J. Zweck***, and C.R. Menyuk, "Efficient computation of PMD-induced penalties using multicanonical Monte Carlo simulations", *ECOC-IOOC 2003*, Rimini, Italy, paper 507, [One of winners of the "2002 Venice Summer School on PMD Awards" for student papers on polarization-mode dispersion at ECOC-IOOC 2003]
47. I.T. Lima Jr., A.O. Lima, **J. Zweck***, and C.R. Menyuk, "An accurate formula for the Q -factor of a fiber transmission system with partially polarized noise", *Conference on Lasers and Electro-Optics 2003*, Baltimore, MD, paper CThJ2
48. H. Jiao, I.T. Lima Jr., A.O. Lima, Y. Sun, **J. Zweck***, L. Yan, C.R. Menyuk, and G.M. Carter, "Experimental validation of a realistic receiver model for systems with unpolarized noise", *Conference on Lasers and Electro-Optics 2003*, Baltimore, MD, paper CThJ1
49. **J. Zweck**, S.E. Minkoff, A.O. Lima, I.T. Lima, Jr., and C.R. Menyuk, "A comparative study of feedback controller sensitivity to all orders of PMD for a fixed DGD compensator", *Optical Fiber Communications 2003*, Atlanta, GA, paper ThY2
50. T. Wanner, B.S. Marks, C.R. Menyuk, and **J. Zweck**, "Polarization mode dispersion, decorrelation, and diffusion in optical fibers with randomly varying elliptical birefringence", *Optical Fiber Communications 2003*, Atlanta, GA, paper WJ5
51. O.V. Sinkin, **J. Zweck***, and C.R. Menyuk, "Effects of the nonlinearly-induced timing and amplitude jitter on the performance of different modulation formats in WDM optical fiber communications systems", *Optical Fiber Communications 2003*, Atlanta, GA, paper TuF5

52. I.T. Lima Jr., A.O. Lima, **J. Zweck***, and C.R. Menyuk, “Computation of the Q -factor in optical fiber systems using an accurate receiver model”, *Optical Fiber Communications 2003*, Atlanta, GA, paper MF81
53. W. Xi, T. Adali*, A.O. Lima, W. Wang, **J. Zweck**, and C.R. Menyuk, “Electrical estimation of polarization mode dispersion parameters for compensation”, *Optical Fiber Communications 2003*, Atlanta, GA, paper TuO5
54. H. Xu, J. Wen, **J. Zweck***, L. Yan, C.R. Menyuk, and G.M. Carter, “The effects of distributed PMD, PDL, and loop scrambling on BER distributions in a recirculating loop used to emulate a long-haul terrestrial transmission”, *Optical Fiber Communications 2003*, Atlanta, GA, paper TuO2
55. H. Xu, H. Jiao, J. Wen, **J. Zweck***, L. Yan, C.R. Menyuk, and G.M. Carter, “Quantitative experimental study of intra-channel nonlinear timing jitter in a 10 Gb/s terrestrial WDM return-to-zero system”, *Optical Fiber Communications 2003*, Atlanta, GA, paper FE7
56. Y. Sun, I.T. Lima Jr., A.O. Lima, H. Jiao, **J. Zweck***, L. Yan, C.R. Menyuk, and G.M. Carter “Effects of partially polarized noise in a receiver”, *Optical Fiber Communications 2003*, Atlanta, GA, paper MF82
57. Y. Sun, A.O. Lima, I.T. Lima Jr., L. Yan, **J. Zweck***, C.R. Menyuk, and G.M. Carter, “Accurate Q -factor distributions in optical transmission systems with polarization effects”, *Optical Fiber Communications 2003*, Atlanta, GA, paper ThJ4
58. I.T. Lima, Jr., A.O. Lima, Y. Sun, **J. Zweck***, B.S. Marks, G.M. Carter, and C.R. Menyuk, “Computation of the outage probability due to the polarization effects using importance sampling”, *Optical Fiber Communications 2002*, Anaheim, CA, paper TuI7
59. **J. Zweck** and C.R. Menyuk, “Reduction of intra-channel four-wave mixing using subcarrier multiplexing”, *Optical Fiber Communications 2002*, Anaheim, CA, paper ThGG9
60. O.V. Sinkin, **J. Zweck***, and C.R. Menyuk, “A comparative study of pulse interactions in optical fiber transmission systems with different modulation formats”, *IEEE Lasers and Electro-Optics Society Annual Meeting*, La Jolla, CA, paper TuK2, 2001, [Winner of IEEE-LEOS Best Student Paper Award]

Conference Proceedings (Human and Computer Vision)

61. L.R. Williams and **J. Zweck**, “A rotation and translation invariant discrete saliency network”, *Advances in Neural Information Processing Systems 14*, MIT Press, 2002, [Full Oral Presentation]
62. **J. Zweck** and L.R. Williams, “Euclidean group invariant computation of stochastic completion fields using shiftable-twistable functions”, *Proc. of the 6th European Conference on Computer Vision, Part II*, Dublin, Ireland, Lecture Notes in Computer Science, **1843**, pp. 100–116, Springer-Verlag, 2000

Non-Peer-Reviewed Works**Articles (Photonics)**

63. **J. Zweck**, I.T. Lima, Jr., Y. Sun, A.O. Lima, C.R. Menyuk, and G.M. Carter, “Modeling receivers in optical communication systems with polarization effects”, *Optics and Photonics News*, November 2003, pp. 30–35

Articles (Human and Computer Vision)

64. **J. Zweck** and L.R. Williams, “A wavelet basis for Euclidean invariant computation of visual contours”, *SIAM News, Applications on Advanced Architecture Computers Column*, **33** (3), 2000
65. **J. Zweck** and L.R. Williams, “Euclidean invariant computation of stochastic completion fields using shiftable-twistable wavelets”, *Applications of High Performance Computing in Engineering VI*, Ingber, Power, and Brebbia (Eds.), WIT Press, 2000

Invited Conference Proceedings (Photonics)

66. C.R. Menyuk, B.S. Marks, and **J. Zweck**, “A methodology for calculating performance in an optical fiber communications system”, *Optical Communication Theory and Techniques, Proceedings of Tyrrhenian International Workshop on Digital Communications*, E. Forestieri (Ed.), Springer-Verlag, pp. 113–120, Pisa Italy, October 17–18, 2004
67. **J. Zweck**, I.T. Lima, Jr., R. Holzlöhner, and C.R. Menyuk, “New advances in modeling optical fiber communication systems”, *Optical Society of America Integrated Photonics Research (Technical Digest)*, paper IThB1, Vancouver, Canada, July 17–19, 2002

Works Submitted or in Preparation**Articles**

68. B. Krummel and **J. Zweck**, “Curvature measures of triangulated surfaces with boundary”, [*in preparation for submission*]
69. R. Harvey, B. Lawson and **J. Zweck** (*First Author*), “The product formula for the total Chern and Pontryagin sparks”, Rice University Preprint, pp. 1–54, 1999, [*almost complete unpublished work*]

PRESENTATIONS**Conference/Poster Presentations (Refereed)**

1. V. Veerasubramanian, J. Hu, **J. Zweck***, C. R. Menyuk, “Propagation analysis of an 80-Gb/s wavelength-converted signal utilizing XPM”, *Optical Fiber Communications 2008*, San Diego, CA, February 24–28, 2008, paper JWA69 [*poster*]

2. J.T. Ratnanather, L. Younes, **J. Zweck**, L. Wang, M. Hosakere, J.G. Csernansky, and M.I. Miller, “Statistical analysis of surface roughness via local area maps: Application to the cingulate gyrus in healthy and schizophrenic subjects”, *2007 International Congress on Schizophrenia Research*, Colorado Springs, Colorado, March 28 - April 1, 2007, paper 99 [poster]
3. **J. Zweck** and C.R. Menyuk, “Detection and mitigation of soft failure due to polarization-mode dispersion in optical networks”, *Optical Fiber Communications 2006*, Anaheim, CA, March 7-9, 2006, paper OFG5
4. O.V. Sinkin, V.S. Grigoryan*, **J. Zweck** and C.R. Menyuk, “Calculation of the bit-error ratio in wavelength-division-multiplexed return-to-zero systems when the non-linear penalty is dominated by collision-induced timing jitter”, *Optical Fiber Communications 2006*, Anaheim, CA, March 7-9, 2006, paper JThB3 [poster]
5. L. Fomundam, **J. Zweck***, H. Xu, H. Jiao, and G.M. Carter, “Probability density functions of rotations in loop-synchronous polarization scrambling for recirculating loop experiments”, *Optical Fiber Communications 2006*, Anaheim, CA, March 7-9, 2006, paper OWI16 [poster]
6. W. Xi, T. Adali, and **J. Zweck**, “Electrical estimation of conditional probability for maximum-likelihood based PMD mitigation”, *Optical Fiber Communications 2005*, Anaheim, CA, March 6-11, 2005, paper OWJ5
7. A.O. Lima, I.T. Lima Jr., C.R. Menyuk and **J. Zweck**, “Performance evaluation of single-section and three-section PMD compensators using extended Monte Carlo methods”, *Optical Fiber Communications 2005*, Anaheim, CA, March 6-11, 2005, paper OME27 [poster]
8. H. Xu, B.S. Marks, **J. Zweck**, L. Yan, C.R. Menyuk, and G.M. Carter, “The long-term distribution of differential group delay in a recirculating loop”, *Symposium on optical fiber measurements, SOFM 2004*, Boulder, Colorado, Wed Sept 29th, Session V, Talk 3, 9:45am
9. W. Wang, O.V. Sinkin, T. Adali, **J. Zweck**, and C.R. Menyuk, “Prior-based line-coding for WDM RZ systems”, *Conference on Lasers and Electro-Optics* San Francisco, CA, May 16–21, 2004, paper CFN5
10. A. Kalra, **J. Zweck** and C.R. Menyuk, “Comparison of bit-error ratios for receiver models with integrate-and-dump and realistic electrical filters using the Gaussian approximation”, *Conference on Lasers and Electro-Optics* San Francisco, CA, May 16–21, 2004, paper CWA24, [poster]
11. W. Xi, T. Adali, and **J. Zweck**, “A MAP equalizer for the optical communications channel”, *International Conference on Acoustics, Speech, and Signal Processing*, Montreal, Canada, May 17–21, 2004, paper SPCOM-P10, [poster]
12. O.V. Sinkin, V.S. Grigoryan, R. Holzlöhner, A. Kalra, **J. Zweck**, and C.R. Menyuk, “Calculation of error probability in WDM RZ systems in presence of bit-pattern-dependent nonlinearity and of noise”, *Optical Fiber Communications 2004*, Los Angeles, CA, Feb. 22–27, 2004

13. O.V. Sinkin, R. Holzlöhner, V.S. Grigoryan, **J. Zweck**, and C.R. Menyuk, “Probabilistic description of nonlinear penalties in WDM RZ systems using multicanonical Monte Carlo simulations”, *IEEE Lasers and Electro-optics Society (LEOS) 2003 Annual Meeting*, Tuscon AZ, Oct. 26–30, 2003
14. A.O. Lima, I.T. Lima Jr., **J. Zweck**, and C.R. Menyuk, “Efficient computation of PMD-induced penalties using multicanonical Monte Carlo simulations”, *ECOC-IOOC 2003*, Rimini, Italy, Sept. 21–25, 2003
15. I.T. Lima Jr., A.O. Lima, **J. Zweck**, and C.R. Menyuk, “An accurate formula for the Q -factor of a fiber transmission system with partially polarized noise”, *Conference on Lasers and Electro-Optics 2003*, Baltimore, MD, June 1–6, 2003
16. H. Jiao, I.T. Lima Jr., A.O. Lima, Y. Sun, **J. Zweck**, L. Yan, C.R. Menyuk, and G.M. Carter, “Experimental validation of a realistic receiver model for systems with unpolarized noise”, *Conference on Lasers and Electro-Optics 2003*, Baltimore, MD, June 1–6, 2003
17. **J. Zweck**, S.E. Minkoff, A.O. Lima, I.T. Lima, Jr., and C.R. Menyuk, “A comparative study of feedback controller sensitivity to all orders of PMD for a fixed DGD compensator”, *Optical Fiber Communications 2003*, Atlanta, GA, March 22–27, 2003
18. T. Wanner, B.S. Marks, C.R. Menyuk, and **J. Zweck**, “Polarization mode dispersion, decorrelation, and diffusion in optical fibers with randomly varying elliptical birefringence”, *Optical Fiber Communications 2003*, Atlanta, GA, March 22–27, 2003
19. O.V. Sinkin, **J. Zweck**, and C.R. Menyuk, “Effects of the nonlinearly-induced timing and amplitude jitter on the performance of different modulation formats in WDM optical fiber communications systems”, *Optical Fiber Communications 2003*, Atlanta, GA, March 22–27, 2003
20. I.T. Lima Jr., A.O. Lima, **J. Zweck**, and C.R. Menyuk, “Computation of the Q -factor in optical fiber systems using an accurate receiver model”, *Optical Fiber Communications 2003*, Atlanta, GA, March 22–27, 2003
21. W. Xi, T. Adali, A.O. Lima, W. Wang, **J. Zweck**, and C.R. Menyuk, “Electrical estimation of polarization mode dispersion parameters for compensation”, *Optical Fiber Communications 2003*, Atlanta, GA, March 22–27, 2003
22. H. Xu, J. Wen, **J. Zweck**, L. Yan, C.R. Menyuk, and G.M. Carter, “The effects of distributed PMD, PDL, and loop scrambling on BER distributions in a recirculating loop used to emulate a long-haul terrestrial transmission”, *Optical Fiber Communications 2003*, Atlanta, GA, March 22–27, 2003
23. H. Xu, H. Jiao, J. Wen, **J. Zweck**, L. Yan, C.R. Menyuk, and G.M. Carter, “Quantitative experimental study of intra-channel nonlinear timing jitter in a 10 Gb/s terrestrial WDM return-to-zero system”, *Optical Fiber Communications 2003*, Atlanta, GA, March 22–27, 2003
24. Y. Sun, I.T. Lima Jr., A.O. Lima, H. Jiao, **J. Zweck**, L. Yan, C.R. Menyuk, and G.M. Carter “Effects of partially polarized noise in a receiver”, *Optical Fiber Communications 2003*, Atlanta, GA, March 22–27, 2003

25. Y. Sun, A.O. Lima, I.T. Lima Jr., L. Yan, **J. Zweck**, C.R. Menyuk, and G.M. Carter, "Accurate Q -factor distributions in optical transmission systems with polarization effects", *Optical Fiber Communications 2003*, Atlanta, GA, March 22–27, 2003
26. I.T. Lima, Jr., A.O. Lima, Y. Sun, **J. Zweck**, B.S. Marks, G.M. Carter, and C.R. Menyuk, "Computation of the outage probability due to the polarization effects using importance sampling", *Optical Fiber Communications 2002*, Anaheim, CA, Mar. 17–22, 2002
27. **J. Zweck** and C.R. Menyuk, "Reduction of intra-channel four-wave mixing using subcarrier multiplexing", *Optical Fiber Communications 2002*, Anaheim, CA, Mar. 17–22, 2002, [Poster]
28. L.R. Williams and **J. Zweck**, "A rotation and translation invariant discrete saliency network", *Advances in Neural Information Processing Systems 14*, Vancouver, Canada, Dec. 3–8, 2001, [Full Oral Presentation]
29. **J. Zweck** and C.R. Menyuk, "Reduction of nonlinear effects in optical fiber communications systems", *Southeast Conference on Applied Mathematics*, North Carolina State University, November 9–11, 2001
30. O.V. Sinkin, **J. Zweck**, and C.R. Menyuk, "A comparative study of pulse interactions in optical fiber transmission systems with different modulation formats", *IEEE Lasers and Electro-Optics Society Annual Meeting*, La Jolla, CA, paper TuK2, November 12–15, 2001, [Winner of IEEE-LEOS Best Student Paper Award]
31. L.R. Williams and **J. Zweck**, "Euclidean group invariant computation of stochastic completion fields using shifttable-twistable functions", *European Conference on Computer Vision*, Dublin, Ireland, June 26 – July 1, 2000
32. L.R. Williams and **J. Zweck**, "A wavelet basis for Euclidean group invariant computation of stochastic completion fields", *Learning Workshop*, Snowbird, Utah, April 6–9, 1999

Conference/Poster Presentations (Non-Refereed)

33. N. Zakarias, S.E. Minkoff, and **J. Zweck**, "Computational Modeling of Quartz-Enhanced Photoacoustic Spectroscopy (QEPAS) Sensors", *SIAM Conference on Mathematics for Industry*, Philadelphia, PA, October 9–11, 2007
34. **J. Zweck** and S.E. Minkoff, "Optimization of polarization-mode dispersion compensators in optical fiber communications", *Conference on Nonlinearity and Randomness in Complex Systems*, SUNY Buffalo, NY, March 31 – April 2, 2006
35. **J. Zweck**, W. Pellegrini, C.R. Menyuk, and R. Holzöhner, "Deterministic and Stochastic Methods for Computing the Bit Error Ratio in an Optical Fiber Communication System", *The Fourth IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory*, Athens, GA, April 11–14, 2005
36. C.R. Menyuk, B.S. Marks, and **J. Zweck**, "A methodology for calculating performance in an optical fiber communications system", *Tyrrhenian International Workshop on Digital Communications* Pisa Italy, October 17–18, 2004, [Invited]

37. “Numerical and statistical challenges in comparative studies of brain surface curvatures”, *Institute for Pure and Applied Mathematics, Graduate Summer School: Mathematics in Brain Imaging*, UCLA July 12 - 23, 2004 [*Impromptu 10 minute talk*]
38. **J.W. Zweck**, O. Sinkin, W. Pellegrini, and C. Menyuk, “Applications of Multicanonical Monte Carlo Sampling to Nonlinear Optical Communications Systems”, *First SIAM Nonlinear Waves and Coherent Structures*, Orlando, FL, MS2, paper 4, October 2–5, 2004
39. “Numerical and statistical challenges in comparative studies of brain surface curvatures”, *South East Geometry Conference*, University of Georgia, Athens, GA, March 20, 2004 [*Invited*]
40. C.R. Menyuk, B.S. Marks, **J. Zweck**, A.O. Lima, J. Hu, A. Kalra, A. Onuorah, O.V. Sinkin, Y. Sun, “*Short Course: Advances in modeling high data rate optical fiber communications systems*”, *Optical Fiber Communications 2004*, Los Angeles, CA, Feb. 22–27, 2004
41. **J. Zweck** and L.R. Williams, “Euclidean Invariant Computation of Salient Closed Contours in Images”, *SIAM 2003 Annual Meeting, Montreal Canada*, June 16, 2003
42. C.R. Menyuk, V.S. Grigoryan, R.-M. Mu, D. Wang, T. Yu, I.T. Lima, Jr., **J. Zweck**, B.S. Marks, J. Maloney, and Q. Zhang, “*Short Course: Modeling high-data-rate optical fiber communications systems*”, *Optical Fiber Communications 2003*, Atlanta, GA, Mar. 22–27, 2003; *Optical Fiber Communications 2002*, Anaheim, CA, Mar. 17–22, 2002
43. **J. Zweck**, I.T. Lima, Jr., R. Holzlöhner, and C.R. Menyuk, “New advances in modeling optical fiber communication systems”, *Optical Society of America Integrated Photonics Research*, Vancouver, Canada, July 17–19, 2002, [*Invited*]
44. **J. Zweck** and C.R. Menyuk, “Mitigation of nonlinear impairments in high-data-rate optical fiber communication systems,”, *SIAM 50th Anniversary and 2002 Annual Meeting*, Philadelphia, PA, July 8–12, 2002
45. L.R. Williams and **J. Zweck**, “Euclidean invariant computation of stochastic completion fields using shiftable-twistable wavelets”, *Sixth International Conference on Applications of High-Performance Computing in Engineering*, Maui, Hawaii, Jan. 2000
46. “Secondary characteristic currents”, *Special Session on Geometric Analysis, American Mathematical Society Meeting*, Corvallis, Oregon, Apr. 19, 1997, [*Invited*]
47. “Secondary characteristic currents”, *Joint Mathematics Meetings*, San Diego, Jan. 10, 1997
48. “Stiefel-Whitney currents”, *Joint Mathematics Meetings*, Orlando, Jan. 12, 1996
49. “Characteristic currents of singular connections associated with a compactified bundle”, *Differential Geometry Workshop, University of Adelaide, Australia*, Jun. 30, 1993, [*Invited*]
50. “Chern currents of singular connections associated with a compactified bundle”, *Texas Topology and Geometry Conference*, Rice University, Apr. 17, 1993, [*Invited*]

Other Professional Presentations**Colloquia**

51. “A diffeomorphic mean curvature flow for the processing of anatomical surfaces” *Department of Mathematics and Statistics, University of Maryland Baltimore County*, Sept. 14th, 2007
52. “Modeling, analysis and simulation of fiber optic communication systems”, *Department of Mathematics, United States Naval Academy*, Feb. 24th, 2003
53. “Modeling, analysis and simulation of fiber optic communication systems”, *Department of Mathematics and Statistics, University of Maryland Baltimore County*, Feb. 5th, 2003
54. “Euclidean invariant contour completion using shiftable-twistable functions”, *UMBC; University of North Texas; Texas Christian University; Portland State University; Connecticut College*, March–May 2000
55. “Euclidean group invariant computation of stochastic completion fields in a steerable-shiftable wavelet basis”, *NEC Research Institute*, Jun. 21, 1999
56. “A biologically plausible Euclidean invariant solution of the illusory contour problem in human and computer vision”, *Dept of Mathematics and Computer Science, Metropolitan State College of Denver*, Apr. 18, 1999
57. “Stiefel–Whitney currents”, *Department of Mathematics University of Georgia*, Nov. 1, 1996
58. “The theory of characteristic currents”, *Department of Mathematics, University of Houston*, Apr. 14, 1995
59. “Forms, currents and the local Gauss-Bonnet theorem”, *Department of Mathematics, University of Nevada Reno*, Apr. 3, 1995
60. “Compactification problems in the theory of characteristic currents”, *Department of Mathematics, Brown University*, Feb. 10, 1994
61. “Characteristic currents, divisors and singular connections”, *Department of Mathematics, University of Georgia*, Jan. 6, 1994

Seminars

62. “A receiver model for optical communications systems with polarization effects”, *Differential Equations Seminar, Department of Mathematics, UMBC*, Nov. 10, 2008
63. “Curvature-driven diffeomorphic flows of surfaces”, *GADGET Seminar, Department of Mathematics, University of Texas at Austin*, Mar. 27th, 2007
64. “Applications of multicanonical Monte Carlo sampling to nonlinear optical communications systems”, *Electrical Engineering Graduate Seminar, UMBC*, Oct. 8, 2004

65. “Level Set Methods and Fast Marching Methods”, *Differential Equations Seminar, Department of Mathematics, UMBC*, Nov. 17 & 24, 2003
66. “Euclidean invariant computation of salient closed contours in images”, *Numerical Analysis Seminar, Department of Mathematics, University of Maryland, College Park*, Sept. 23, 2003
67. “Euclidean invariant contour completion using shiftable-twistable functions”, *Compute Vision Seminar, Department of Computer Science, University of Maryland, College Park*, March 2000
68. “Euclidean invariant contour completion using shiftable-twistable functions”, *Vision Seminar, Computer Science Department, Yale University*, Dec. 8th, 1999
69. “Euclidean invariant contour completion using shiftable-twistable functions”, *Applied Mathematics Pattern Theory and Vision Seminar, Brown University*, Dec. 1st, 1999
70. “Euclidean invariant computation in human vision using wavelets to solve a Fokker-Planck equation”, *Department of Mathematics, University of New Mexico*, Nov. 4, 1999
71. “Computing visual contours in a Euclidean invariant manner using wavelets”, *Albuquerque High Performance Computing Center*, Oct. 27, 1999
72. “The theory of primary and secondary characteristic currents”, *Department of Mathematics, University of New Mexico*, Nov. 14, 1997
73. “Characteristic currents of vector bundle maps”, *University of Texas at Austin*, Sept. 4, 1996
74. “Characteristic currents of C^∞ -meromorphic sections of a vector bundle”, *Department of Mathematics, University of Georgia*, Jan. 7, 1994

SERVICE

Departmental

2007-2008	Mathematics and Statistics Department Graduate Committee
2005–2007	Faculty Fellow on NSF sponsored “VIP K-16” project between USM, Montgomery County Public Schools, and Montgomery College
Fall 2006	Mathematics and Statistics Department Mathematics Planning Committee member
Fall 2006	Mathematics and Statistics Department Undergraduate Committee member
2005–2006	Mathematics and Statistics Department Academic Planning Committee member
2005–2006	Mathematics and Statistics Department Undergraduate Committee member

- 2005– Instigated, coordinated development and ran training program for Math/Stat undergraduate and graduate teaching assistants [Program partially funded by subgrant to department from “VIP K-16” project]
- Spring 2005 Co-author with Sue Minkoff of “Mathematics and Statistics Department Focus on Interdisciplinary Mathematical Modeling and Computation”, proposal for UMBC’s Strategic Framework for 2016
- 2003–2005 Applied Mathematics Colloquium Organizer

University

- 2008–2009 Member of Undergraduate Research and Creative Achievement Day (URCAD) committee
- 2007–2008 Member of UMBC Writing Director hiring committee

Professional

- 2000– Lead developer of the software PhoSSiL, the *Photonics Systems Simulator Library*. PhoSSiL is a library of C++ classes that models optical fiber communications and laser systems and includes efficient algorithms for the accurate calculation of the performance of such systems. In the future, PhoSSiL will be made freely available to the optics research community.
- 2009 *Minisymposium organizer*: “MS 66, 77, and 87: Dynamics, Stability, and Rare Events for Mode-locked Lasers”, *SIAM Annual Meeting*, Denver, CO, July 6-10, 2009 (Collaboration with M.J. Ablowitz and C.R. Menyuk)
- 2007 *Minisymposium organizer*: “MS10: Modeling for Mid-infrared Sensor Systems”, *SIAM Conference on Mathematics for Industry*, Philadelphia, PA, Wednesday October 10th, 2007, (Collaboration with S.E. Minkoff)
- 2004 *Minisymposium organizer*: “Nonlinear and Stochastic Effects in Optical Fibers and Short-Pulse Lasers”, *The Fourth IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory*, Athens, GA, Wednesday Session 3, April 11–14, 2005, (Collaboration with G. Biondini and W.L. Kath)
- 2004 *Minisymposium organizer*: “Methods for Simulating Rare Events in Stochastic Nonlinear Wave Systems”, *First SIAM Nonlinear Waves and Coherent Structures*, Orlando, FL, MS2, October 1–4, 2004, (Collaboration with W.L. Kath)
- 2000–2007 Reviewer for *National Science Foundation*, *SIAM J. Applied Mathematics*, *Quarterly of Applied Mathematics*, *Mathematica Scandinavia*, *Journal of Mathematical Imaging and Vision*, *Physical Review E*, *J. Optical Society of America B*, *Photonics Technology Letters*, *Optics Letters*, *J. Lightwave Technology*, *Optics Express*, *Mathematics and Computers in Simulation*, *IEEE Transactions on Signal Processing*, *Journal on Optical Communications*, *UMBC Review*

- 2002 *Minisymposium organizer*: “Recent Advances in Mathematical Modeling for Optical Fiber Communications - Parts I and II,” *SIAM 50th Anniversary and 2002 Annual Meeting*, Philadelphia, PA, MS7 and MS 15 8–12, July 2002, (Collaboration with B.S. Marks)
- 2002 Documenter of the *Reduced Stokes Model* software for modeling polarization effects in optical communication systems, licensed by UMBC to Science Applications International Corporation
- 2001 Consultant to optical fiber communications company Kokusai Denshin Denwa Corporation, Japan
- 2000–2001 Member of UMBC team that performed optical communications research for Ciena Corporation