Jonathan Hu, PhD

Contact Information

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Education / Training

Princeton University, Princeton, NJ — 05/09 – 07/11
Research Associate, Department of Electrical Engineering

University of Maryland Baltimore County, Baltimore, MD — 08/08
PhD, Department of Computer Science and Electrical Engineering — GPA 4.0

University of Tulsa, Tulsa, OK — 08/01
M.S., Electrical Engineering, — GPA 4.0

Zhejiang University, Hangzhou, China — 07/97
B.S., Electrical Engineering, — Minor in Computer Science

Research Interests

Nanophotonics, surface plasmon, metamaterial, light-emitting diode (LED), electromagnetic wave, solar cell, nonlinear optics, photonic crystal fiber, optical communication, simulation, and modeling

Experience

Assistant Professor — 08/11 – present
Baylor University, Waco TX

Research Associate — 05/09 – 07/11
Princeton University, Princeton, NJ

- Model light scattering for nanophotonics
- Model nano-pillar antenna array for surface enhanced Raman scattering (SERS)
- Model light extraction of LEDs with photonic crystal structure
- Model Quantum Cascade (QC) Laser
- Optimize structure for surface plasmon resonance
- Help with proposal writing and review

Postdoc — 09/08 – 04/09
Research Assistant — 08/01 – 09/08
University of Maryland Baltimore County, Baltimore, MD

- Model supercontinuum generation using tapered chalcogenide-glass photonic crystal fiber
- Write parallel computing code with MPI
- Model photonic crystal fiber (PCF) or microstructure optical fiber (MOF)
- Implement finite-element method (FEM) and multipole method
- Run monte carlo simulation
- Analyze dispersion and mode diameter in PCF for parametric generation (900-950nm)
- Develop simulation package for optical communication (C/C++)
- Develop shooting method for Raman amplifier
- Optimize Raman gain profile with multiple Raman pumps using genetic algorithm
- Analyze propagation effect in wavelength-converted signal utilizing XPM (80 Gb/s)
- Setup optical transmitter for experiment
- Program LabVIEW to control instrument

collaboration with Naval Research Laboratory, Washington, D.C.

- Model supercontinuum generation using chalcogenide-glass photonic crystal fiber
- Model tapered photonic crystal fiber for pulse compression
- Analyze loss and bandgap for air-core photonic bandgap fiber for nonsilica glasses
- Optimize core design in chalcogenide-glass air-core photonic bandgap fiber

collaboration with Laboratory for Physical Sciences, College Park, MD

- Model Raman/EDFA hybrid amplifier system in a recirculating loop (10 Gb/s)
- Solve rate equation to model EDFA
- Model EDFA transient effect
- Model pattern dependent effect in receiver (10 Gb/s)
- Calculate Q and bit error rate (BER)

Teaching Experience

Baylor University

- ECE 3335: Signals and Systems(3 cr) Fall 2011
- EGR 1302: Introduction to engineering analysis(3 cr) Spring 2012

Princeton University (McGraw Center for Teaching and Learning)
Attended short courses and workshops in order to develop teaching skills and create innovative strategies to promote and assess learning in the classroom. Included are:

- Master Class on Lecturing (limited to 12 people per year) Spring 2011
- Engaging Students, Enhancing Participation Fall 2010
- The Scholar as Teacher Spring 2010

Professional services

- Proposal review panelist for
  U.S. National Science Foundation (NSF) (Dec. 2011, May 2012)
- Proposal reviewer for
  Natural Sciences and Engineering Research Council of Canada (NSERC)
  U.S. National Telecommunications and Information Administration (NTIA)
- Program Committee for
  IEEE International Conference on Electro/Information Technology (EIT 2012)
- Session Chair for Frontier in Optics/Laser Science Conference (2008)
- Publication reviewer for
  Optics Letters,
  Optics Express,
  Applied Optics,
  Photonics Technology Letters,
  Journal of Optical Society of America B,
  Journal of Lightwave Technology,
  Journal of Quantum Electronics,
  Optics Communications,
  Fiber and Integrated Optics,
  Journal of Modern Optics,
  International Journal of Optics, and
  IMOC 2009

Journal publications

1. W. Zhang, F. Ding, W.-D. Li, Y. Wang, **J. Hu** and S. Y Chou, "Giant and uniform fluorescence enhancement over large areas using plasmonic nanodots in 3D resonant cavity nanoantenna by nanoimprinting," Nanotechnology **23** 225301, (2012).
2. **J. Hu** and C. Gmachl, "QCL-based sensors target health and environmental applications," Laser Focus World, **48** 38-43, (2012).

3. **J. Hu** and C. Gmachl, "Quantum cascade lasers enhance mid-IR Spectroscopy," Photonics Spectra, **45** 48-50, (2011)
4. W. Li, **J. Hu**, and S. Y. Chou, "Extraordinary light transmission through opaque thin metal film with subwavelength holes blocked by metal disks," Opt. Express **19**, 21098-21108 (2011).
http://www.opticsinfobase.org/oe/abstract.cfm?URI=oe-19-21-21098
5. W. Li, F. Ding, **J. Hu**, and S. Y. Chou, "Three-dimensional cavity nanoantenna coupled plasmonic nanodots for ultrahigh and uniform surface-enhanced Raman scattering over large area," Opt. Express **19**, 3925-3936 (2011).
http://www.opticsinfobase.org/oe/abstract.cfm?URI=oe-19-5-3925
(**Media coverage: ScienceDaily Mar. 22, 2011, Photonics.com Light Matters #104 Mar. 23, 2011**)
6. R. J. Weiblen, A. Docherty, **J. Hu**, and C. R. Menyuk, "Calculation of the expected bandwidth for a mid-infrared supercontinuum source based on As_2S_3 chalcogenide photonic crystal fibers," Opt. Express **18**, 26666–26674 (2010.)
http://www.opticsinfobase.org/abstract.cfm?URI=oe-18-25-26666 (**invited**).
7. **J. Hu**, C. R. Menyuk, L. B. Shaw, J. S. Sanghera, and I. D. Aggarwal, "Computational study of a 3–5 μm source that is created by using supercontinuum generation in As_2S_3 chalcogenide fibers with a pump at 2 μm," Opt. Lett. **35**, 2907–2909 (2010).
8. **J. Hu**, C. R. Menyuk, L. B. Shaw, J. S. Sanghera, and I. D. Aggarwal, "Maximizing the bandwidth of supercontinuum generation in As_2Se_3 chalcogenide fibers," Opt. Express **18**, 6722–6739 (2010). www.opticsinfobase.org/oe/abstract.cfm?URI=oe-18-7-6722.
(**Figure appeared in issue cover page**
http://www.opticsinfobase.org/oe/issue.cfm?volume=18&issue=7)
9. **J. Hu** and C. R. Menyuk, "Understanding leaky modes: Slab waveguide revisited," Adv. Opt. Photon. **1**, 58–106 (2009).
http://www.opticsinfobase.org/aop/abstract.cfm?URI=aop-1-1-58.
(**Top three downloads in three consecutive months after publication in OSA**)
10. **J. Hu** and C. R. Menyuk, "Optimization of the operational bandwidth in air-core photonic bandgap fibers for IR transmission," Opt. Commun. **282**, 18–21 (2009).
11. **J. Hu** and C. R. Menyuk, "Leakage loss and bandgap analysis in air-core photonic bandgap fiber for nonsilica glasses," Opt. Express **15**, 339–349 (2007).
http://www.opticsinfobase.org/abstract.cfm?URI=oe-15-2-339.
12. 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 modeling optical communication systems," Opt. Commun. **272**, 107–110 (2007).
13. **J. Hu**, B. S. Marks, C. R. Menyuk, J. Kim, T. F. Carruthers, B. M. Wright, T. F. Taunay, and E. J. Friebele, "Pulse compression using a tapered microstructure optical fiber," Opt. Express **14**, 4026–4036 (2006).
http://www.opticsinfobase.org/abstract.cfm?URI=oe-14-9-4026.
14. J. Kim, U-C. Paek, B. H. Lee, **J. Hu**, B. Marks, and C. R. Menyuk, "Impact of interstitial air holes on a wide bandwidth rejection filter made from a photonic crystal fiber," Opt. Lett. **31**, 1196–1198 (2006).
15. G. E. Tudury, **J. Hu**, B. S. Marks, A. S. Lenihan, C. R. Menyuk, and G. M. Carter, "Gain characteristics of a 210-km hybrid Raman/EDFA amplified fiber loop," Opt. Commun. **261**, 152–157, (2006).
16. **J. Hu**, B. S. Marks, Q. Zhang, and C. R. Menyuk, "Modeling backward-pumped Raman amplifiers," J. Opt. Soc. Am. B **22**, 2083–2090, (2005).

17. **J. Hu**, B. S. Marks, and C. R. Menyuk, "Flat-gain fiber Raman amplifiers using equally spaced pumps," J. Lightwave Technol. **22**, 1519–1522, (2004).

Refereed conference proceedings

1. **J. Hu**, W.-D. Li, and S. Chou, "Blocker size effects on extraordinary light transmission through subwavelength holes in opaque thin metal film," in Proc. Conference on Lasers and Electro-Optics (CLEO), San Jose, CA, paper JTh2A.91, (2012).
2. C. R. Menyuk, **J. Hu**, R. J. Weiblen, and A. Docherty, "Supercontinuum Generation at Mid-IR Wavelengths in Chalcogenide Photonic Crystal Fibers," Frontiers in Optics, San Jose, CA paper FTuW1, (2011). (**invited**).
3. W.-D. Li, F. Ding, Y. Liang, C. Wang, H. Chen, **J. Hu**, W. Zhang and S. Chou, "Design and fabrication of high enhancement yet wafer-scale uniform SERS/plasmonic structures based on nanoimprint lithography and self-assembly," International Conference on Electron, Ion, Photon Beam Technology and Nanofabrication (EIPBN), Las Vegas, NV, paper 5C.2, (2011).
4. W.-D. Li, F. Ding, **J. Hu**, and S. Chou, "Nanoantenna Coupled Plasmonic Nanodots in a Three-dimensional cavity for uniform and ultra-high surface-enhanced Raman scattering (SERS) over large area," International Topical Meeting on Nanophotonics and Metamaterials (Nanometa), Tirol, Austria, paper WED4f.40, (2011).
5. W.-D. Li, **J. Hu**, and S. Y. Chou, "Nanoantenna enhanced transmission through blocked metallic subwavelength holes," International Topical Meeting on Nanophotonics and Metamaterials (Nanometa), Tirol, Austria, paper WED4f.41, (2011).
6. **J. Hu**, W.-D. Li, F. Ding, and S. Y. Chou, "Effects of nanodots on surface plasmons and electric field enhancement in nano-pillar antenna array," in Proc. Conference on Lasers and Electro-Optics (CLEO), San Jose, CA, paper QMH1, (2010).
7. R. J. Weiblen, **J. Hu**, C. R. Menyuk, L. B. Shaw, J. S. Sanghera, and I. D. Aggarwal, "Maximizing the Supercontinuum Bandwidth in As_2Se_3 Chalcogenide Photonic Crystal Fibers," in Proc. Conference on Lasers and Electro-Optics (CLEO), San Jose, CA, paper CTuX7, (2010).
8. **J. Hu**, C. R. Menyuk, L. B. Shaw, J. S. Sanghera, and I. D. Aggarwal, "Generating Mid-IR Source Using As_2Se_3-Based Chalcogenide Photonic Crystal Fibers," in Proc. Conference on Lasers and Electro-Optics (CLEO), Baltimore, MD, paper CThN6, (2009).
9. **J. Hu**, C. R. Menyuk, L. B. Shaw, J. S. Sanghera, and I. D. Aggarwal, "Supercontinuum generation in an As_2Se_3-based chalcogenide PCF using four-wave mixing and soliton self-frequency shift," in Proc. Conference on Optical Fiber Communications (OFC), San Diego, CA, paper OWU6, (2009).
10. **J. Hu**, C. R. Menyuk, L. B. Shaw, J. S. Sanghera, and I. D. Aggarwal, "Raman response function and supercontinuum generation in chalcogenide fiber," in Proc. Conference on Lasers and Electro-Optics (CLEO), San Jose, CA, paper CMDD2, (2008).
11. W. Torruellas, M. Dennis, J. Warren, **J. Hu**, and C. Menyuk, "Parametric generation in optical fibers in the 900-950nm spectral band," Proceedings of SPIE, Volume 6952 (2008).
12. **J. Hu** and C. R. Menyuk, "Optimize operational bandwidth through core design in air-core photonic bandgap fibers for IR transmission," in Proc. Conference on Optical Fiber Communications (OFC), San Diego, CA, paper JWA9, (2008).
13. V. Veerasubramanian, **J. Hu**, J. Zweck, and C. R. Menyuk, "Propagation analysis of an 80-Gb/s wavelength-converted signal utilizing XPM," in Proc. Conference on Optical Fiber Communications (OFC), San Diego, CA, paper JWA69, (2008).
14. J. J. Butler, S. R. Sueoka, S. R. Montgomery, S. R. Flom, R. G.S. Pong, J. S. Shirk, T. E. Taunay, B. M. Wright, **J. Hu**, and C. R. Menyuk, "Optical limiting in solid-core photonic

crystal fibers," in Proc. Conference on Lasers and Electro-Optics (CLEO), Baltimore, MD, paper CMS6, (2007).

15. **J. Hu** and C. R. Menyuk, "Use of fingers in the core to reduce leakage loss in air-core photonic bandgap fibers," in Proc. Conference on Optical Fiber Communications (OFC), Anaheim, CA, paper OML6, (2007).
16. **J. Hu** and C. R. Menyuk, "Loss and bandgap analysis in air-core photonic bandgap fiber for nonsilica glasses," in Proc. Conference on Quantum Electronics and Laser Science Conference (QELS), Long Beach, CA, paper JWB55, (2006).
17. **J. Hu** and C. R. Menyuk, "Loss and bandgap analysis in air-core photonic bandgap fiber for IR transmission," in Proc. Conference on Optical Fiber Communications (OFC), Anaheim, CA, paper OFC5, (2006).
18. **J. Hu**, B. S. Marks, J. Kim, and C. R. Menyuk, "Mode compression and loss in tapered microstructure optical fiber," in Proc. Conference on Quantum Electronics and Laser Science Conference (QELS), Baltimore, MD, paper JWB56, (2005).
19. J. Wen, P. Griggio, **J. Hu**, L. Yan, and G. M. Carter, "Quantitative study of the performance statistics of WDM systems under different channel spacings," in Proc. Conference on Lasers and Electro-Optics (CLEO), Baltimore, MD, paper CWG1, (2005).
20. **J. Hu**, Y. Sun, B. S. Marks, L. Yan, G. M. Carter, and C. R. Menyuk, "Optimizing the input scrambling rate in a recirculating loop with EDFAs," in Proc. Conference on Lasers and Electro-Optics (CLEO), San Francisco, CA, paper CFN7, (2004).
21. **J. Hu**, B. S. Marks, and C. R. Menyuk, "Design of flat-gain fiber Raman amplifiers using equally spaced pumps with fixed and optimized central wavelength," in Proc. Conference on Lasers and Electro-Optics (CLEO), Baltimore, MD, paper CThD5, (2003).
22. G. E. Tudury, **J. Hu**, B. S. Marks, G. M. Carter, and C. R. Menyuk, "Spectral gain characteristics of an amplified hybrid Raman/EDFA 210-km link," in Proc. Conference on Lasers and Electro-Optics (CLEO), Baltimore, MD, paper CThM52, (2003).
23. **J. Hu**, B. S. Marks, Q. Zhang, and C. R. Menyuk, "A shooting algorithm to model backward-pumped Raman amplifiers," Lasers and Electro-Optics Society (LEOS) Annual Meeting, Tucson, AZ, paper TuI3, (2003).

PRESENTATIONS

1. **J. Hu**, "From microphotonics to nanophotonics: photonic crystal fibers for mid-IR application and 3D plasmonic nanoantenna array," Dept. of Optical Engineering seminar, Zhejiang University, China, Dec. 29, 2010
2. **J. Hu**, "From microphotonics to nanophotonics: photonic crystal fibers for mid-IR application and 3D plasmonic nanoantenna array," Dept. of Electronic Engineering, Shanghai Jiao Tong University, China, Dec. 23, 2010
3. **J. Hu**, "Maximizing the bandwidth of supercontinuum generation in As_2Se_3 chalcogenide fibers," Bell Laboratories, Aug. 12, 2010
4. **J. Hu**, "Maximizing the bandwidth of supercontinuum generation in As_2Se_3 chalcogenide fibers," EMD seminar, Princeton University, Mar. 6, 2009
5. **J. Hu**, "Raman response function and supercontinuum generation in chalcogenide fiber," EE seminar, Northwestern University, Oct. 17, 2008
6. **J. Hu**, "Raman response function and supercontinuum generation in an As_2Se_3-based Chalcogenide-Glass Photonic Crystal Fiber," Radlab seminar, University of Michigan, Oct. 3, 2008
7. S. R. Sueoka, J. Butler, S. Montgomery, J. Shirk, S. Flom, R. Pong, B. Wright, T. Tauney, A. Rosenberg, C. Menyuk, and **J. Hu**, "Optical limiting in solid-core holey fibers," 2007

AAS/AAPT Joint Meeting, American Astronomical Society Meeting, Seattle, Washington, paper 209.02, 2007

8. **J. Hu**, "Design of Raman and Erbium-doped fiber amplifiers in Optical Communication System," CSEE graduate seminar, UMBC, Oct. 10, 2006
9. J. Kim, **J. Hu**, B. Marks, C. Menyuk, U-C. Paek, and B. H. Lee, "Improved multipole method for analysis of photonic crystal fibers," Photonics'05 T2D2, Chungmu, Korea, 2005
10. J. Kim, **J. Hu**, B. Marks, C. Menyuk, U-C. Paek, and B. H. Lee, "Cladding mode analysis of the photonic crystal fiber with two layers of holes," Proceedings of Physics Society of Korea Fall Meeting, LP2-036, Chonju, Korea, 2005
11. J. Kim, J. E. Im, **J. Hu**, B. Marks, C. Menyuk, U-C. Paek, and B. H. Lee, "Cladding mode analysis for photonic crystal fiber by using multipole method," COOC'05, FP-20, Daegu, Korea, 2005

Software package

- UndStdLeakyMode: Understanding leaky Modes
  A MATLAB program to understand leaky modes
  Sole developer
  URL: http://www.umbc.edu/photonics/software/UndStdLeakyMode

- PhoSSiL: Photonics Systems Simulator Library
  A library of C++ codes to simulate optical fiber communications systems and lasers
  Development team member, in charge of EDFA and Raman amplifier
  URL: http://www.umbc.edu/photonics/members/jzweck/PhoSSiL

Honors / Activities

- Chinese government award for outstanding self-financed students abroad (2006)
- First place award in IEEE Baltimore and Washington-Northern Virginia LEOS chapter graduate student poster competition (2008)
- Author of an invited tutorial journal paper in *Advance in optics and photonics*
- Travel grant, CRA's Academic Careers Workshop (2006)
- Membership in IEEE Photonics Society
- Membership in Optical Society of American (OSA)
- Memberships in Tau Beta Pi, Phi Kappa Phi, and Sigma Xi