

## CURRICULUM VITAE

# BABAK MOMENI

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Assistant Professor  
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## Education

- 2002-2007 Georgia Institute of Technology, Atlanta, GA, Ph.D. in Electrical Engineering  
Thesis: Design and implementation of dispersive photonic nanostructures; *Advisor: Dr. A. Adibi*
- 2002-2007 Georgia Institute of Technology, Atlanta, GA, M.Sc. in Physics
- 1999-2001 Sharif University of Technology, Tehran, Iran, M.Sc. in Electrical Engineering  
Thesis: Analysis of multiple grating structures; *Advisors: Dr. B. Rashidian and Dr. K. Barkeshli*
- 1995-1999 Sharif University of Technology, Tehran, Iran, B.Sc. in Electrical Engineering  
Thesis: Design of anisotropic optical filters; *Advisor: Dr. B. Rashidian*
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## Professional Experience





















- 2015-present Assistant Professor; Boston College: *Microbial Systems Biology*.
- 2009-2015 Postdoctoral Associate; Fred Hutchinson Cancer Research Center: *Quantitative Biology Group*.
- 2007-2009 Postdoctoral Fellow; Georgia Institute of Technology: *Photonics Research Group*.
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## Honors and Awards

- 2017 Award for Excellence in Biomedical Research from Smith Family Foundation.
- 2011 Gordon and Betty Moore Foundation Fellow of the Life Sciences Research Foundation.
- 2010 Best Poster Award; Basic Sciences Division, Fred Hutchinson Cancer Research Center.
- 2008 School of Electrical and Computer Engineering Research Spotlight Award; Georgia Tech.
- 2007 Best Paper Award; Photonics West Optoelectronics Symposium, San Jose, CA.
- 2006 New Focus/Bookham Student Award; Conference on Lasers and Electro-Optics (CLEO), Long Beach, CA.
- 2006 School of Electrical and Computer Engineering Research Assistant Excellence Award; Georgia Tech.
- 2005 Outstanding Leadership Award; Optics in the Southeast conference (OISE), Atlanta, GA.
- 2001 Ranked 1<sup>st</sup> in M. Sc. program (Optical Communications); Sharif University of Technology; Iran.
- 1999 Ranked 2<sup>nd</sup> in the National Scientific Olympiad in Electrical Engineering; Iran.
- 1995 Silver Medal in the National Mathematics Olympiad; Iran.
- 1994 Silver Medal in the National Computer Science Olympiad; Iran.
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## Peer-Reviewed Research Articles






1. Y. Fan, Y. Xiao, **B. Momeni**, and Y.-Y. Liu, "Horizontal gene transfer can help maintain the equilibrium of microbial communities," *J. Theor. Biol.* 454, 53-59 (2018). 
2. **B. Momeni**, Li Xie, and W. Shou, "Lotka-Volterra pairwise modeling fails to capture diverse pairwise microbial interactions," *eLife* 6, e25051 (2017). 
3. S. Widder, R. Allen, T. Pfeiffer, T. Curtis, C. Wiuf, W. Sloan, O. Cordero, S. Brown, **B. Momeni**, W. Shou, H. Kettle, H. Flint, A. Haas, B. Laroche, J.-U. Kreft, P. Rainey, S. Freilich, S. Schuster, K. Milferstedt, J. Roelof

- Van der Meer, T. Grosskopf, J. Huisman, A. Free, C. Picioreanu, C. Quince, I. Klapper, S. Labarthe, B. Smets, H. Wang, Isaac Newton Institute Fellows, and O. Soyer "Challenges in microbial ecology: building predictive understanding of community function and dynamics," *ISME J* 10, 2557-2568 (2016). 
4. **B. Momeni**, A. J. Waite, and W. Shou, "Spatial self-organization favors heterotypic cooperation over cheating," *eLife* 2, e00960 (2013). 
  5. **B. Momeni**, K. A. Brileya, M. W. Fields, and W. Shou, "Strong inter-population cooperation leads to partner intermixing in microbial communities," *eLife* 2, e00230 (2013). 
  6. **B. Momeni** and W. Shou, "Cryosectioning yeast communities for examining fluorescence patterns," *J. Vis. Experim.* 70, e50101 (2012). 
  7. Z. Xia, A. A. Eftekhar, M. Soltani, **B. Momeni**, Q. Li, M. Chamanzar, S. Yegnanarayanan, and A. Adibi, "High resolution on-chip spectroscopy based on miniaturized microdonut resonators," *Opt. Express* 19, 12356-12364 (2011). 
  8. M. Askari, **B. Momeni**, C. M. Reinke, and A. Adibi, "Absorbing boundary conditions for low group velocity electromagnetic waves in photonic crystals," *Appl. Opt.* 50, 1266-1271 (2011). 
  9. M. Chamanzar, M. Soltani, **B. Momeni**, S. Yegnanarayanan, and A. Adibi, "Hybrid photonic surface-plasmon-polariton ring resonators for sensing applications," *Appl. Phys. B* 101, 263-271 (2010). 
  10. P. Alipour, E. Shah Hosseini, A. A. Eftekhar, **B. Momeni**, and A. Adibi, "Athermal performance in high-Q polymer-clad silicon microdisk resonators," *Opt. Lett.* 35, 3462-3464 (2010). 
  11. **B. Momeni**, M. Askari, E. Shah Hosseini, A. Atabaki, and A. Adibi, "An on-chip silicon grating spectrometer using a photonic crystal reflector," *J. Opt.* 12, 035501 (2010). 
  12. A. H. Atabaki, **B. Momeni**, A. A. Eftekhar, E. S. Hosseini, S. Yegnanarayanan, and A. Adibi, "Tuning of resonance-spacing in a traveling-wave resonator device," *Opt. Express* 18, 9447-9455 (2010). 
  13. M. Askari, **B. Momeni**, M. Soltani, and A. Adibi, "Systematic design of wide-bandwidth photonic crystal waveguide bends with high transmission and low dispersion," *J. Lightwave Technol.* 28, 1707-1713 (2010). 
  14. **B. Momeni**, E. Shah Hosseini, and A. Adibi, "Planar photonic crystal spectrometers in silicon-nitride for the visible range," *Opt. Express* 17, 17060-17069 (2009). 
  15. **B. Momeni**, E. Shah Hosseini, M. Askari, M. Soltani, and A. Adibi, "Integrated photonic crystal spectrometers for sensing applications," *Opt. Commun.*, 282, 3168-3171 (2009). 
  16. M. Chamanzar, **B. Momeni**, and A. Adibi, "Compact on-chip interferometers with high spectral sensitivity," *Opt. Lett.* 34, 220-222 (2009). 
  17. A. Atabaki, E. Shah Hosseini, **B. Momeni**, and A. Adibi, "Enhancing the guiding bandwidth of photonic crystal waveguides on silicon-on-insulator," *Opt. Lett.* 33, 2608-2610 (2008). 
  18. **B. Momeni**, M. Chamanzar, E. Shah Hosseini, M. Askari, M. Soltani, and A. Adibi, "Strong angular dispersion using higher bands of planar silicon photonic crystals," *Opt. Express* 16, 14213-14220 (2008). 
  19. **B. Momeni**, M. Badieirostami, and A. Adibi, "Modeling the propagation of optical beams in three-dimensional photonic crystals," *J. Opt. Soc. Am. B* 25, 785-793 (2008). 
  20. S. Tay, J. Thomas, **B. Momeni**, M. Askari, A. Adibi, P. Hotchkiss, S. Jones, S. Marder, R. Norwood, and N. Peyghambarian, "Infiltration of 2D photonic crystals with nanoparticle/polymer nanocomposites," *Appl. Phys. Lett.* 91, 221109 (2007). 
  21. **B. Momeni**, M. Badieirostami, and A. Adibi, "Accurate and efficient techniques for the analysis of reflection at the interfaces of three-dimensional photonic crystals," *J. Opt. Soc. Am. B* 24, 2957-2963 (2007). 
  22. **B. Momeni**, A. A. Eftekhar, and A. Adibi, "Effective impedance model for analysis of reflection at the interfaces of photonic crystals," *Opt. Lett.* 32, 778-780 (2007). 
  23. **B. Momeni** and A. Adibi "Preconditioned superprism-based photonic crystal demultiplexers: analysis and

- design," *Appl. Opt.* 45, 8466-8476 (2006). 
24. **B. Momeni** and A. Adibi, "Demultiplexers harness photonic-crystal dispersion properties," *Laser Focus World* 42, 125-128 (2006). 
  25. **B. Momeni**, J. Huang, M. Soltani, M. Askari, S. Mohammadi, A. Adibi, and M. Rakhshandehroo, "Compact wavelength demultiplexing using focusing negative index photonic crystal superprisms," *Opt. Express* 14, 2413-2422 (2006). (*Highlighted in SPIE Newsroom*, <http://spie.org/x14414.xml?ArticleID=x14414>) 
  26. J. Hunag, C. M. Reinke, A. Jafarpour, **B. Momeni**, M. Soltani, and A. Adibi, "Observation of large parity-change induced dispersion in triangular-lattice photonic crystal waveguides using phase sensitive lock-in techniques," *Appl. Phys. Lett.* 88, 071111 (2006). 
  27. C. M. Reinke, A. Jafarpour, **B. Momeni**, M. Soltani, S. Khorasani, A. Adibi, Y. Xu, and R. K. Lee, "Nonlinear finite-difference time-domain simulation of  $\chi^{(2)}$  and  $\chi^{(3)}$  effects in two-dimensional photonic crystals," *J. Lightwave Technol.* 24, 624-634 (2006). 
  28. **B. Momeni** and A. Adibi, "Adiabatic matching stage for coupling of light to extended Bloch modes of photonic crystals," *Appl. Phys. Lett.* 87, 171104 (2005). 
  29. **B. Momeni** and A. Adibi, "Systematic design of superprism-based photonic crystal demultiplexers," *IEEE J. Select. Area. Commun.* 23, 1355-1364 (2005). 
  30. **B. Momeni** and A. Adibi, "An approximate effective index model for efficient analysis and control of beam propagation effects in photonic crystals," *J. Lightwave Technol.* 23, 1522-1532 (2005). 
  31. **B. Momeni** and B. Rashidian, "Pure coupled mode analysis of diffraction by isotropic transmission volume gratings," *IEEE Trans. Ant. Propag.* 52, 3304-3311 (2004). 
  32. M. Badieirostami, **B. Momeni**, M. Soltani, A. Adibi, Y. Xu, and R. K. Lee, "Investigation of physical mechanisms in coupling photonic crystal waveguiding structures," *Opt. Express* 12, 4781-4789 (2004). 
  33. **B. Momeni** and B. Rashidian, "Improved coupled wave analysis of two-dimensional planar multiple gratings," *IEEE Trans. Ant. Propag.* 52, 165-171 (2004). 
  34. **B. Momeni** and A. Adibi, "Optimization of photonic crystal demultiplexers based on superprism effect," *Appl. Phys. B* 77, 556-560 (2003). 
  35. N. Wu, M. Javanmard, **B. Momeni**, M. Soltani, A. Adibi, Y. Xu, and R. K. Lee, "General methods for designing single-mode planar photonic crystal waveguides in hexagonal lattice structures," *Opt. Express* 11, 1371-1377 (2003). 

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## Book Chapters and Review Articles

1. M. Zaccaria, S. Dedrick, and **B. Momeni**, "Modeling microbial communities: a call for collaboration between experimentalists and theorists," *Processes* 5, 53 (2017). 
2. S. Kang, S. Kahan, and **B. Momeni**, "Simulating Microbial Community Patterning Using Biocellion," *Engineering and Analyzing Multicellular Systems (Springer Protocols)*, Edited by L. Sun and W. Shou, New York: Humana, 2014. 
3. **B. Momeni**<sup>\*</sup>, C. -C. Chen<sup>\*</sup>, K. L. Hillesland<sup>\*</sup>, A. J. Waite, and W. Shou, "Using artificial systems to explore the ecology and evolution of symbioses," *Cell. Mol. Life Sci.*, 68, 1353-1368 (2011). (<sup>\*</sup> equal contribution) 
4. **B. Momeni**, S. Yegnanarayanan, A. A. Eftekhar, M. Soltani, and A. Adibi, "Photonic crystal waveguides and filters," *Comprehensive Semiconductor Science and Technology Series*, Edited by P. Bhattacharya, R. Fornari, H. Kamimura, Amsterdam: Elsevier Science, 2011. 
5. **B. Momeni**, S. Yegnanarayanan, M. Soltani, A. A. Eftekhar, E. Shah Hosseini, and A. Adibi, "Silicon nanophotonic devices for integrated sensing," *J. Nanophoton.* 3, 031001 (2009). 

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## Invited Talks

1. **B. Momeni**, "Synthetic ecology: Using microbial systems for studies in community ecology," Institute for Fundamental Research (IPM) Frontiers in Biological Sciences, Tehran, Iran, 2017.
2. **B. Momeni**, "Microbial interactions through chemical mediators," Georgia Institute of Technology: Biology Seminar Series, Atlanta, GA, 2017.
3. **B. Momeni**, "Modeling microbial communities as a network of mediated interactions," Harvard Channing Division of Network Medicine, Boston, MA, 2016.
4. **B. Momeni**, "Modeling microbial communities as a network of chemically mediated interactions," Boston University Biophysics Series, Boston, MA, 2016.
5. **B. Momeni**, "Microbial communities: linking interactions to functions," MIT Quantitative Ecology Symposium, Cambridge, MA, 2016.
6. **B. Momeni** and W. Shou, "Compositional stability and spatial patterning driven by ecological interactions within microbial communities," NIMBioS Workshop, Knoxville, TN, 2013.
7. **B. Momeni**, E. Shah Hosseini, and A. Adibi, "Cascaded silicon-nitride integrated spectrometers for wideband high-resolution spectral interrogation," Proc. SPIE 7609, 76090L (2010).
8. **B. Momeni**, M. Chamanzar, E. Shah Hosseini, M. Askari, M. Soltani, and A. Adibi, "Design and applications of strongly dispersive photonic crystal structures," Proc. SPIE 6901, 690107 (2008).
9. **B. Momeni**, E. Shah Hosseini, M. Askari, S. Mohammadi, M. Soltani, and A. Adibi, "Compact photonic crystal demultiplexers and spectrometers," Proc. SPIE 6480, 648012 (2007) (**best paper award**).
10. **B. Momeni**, J. Huang, M. Soltani, M. Askari, S. Mohammadi, and A. Adibi, "Compact preconditioned photonic crystal demultiplexers based on combined focusing and superprism effects," Proc. SPIE 6128, 61280V (2006).
11. **B. Momeni**, A. Jafarpour, C. M. Reinke, M. Soltani, and A. Adibi, "Novel optical devices based on dispersion engineering in photonic crystals," *Optics in the Southeast*, Charlotte, NC, 2004.
12. **B. Momeni**, M. Soltani, A. Jafarpour, C. M. Reinke, Y. Xu, R. K. Lee, and A. Adibi, "Design and characterization of photonic crystal devices," *Micromachining Technology for Microoptics and Nanooptics Conference in Photonics West Meeting 2004*, San Jose, CA, 2004.

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## Selected Presentations

1. L. Niehaus, I. Boland, and **B. Momeni**, "Impact of interspecies interactions on microbial coexistence," *Boston Bacterial Meeting*, Boston, MA, 2018.
2. T. Harder de Palma and **B. Momeni**, "Studying the mechanisms of interactions among oral microorganisms in a synthetic community," *Boston Bacterial Meeting*, Boston, MA, 2018.
3. **B. Momeni**, "Modeling facilitation and inhibition in microbial communities: The combined effect of concurrent interactions," *ASM Conference on Mechanisms of Interbacterial Cooperation and Competition*, Washington, DC, 2017.
4. **B. Momeni**, "Limitations of pairwise modeling for predicting microbial community dynamics," *PennCHOP Symposium*, University of Pennsylvania, Philadelphia, PA, 2016.
5. L. Niehaus, M. Liu, W. Shou, and **B. Momeni**, "Network properties of stable microbial communities," *ISME 15*, Montreal, Québec, Canada, 2016.
6. **B. Momeni** and W. Shou, "Modeling microbial communities: is pairwise modeling adequate?" *ASM 2016 Annual Meeting*, Boston, MA, 2016.
7. **B. Momeni**, "Investigating the origins of species coexistence using a cellulose-degrading microbial communities," *EMBL Symposium on New Approaches and Concepts in Microbiology*, Heidelberg, Germany, 2015.
8. **B. Momeni** and W. Shou, "Modeling microbial communities: mechanistic versus phenomenological," *EMBL Symposium on New Approaches and Concepts in Microbiology*, Heidelberg, Germany, 2015.

9. **B. Momeni** and W. Shou, "Interdependence of species interactions and spatial patterning in microbial communities," *15<sup>th</sup> International Symposium on Microbial Ecology (ISME 15)*, Seoul, South Korea, 2014.
10. **B. Momeni** and W. Shou, "Patterning in Simple Microbial Communities," *Cold Spring Harbor Lab Meeting: Computational Cell Biology*, Cold Spring Harbor, NY, 2013.
11. **B. Momeni** and W. Shou, "Partner intermixing: a signature for culture-independent identification of cooperation in microbial communities," *ISB International Symposium-Systems Biology and the Microbiome*, Seattle, WA, 2012.
12. **B. Momeni** and W. Shou, "Spatial patterning in multicellular microbial communities," *Computational and Molecular Biology Seminar*, University of Washington, Seattle, WA, 2011.
13. **B. Momeni** and W. Shou, "Spatial patterns in a yeast model system," *Computational and Molecular Biology Seminar*, University of Washington, Seattle, WA, 2010.
14. **B. Momeni**, E. Shah Hosseini, A. H. Atabaki, Q. Li, M. Soltani, and A. Adibi, "On-chip spectrometers for visible and infrared sensing applications," *Proc. SPIE 7223*, 722306 (2009).
15. **B. Momeni**, E. Shah Hosseini, M. Soltani, and A. Adibi, "High resolution wavelength demultiplexers using the second photonic band of planar photonic crystals," *OSA's 91th Annual Meeting*, San Jose, CA, 2007.
16. **B. Momeni**, M. Askari, E. Shah Hosseini, S. Mohammadi, M. Soltani, and A. Adibi, "Compact integrated optical demultiplexers and spectrometers enabled by dispersion engineering in photonic crystals," *PECS-VII: Photonic and Electromagnetic Crystal Structures*, Monterey, CA, 2007.
17. **B. Momeni**, E. Shah Hosseini, M. Askari, S. Mohammadi, M. Soltani, and A. Adibi, "Chip-Scale photonic crystal spectrometers with high resolution for lab-on-a-chip sensing applications," *Conference on Lasers and Electro-Optics (CLEO)*, Baltimore, MD, 2007.
18. **B. Momeni**, J. Huang, M. Askari, S. Mohammadi, M. Soltani, and A. Adibi, "Compact photonic crystal superprism demultiplexers based on diffraction compensation," *Conference on Lasers and Electro-Optics (CLEO)*, Long Beach, CA, 2006.
19. **B. Momeni**, M. Soltani, M. Askari, D. K. Brown, and A. Adibi, "Ultracompact preconditioned superprism-based photonic crystal demultiplexers," *IEEE LEOS Annual Meeting*, Sydney, Australia, 2005.
20. **B. Momeni** and A. Adibi, "Investigation of reflection at the interface of photonic crystals," *Optics in the Southeast*, Atlanta, GA, 2005.
21. **B. Momeni** and A. Adibi, "Adiabatic coupling to extended Bloch modes of photonic crystals," *Proc. SPIE 5733*, 289-296 (2005).
22. **B. Momeni** and A. Adibi, "Controlling diffraction of optical beams using photonic crystals," *Proc. SPIE 5360*, 355-363 (2004).
23. **B. Momeni** and A. Adibi, "Optimization of superprism-based photonic crystal demultiplexers," *Conference on Lasers and Electro-Optics (CLEO/QELS)*, Baltimore, MD, 2003.
24. **B. Momeni** and A. Adibi, "Controlling the propagation of optical beams in photonic crystals," *OSA Annual Meeting*, Tucson, AZ, 2003.
25. **B. Momeni** and A. Adibi, "Systematic design of superprism-based photonic crystal demultiplexers," *OSA Annual Meeting*, Tucson, AZ, 2003.
26. **B. Momeni**, C. M. Reid, A. Adibi, M. E. Sullivan, and D. J. Brady, "Unique dispersion properties of photonic crystals: properties and applications," *Fitzpatrick Annual Symposium*, Duke University, Durham, NC, 2003.
27. **B. Momeni** and A. Adibi, "Engineering the bandgap in photonic crystals," *OSA Annual Meeting*, Orlando, FL, 2002.
28. **B. Momeni**, J. B. Coe, M. Soltani, and A. Adibi, "Efficient computation of band structure in photonic crystals," *Optics in the Southeast*, Huntsville, AL, 2002.
29. **B. Momeni** and B. Rashidian, "Improved coupled mode analysis of planar diffraction gratings," *Proc. SPIE 4581*, 68-78 (2001).

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## Patents

- “Spatial separation of optical frequency components using photonic crystals,” **B. Momeni** and A. Adibi, U.S. Patent 7796849, 2010. 
- “A flexible cellular architecture for reconfigurable photonic array,” A. A. Eftekhar, S. Yegnanarayanan, **B. Momeni**, and A. Adibi, provisional patent submitted.
- “Ultra-high resolution on-chip spectrometer,” M. Soltani, A. A. Eftekhar, S. Yegnanarayanan, **B. Momeni**, Z. Xia, Q. Li, and A. Adibi, provisional patent submitted.

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## Professional Memberships and Activities

- Member of eLife early-career advisory group.
- Served as ad-hoc reviewer for: eLife, Nature Ecology & Evolution, PLOS Computational Biology, Environmental Microbiology Reports, Bioessay, PNAS, PLOS Biology, Current Biology, Frontiers in Microbiology, BMC, Physics Letters A, Nature Communications, Optics Letters, Optics Express, Applied Optics, Journal of Lightwave Technologies, Photonics Technology Letters, Optics Communications, Photonics and Nanostructures, and Journal of Optical Society of America B.
- Member of the International Society for Microbial Ecology (ISME), the American Society for Microbiology (ASM), the Optical Society of America (OSA), and the International Society for Optical Engineers (SPIE).
- Member of Eta Kappa Nu, Electrical Engineering Honor Society.