Anthony Barsic, Ph.D.

Curriculum vitæ

Education

2010–2014 **Ph.D.**, *University of Colorado*, Boulder, CO.
Electrical Engineering, specializing in Optics and Signal Processing

2014 **Study Abroad**, *Weizmann Institute of Science*, Rehovot, Israel.
International Research Rotation, Quantum Optics

2008–2011 **Master of Science**, *University of Colorado*, Boulder, CO, *3.9/4.0*.
Electrical Engineering, specializing in Optics and Signal Processing

2003–2008 **Bachelor of Science**, *Iowa State University*, Ames, IA, *3.9/4.0*.
Electrical Engineering major
German minor

2006 **Study Abroad**, *Mannheim Polytechnic University*, Mannheim, Germany.
Work/Study program with John Deere

Doctoral Thesis

Title: *Localization of Dense Clusters of Nanoscale Emitters for Super-resolution Microscopy*

Advisor: Prof. Rafael Piestun

Abstract: Through a combination of optical and computational techniques, I developed several ways to overcome the diffraction limit of light. These methods enable faster and more detailed study of biological processes. The outcome of my work is a set of tools for cellular biologists to use for making observations about biological processes that would not have been possible otherwise.

Teaching Experience

2024–Present **Senior Lecturer, Director of Semiconductor Curriculum**, *University of Vermont*, Burlington, VT.
Courses: Electromagnetic Field Theory, Microcontroller Systems, First Year Seminar
Overseeing the development and implementation of The Undergraduate Certificate in Semiconductor Engineering and Physics

2015–2024 **Lecturer, Assistant Professor Adjunct**, *University of Colorado*, Boulder, CO.
Courses: Freshman Seminar; Circuits as Systems; Bio-medical instrumentation; Geometrical Optics; Graduate Optics Lab; Optics, Photonics, and Nanofabrication Lab
Service: Curriculum Committee, Departmental Action Team

2011–2015 **Mentor, Undergraduate Research Advisor**, *University of Colorado*, Boulder, CO.
Served as a mentor for two undergraduate researchers and one new PhD student

2010–2011 **Departmental Lead Teaching Assistant**, *University of Colorado*, Boulder, CO.
Served as a training and professional development resource for new teaching assistants

2008–9, 2012 **Teaching Assistant**, *University of Colorado*, Boulder, CO.
Courses: Graduate Optics Lab, Electromagnetic Fields and Waves

2005–2008 **Teaching Assistant**, *Iowa State University*, Ames, IA.
Course: Introduction to Electrical Engineering and Problem Solving

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Research Experience

2017–2024 **Professional Research Associate**, *University of Colorado, Laboratory for Atmospheric and Space Physics*, Boulder, CO.
Professional Research Associate
Mission: CLARREO (Climate Absolute Radiance and Refractivity Observatory)
Role: Instrument Engineer
- Designed and analyzed a space-based imaging spectromoter for measuring climate data
- Specified, purchased, and aligned custom optics
- Planned and executed the calibration campaign (ongoing)

2009–2014 **Graduate Research Assistant**, *University of Colorado*, Boulder, CO.
Computational Optical Sensing and Imaging
Advisor: Rafael Piestun
Topic: Super-resolution microscopy

2007–2008 **Undergraduate Research Assistant**, *Iowa State University*, Ames, IA.
Microelectronics Research Center
Advisor: Gary Tuttle
Topic: Microwave-scale photonic crystals

2004–2005 **Undergraduate Research Assistant**, *Iowa State University*, Ames, IA.
Ames Lab Magnetics Group
Advisor: David Jiles
Topic: Magneto-mechanical materials

Industry Experience

2015–2016 **Senior Research Engineer**, *Double Helix LLC*, Boulder, CO.
3D microscopy and imaging tools (hardware and image processing)

2005-2006 **Intern**, *John Deere*, Waterloo, IA and Mannheim, Germany.
Design and environmental testing for liquid crystal displays

Patents

2012-2016 **Patent Applications**, *University of Colorado*, Office of Technology Transfer.
2014: "Imaging or Measurement Methods and Systems"
2015: "3-D Localization and Imaging of Dense Arrays of Particles"

Technical Skills and Experience

MATLAB	simulations, image processing, hardware control, data acquisition
Zemax	optical system design
Arduino	physical computing, hardware control, pedagogy
ImageJ/FIJI	image processing
LaTeX	technical communication
LabView	hardware control, data acquisition
SolidWorks	basic part design for 3D printing and rapid prototyping
Clean Room	fabrication of electrical devices, solar cells, photonic devices
Others:	some knowledge of UNIX/Bash scripting, C, C++, Java, Python
Computers:	experience with Linux and Windows operating systems, some experience with microcomputers (Raspberry Pi)

Volunteer & Service Work

- Discussion Facilitator, Anti-Racism Course, University of Colorado Laboratory for Atmospheric and Space Physics (2020)
- Curriculum Committee, University of Colorado Dept of Electrical, Computer, and Energy Engineering (2015-2017)
- Departmental Action Team, University of Colorado Dept of Electrical, Computer, and Energy Engineering (2015-2017)
- Reviewer of scientific papers for publication in *Applied Optics*, *Optics Express*, and *Optics Letters* (2013-2017)
- Student Outreach Leader, prepared science experiments and demonstrated them for several outreach events for jr. high and high school students (2009-2010)

Leadership

- Vice President, student chapter of the Optical Society of America (2012-2013)
- Vice President, student chapter of SPIE, the International Society for Optics and Photonics (2012-2013)
- Departmental Lead Teaching Assistant, University of Colorado (2010-2011)

Fellowship Awards

2014–2015 **BFSA**, *BioFrontiers Science Alliance Seed Grant*, "Analyzing Polyomavirus Factories with Double-Helix Super Resolution Microscopy.".
Provided by University of Colorado BioFrontiers Institute

2009–2014 **COSI**, *Computational Optical Sensing and Imaging*.
An Integrative Graduate Education and Research Traineeship from the National Science Foundation

2013 **GAANN**, *Graduate Assistanceship in Areas of National Need*.
Provided by the U.S. Department of Education

2009–2012 **EEF**, *Excellence in Engineering Fellowship*.
Provided by Sandia National Labs

Awards and Recognitions

- Poster Competition Winner, Colorado Photonics Industry Association annual meeting (Oct 2013)
- 1^{st} Place, IEEE Region 4 Student Research Paper Contest (May 2008)
- Graduated Summa Cum Laude, Iowa State University (May 2008)
- Peer Mentor Award, University-wide recognition, Iowa State University, (2008)
- Peer Mentor Award, Departmental recognition, Iowa State University (2006, 2007, 2008)
- National Merit Scholar (2003)

Interests

- Hiking and backpacking with my dog
- Riding and repairing bicycles, motorcycles, and electric motorcycles
- Playing and making flutes, playing piano
- Reading fiction novels, playing and running Dungeons & Dragons

Publications

Journal Papers

[1] Saumya Jain, Joshua R. Wheeler, Robert W. Walters, Anurag Agrawal, Anthony Barsic, and Roy Parker. ATPase-Modulated Stress Granules Contain a Diverse Proteome and Substructure. *Cell*, 164:1–12, January 2016.

[2] Anthony Barsic, Ginni Grover, and Rafael Piestun. Three-dimensional super-resolution and localization of dense clusters of single molecules. *Scientific reports*, 4:5388, June 2014.

[3] Anthony Barsic, Ginni Grover, and Rafael Piestun. Sparse reconstructions of overlapping three-dimensional point spread functions using overcomplete dictionaries. *arXiv.org*, pages 1–4, 2013.

[4] Anthony Barsic and Rafael Piestun. Super-resolution of dense nanoscale emitters beyond the diffraction limit using spatial and temporal information. *Applied Physics Letters*, 102(23):231103, 2013.

[5] Daniel Stieler, Anthony Barsic, Rana Biswas, Gary Tuttle, and Kai-Ming Ho. A planar four-port channel drop filter in the three-dimensional woodpile photonic crystal. *Optics express*, 17(8):6128–33, April 2009.

[6] Daniel Stieler, Anthony Barsic, Gary Tuttle, Ming Li, and Kai-Ming Ho. Effects of defect permittivity on resonant frequency and mode shape in the three-dimensional woodpile photonic crystal. *Journal of Applied Physics*, 105(10):103109, 2009.

[7] Emily R. Kinser, Chester C.H. Lo, Anthony Barsic, and David C. Jiles. Modeling microstructural effects on Barkhausen emission in surface-modified magnetic materials. *IEEE Transactions on Magnetics*, 41(10):3292–3294, October 2005.

Conference Proceedings

[8] Anthony Barsic and Rafael Piestun. Beyond Super-resolution Localization Microscopy: Extension to Three Dimensions, Dense Scenes, Fast Acquisition, and Drift-less, Multicolor Thick Samples. In *Focus on Microscopy*, 2015.

[9] Anthony Barsic and Rafael Piestun. Dictionary Generation for Sparsity-based Three-Dimensional Super-resolution Microscopy. In *Novel Techniques in Microscopy (Optical Society of America)*, 2015.

[10] Anthony Barsic and Rafael Piestun. 3-D Super-resolution Localization Microscopy. In *Quantitative Biology Student Symposium (BioFrontiers Institute, University of Colorado)*, 2015.

[11] Anthony Barsic, Ginni Grover, and Rafael Piestun. Compressive three-dimensional localization microscopy. In *Computational Optical Sensing and Imaging (Optical Society of America)*, 2014.

[12] Anthony Barsic, Ginni Grover, and Rafael Piestun. Three-dimensional super-resolution and super-localization of dense clusters of single molecules using sparse reconstructions. In *Quantitative Bioimaging Conference (University of New Mexico)*, 2014.

[13] Anthony Barsic and Rafael Piestun. Optical and digital methods for super-resolution microscopy using quantum dot blinking, with extensions to three dimensions (INVITED). In *Energy Materials Nanotechnology Fall Meeting*, 2013.

[14] Anthony Barsic, Ginni Grover, and Rafael Piestun. Three-dimensional super-resolution of dense single molecule scenes for localization microscopy. In *Frontiers in Optics (Optical Society of America)*, 2013.

[15] Anthony Barsic and Rafael Piestun. Statistical Independence of Quantum Dot Blinking Signals for Imaging Beyond the Diffraction Limit. In *Computational Optical Sensing and Imaging (Optical Society of America)*, 2013.

[16] Anthony Barsic and Rafael Piestun. Use of Spatial and Temporal Information for Superresolution of Dense Quantum Dot Clusters. In *Quantitative Bioimaging Conference (University of New Mexico)*, 2013.

[17] Anthony Barsic and Rafael Piestun. Super-resolution of Dense Quantum Dot Clusters using Independent Component Sorting. In *Computational Optical Sensing and Imaging Conference (Optical Society of America)*, 2012.

Poster Sessions

[18] Anthony Barsic, Ginni Grover, and Rafael Piestun. Quantitative 3D Super-resolution Microscopy for Biological Research. In *4th Annual Colorado Single Molecules and Membranes Meeting (University of Denver)*, 2015.

[19] Anthony Barsic, Ginni Grover, and Rafael Piestun. Quantitative 3D Super-resolution Microscopy for Biological Research. In *Annual Focus on University Research (Colorado Photonics Industry Association)*, 2014.

[20] Anthony Barsic, Ginni Grover, and Rafael Piestun. Three-dimensional super-resolution and super-localization of dense clusters of single molecules. In *Annual Focus on University Research (Colorado Photonics Industry Association)*, 2013.

[21] Anthony Barsic and Rafael Piestun. Superresolution of Dense Nanoscale Emitters Beyond the Diffraction Limit Using Spatial and Temporal Information. In *Annual Focus on University Research (Colorado Photonics Industry Association)*, 2012.

[22] Anthony Barsic and Rafael Piestun. Superresolution in Fluorescence Microscopy with Quantum Dots. In *Industry Advisory Board Meeting (Colorado Photonics Industry Association)*, 2011.