

Katherine Aidala

Professor of Physics

Mount Holyoke College

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<i>Appointments</i>	2017 - now	Professor of Physics, Mount Holyoke College Chair of Physics Department
	2012 - 2017	Associate Professor of Physics, Mount Holyoke College Chair of Physics Department
	2012 - now	Adjunct Professor of Physics, University of Massachusetts, Amherst
	2009 - 2010	Visiting Scientist, Massachusetts Institute of Technology
	2006 - 2012	Clare Boothe Luce Assistant Prof. of Physics, Mount Holyoke College

<i>Education</i>	Harvard University	<i>Cambridge, MA</i>
	Ph.D. in Applied Physics, 2006 Masters in Applied Physics, 2005 Advisor: Robert M. Westervelt Dissertation: Imaging Magnetic Focusing in a Two-Dimensional Electron Gas	
	Yale University	<i>New Haven, CT</i>
	B.S. in Applied Physics and Psychology (double major), 2001 Advisor: Robert Schoelkopf (applied physics)	

Research Interests My background is in low temperature transport, and I consider myself a condensed matter physicist and materials scientist, who works broadly in nanoscale science and engineering. My lab is centered around the scanning probe microscope, a versatile tool for studying electrical, magnetic, and mechanical properties on the nanoscale. Projects include:

- Transport properties of non-traditional semiconductor thin films
- Evolution of magnetic states in ferromagnetic nanostructures
- Mechanical properties of soft materials (e.g. hydrogels, bacteria biofilms)

<i>Awards</i>	Cottrell Scholar Award from the Research Corporation for Science Advancement (2009)
	Presidential Early Career Award for Scientists and Engineers (PECASE) (2010)
	National Science Foundation CAREER Award (2010)
	40 under 40: Professors who Inspire, from Nerdwallet (2015)
	Meribeth E. Cameron Faculty Award for Scholarship from Mount Holyoke College (2016)

Beyond Mount Holyoke:

- Founded **SciTech Café** in September, 2012. <http://www.scitechcafe.org>. We bring scientists into an informal setting to talk with the public, holding monthly meetings at a local restaurant. Typical attendance is about 100 people.
- Regular guest on WHMP's *The Bill Newman Show* to discuss science and promote SciTech Café's next event.
- **Committee of Visitors** for Division of Materials Research, NSF (2011)
- Regular **panelist and guest for women in physics** and women in science organizations and general career workshops
- Attended the 2012 Project Kaleidoscope Summer Leadership Institute for STEM faculty (July 2012).
- Attended the **Workshop for New Physics and Astronomy Faculty** in College Park, MD (2006).

Within Mount Holyoke:

- Strategic Lead for the Interdisciplinary Makerspace Initiative (2015 - present)
Initiated makerspace activities on campus, now leading the efforts to develop a 4,000 ft^2 new home with curricular and co-curricular programming.
- Academic Priorities Committee (2010 - 2014, Chair for two years)
Major Accomplishment: new graduation requirements for the college
- Engineering Committee (2008 - present, chair since 2011)

Grants

“RUI: Time-Resolved Point Kelvin Probe Force Microscopy for Non-Traditional Semiconductors”

Source: National Science Foundation

Amount: \$368,817 Award Period: September 2012 - August 2015

Subaward from the Center for Integrated Quantum Materials at Harvard

Source: National Science Foundation

Amount: \$150,000 Award Period: September 2013 - August 2018

“MRI: Acquisition of a multi chamber hybrid organic/inorganic thin film deposition system

Source: NSF ECCS-1229028

Amount: \$374,617 Award Period: October 2012 - September 2014

“Collaborative Proposal: Physics of Ferromagnetic Nanostructures in a Circular Field”

Source: National Science Foundation

Amount: \$310,000 Award Period: September 2012 - August 2015

“CAREER: Local Charge, Polarization, and Transport of Nanocrystal Quantum Dot Solid State Structures using Scanning Probe Microscopy”

Source: National Science Foundation

Amount: \$400,000 Award Period: May 2010 - April 2015

“Collaborative Proposal: Physics of Ferromagnetic Nanorings in an External Azimuthal Field”

Source: National Science Foundation

Amount: \$300,000 Award Period: September 2009 - August 2012

Grants Subaward from the Materials Research Science and Engineering Center on Polymers at the University of Massachusetts, Amherst
Source: NSF MRSEC (DMR-0820506)
Amount: \$125,664 Award Period: September 2008 - August 2014

Subaward from the Center for Hierarchical Manufacturing at the University of Massachusetts, Amherst
Source: NSF NSEC (CMMI-1025020)
Amount: \$150,000 Award Period: April 2011 - March 2016

“Imaging and Manipulation of Magnetic Nanostructures for Functional Nanosystems”
Source: NSF NSEC (CMMI-0531171) at the University of Massachusetts
Amount: \$85,000 Award Period: April 2008 - March 2011

“Investigation and Control of Magnetic Nanorings using a Scanning Probe Microscope”
Source: Research Corporation
Amount: \$45,000 Award Period: Dec 2008 - Nov 2010

*Teaching
Experience*

Physics 110: Force, Motion and Energy

First semester of the introductory sequence to physics, with calculus. Uses “think-pair-share” methodology with in-class concept questions.

Physics 201: Electromagnetism and Circuits

Second semester of the introductory sequence to physics, with calculus. Uses “think-pair-share” methodology with in-class concept questions.

Physics 308: Analog Electronics

Laboratory focused electronics course. Implemented new curriculum that uses pre-class assignments to motivate discussion at the beginning of each three hour meeting. The rest of the class time is spent on lab work.

Physics 336: Advanced Quantum Mechanics

Second semester of undergraduate quantum mechanics

Physics 326: Statistical Mechanics and Thermodynamics

Co-taught with the chemistry department’s thermodynamics course

Physics 211/Gender Studies 243: Women and Gender in Science

Seeks to answer, “Why are women under-represented in science?” by exploring relevant literature taken mostly from social science articles and reviews.

Physics 105: Science in the Media (first year seminar)

A current events look at present day scientific research and other newsworthy science and technology stories. We discuss the process of science (e.g. peer review, conferences) and bring in many guests to talk about news within their own expertise. Presentation skills are emphasized.

Physics 290/390: Advanced Laboratory Practicum

Brings together students pursuing independent research, covering topics like how to do a literature search, read journal articles, write an abstract, and give a presentation.

Physics 295/395: Independent Study

I regularly supervise undergraduates doing independent work in my research lab, mentoring 4-10 students each semester.

J.P. Moscatello, C.V. Castaneda*, A. Zaidi*, M. Cao*, O. Usluer, A.L. Briseno, K.E. Aidala, "Time-resolved Klevin probe microscopy to study population and depopulation of traps in electron or hole majority organic semiconductors," *Organic Electronics*, **41**, 26 (2017).

W-M Ju, M.T. Tuominen, N. Pradhan, J. Bickel, K.E. Aidala, "Reversing the circulation of ferromagnetic nanodisks with a local circular field," *in preparation*

F.I. Kaya*, A. Sarella, D. Wang, M. Tuominen, K.E. Aidala, "Nucleation and interactions of 360 degree domain walls on planar ferromagnetic nanowires using circular magnetic fields." *AIP Advances*, **6**, 055025 (2016).

F.I. Kaya*, A. Sarella, D. Wang, M. Tuominen, K.E. Aidala, "Packing 360 degree domain walls of identical circulation on planar ferromagnetic nanowires with notches using circular magnetic fields." *AIP Advances*, **6**, 056408 (2016).

N. Pradhan, M.T. Tuominen, K.E. Aidala, "Polarization dependent switching of asymmetric nanorings with a circular field." *AIP Advances*, **6**(1) 015302 (2016).

K. Aidala, "Short in Academe," *Inside Higher Ed*, December 18, 2014. <https://www.insidehighered.com/views/2014/12/18/essay-being-short-person-academe>

J.E. Bickel, M. Khan*, K.E. Aidala, "A multi-level single-bit storage device." *Journal of Applied Physics*, **115**(17), 17D511 (2014)

J.E. Bickel, S.A. Smith, K.E. Aidala, "The creation of 360 degree domain walls in ferromagnetic nanorings by circular applied magnetic fields," *Journal of Applied Physics*, **115**(17), 17D135 (2014)

H. Xu*, A.E. Murdaugh, W. Chen, K.E. Aidala, M.A. Ferguson, E.M. Spain, M.E. Nunez. "Characterizing Pilus-Mediated Adhesion of Biofilm-Forming *E. coli* to Chemically Diverse Surfaces Using Atomic Force Microscopy." *Langmuir*, **29**(9) 3000 (2013).

S. Paydavosi, K.E. Aidala, P. Brown, G. Supran, P. Hashemi, J.L. Hoyt, V. Bulović. "Detection of charge storage on molecular thin films of Tris(8-hydroxyquinoline) Aluminum (Alq_3) by Kelvin force microscopy: A candidate system for high storage capacity memory cells." *Nano Letters*, **12**(3) 1260 (2012).

A. Goldman*, A.S. Licht*, Y. Sun*, Y. Li*, N.R. Pradhan, T. Yang, M.T. Tuominen, K.E. Aidala, "Multiple 360° domain wall switching in thin ferromagnetic nanorings in a circular magnetic field." *Journal of Applied Physics*, **111**(7), 7D113 (2012)

M.J. Panzer, K.E. Aidala, V. Bulović. "Contact printing of colloidal nanocrystal thin films for hybrid organic/quantum dot optoelectronic devices." *Nano Reviews*, **3**, 16144 (2012).

N.R. Pradhan, A.S. Licht*, Y.Li*, Y. Sun*, M.T. Tuominen, K.E. Aidala. "Switching of $\pm 360^\circ$ domain wall states in a nanoring by an azimuthal Oersted field." *Nanotechnology* **22** (2011) 485705

T. Yang, N.R. Pradhan, A. Goldman*, A.S. Licht*, Y.Li*, M. Kemei*, M.T. Tuominen, K.E. Aidala. "Manipulation of magnetization states of ferromagnetic nanorings by an applied azimuthal Oersted field." *Applied Physics Letters*, **98**, 242505 (2011).

C.E. Packard, K.E. Aidala, S. Ramanan, V. Bulović, "Patterned removal of molecular organic films by diffusion." *Langmuir*, **27**(15), 9073 (2011).

Publications

- K.E. Aidala, M.J. Panzer, P.O. Anikeeva, J.E. Halpert, M.G. Bawendi, V. Bulović. “Morphology of contact printed colloidal quantum dots in organic semiconductor films: Implication for QD-LEDs.” *Physica Status Solidi C*, **8**(1), 120 (2011).
- M.J. Panzer, K.E. Aidala, P.O. Anikeeva, J.E. Halpert, M.G. Bawendi, V. Bulović. “Nanoscale morphology revealed at the interface between colloidal quantum dots and organic semiconductor films.” *Nano Letters*, **10**(7), 2421 (2010).
- C.B. Volle, M.A. Ferguson, K.E. Aidala, E.M. Spain, M.E. Núñez. “Spring constants and adhesive properties of native bacterial biofilm cells measured by atomic force microscopy.” *Colloids and Surfaces B: Biointerfaces*, **67**, 32-40 (2008).
- C.B. Volle, M.A. Ferguson, K.E. Aidala, E.M. Spain, M.E. Núñez. “Quantitative changes in the elasticity and adhesive properties of *E. coli* ZK1056 prey cells during predation by *Bdellovibrio bacteriovorus* 109J.” *Langmuir*, **24**(15), 8102 (2008).
- K.E. Aidala, R.E. Parrott, T. Kramer, E.J. Heller, R.M. Westervelt, M.P. Hanson, A.C. Gossard. “Imaging coherent magnetic focusing.” *Nature Physics*, **3**, 464 (2007).
- K.E. Aidala, R.E. Parrott, E.J. Heller, R.M. Westervelt. “Imaging electrons in a magnetic field.” *Physica E*, **34**, 409 (2006).
- E.J. Heller, K.E. Aidala, B.J. LeRoy, A.C. Bleszynski, A. Kalben, R.M. Westervelt, K.D. Maranowski, and A.C. Gossard. “Thermal averages in a quantum point contact with a single coherent wave packet.” *Nano Letters*, **5**(7), 1285 (2005).
- B.J. LeRoy, A.C. Bleszynski, K.E. Aidala, R.M. Westervelt, A. Kalben, E.J. Heller, S.E.J. Shaw, K.D. Maranowski, A.C. Gossard. “Imaging electron interferometer”, *Physical Review Letters*, **94**, 126801 (2005).
- A. Bleszynski, K. Aidala, B. LeRoy, R. Westervelt, E. Heller, K. Maranowski, A. Gossard. “Imaging electron interferometer.” *Physics of Semiconductors: 27th International Conference on the Physics of Semiconductors*, July 2004, AIP Conference Proceedings **772**, 1461 (2005).
- R.M. Westervelt, M.A. Topinka, B.J. LeRoy, A.C. Bleszynski, K. Aidala, S.E.J. Shaw, E.J. Heller, K.D. Maranowski, A.C. Gossard. “Imaging electron waves.” *Physica E*, **24**, 63 (2004).
- T.R. Stevenson, F.A. Pellerano, C.M. Stahle, K. Aidala, R.J. Schoelkopf. “Multiplexing of radio-frequency single electron transistors.” *Applied Physics Letters*, **80**(16), 3012 (2002).

Selected Presentations

Research Talks:

- “Atomic Force Microscopy: A versatile tool in nanoscience.” K. Aidala. Summer Student Seminar, Amherst College (2016). *invited*
- “Electrical, Mechanical, and Magnetic measurements using Scanning Probe Microscopy.” K. Aidala. New England Society for Microscopy Fall Meeting, Northboro, MA (2015). *invited*
- “Atomic Force Microscopy: A versatile tool in nanoscience.” K. Aidala, Summer research student seminar at Amherst College, (2016). *invited*

“Scanning Probe Microscopy: A versatile tool for electrical, mechanical and magnetic measurements,” Colorado School of Mines Materials Science Department, February 5, 2015. *invited*

“Ferromagnetic Nanostructures in a Local Circular Field,” University of Michigan Condensed Matter Physics Seminar, November 25, 2014. *invited*

“Imaging charge motion in non-traditional semiconductors,” Smith College Physics Seminar, April 17, 2015. *invited*

“Manipulating Magnetic States in Nanorings: The future of Data Storage?” Physics Department Seminar, Wellesley College, October 2013. *invited*

“Manipulating Magnetic States with a Local Circular Magnetic Field.” Tohoku-Harvard Joint Workshop, Sendai, Japan, January 2013. *invited*

“Introduction to Scanning Probe Microscopy,” a series of three talks. Japan Women’s University, Tokyo, Japan, January, 2013. *invited*

“Probing charge and current in nanocrystal quantum dots with atomic force microscopy.” 244th American Chemical Society National Meeting, Philadelphia, PA August 2012. *invited*

“Atomic Force Microscopy: A versatile tool in nanoscale science.” Physics Department Seminar, Ithaca College, Ithaca, NY (2012). *invited*

“Ferromagnetic Nanostructures in a Local Circular Field.” Solid State Seminar, Yale University, New Haven, CT (2012). *invited*

“Characterization of thin films and nanostructures with scanning probe microscopy.” U.S. China Grantees Meeting and Young Researchers Collaboration Workshop, San Francisco, CA (2011). *invited*

“Measuring and manipulating magnetic nanorings with the atomic force microscope.” Physics Seminar, Denison University, Granville, OH (2011). *invited*

“Scanning probe microscopy of electromagnetic fields: Magnetic nanorings and PbS quantum dot arrays.” Physics Colloquium, Clark University, Worcester, MA (2010). *invited*

“Scanning probe microscopy of electromagnetic fields: Magnetic nanorings and PbS quantum dot arrays.” Physics Colloquium, Clark University, Worcester, MA (2010). *invited*

“Morphology of contact printed colloidal quantum dots in organic semiconductor films: Implications for QD-LEDs.” K.E. Aidala, M.J. Panzer, P.O. Anikeeva, J.E. Halpert, M.G. Bawendi, V. Bulovic. International Conference on Excitonic and Photonic Processes in Condensed and Nano Materials. Brisbane, Queensland, Australia (2010).

“Physical properties of native bacterial biofilm cells measured by atomic force microscopy.” Katherine Aidala, Catherine Volle, Megan Ferguson, Megan Núñez, Eileen Spain, American Physical Society March Meeting, Portland, OR (2010).

“Sticky, Squishy Cells.” Physics Seminar, Wellesley College, Wellesley, MA (2009). *invited*

“Elasticity and Adhesion of Native Bacterial Biofilm Cells using AFM.” Squishy Physics Seminar, Harvard University, Cambridge, MA (2009). *invited*

*Selected
Presentations*

“The Scanning Probe Microscope: A versatile tool for nanoscience.” Physics seminar, Kenyon College, Gambier, OH (2008). *invited*

“Scanning Probe Microscopy: From living cells to quantum electrons.” Physics Colloquium, Wake Forest University, Winston-Salem, NC (2007). *invited*

“Imaging Electron Motion in a Two-Dimensional Electron Gas with Scanning Probe Microscopy.” Physics seminar, Amherst College, Amherst, MA (2007). *invited*

“Imaging electrons in a two-dimensional electron gas in a magnetic field.” Frontiers of Nanoscale Science and Technology, Tokyo, Japan (2007) *invited*

“Imaging magnetic focusing in a two-dimensional electron gas.” International Conference on the Properties of Semiconductors, Vienna, Austria (2006).

“Imaging electron waves in a magnetic field.” International Conference on Nanoscience and Technology, Basel, Switzerland. (2006).

“Imaging electron focusing.” American Physical Society March Meeting, Baltimore, MD (2006), *invited*

“Imaging electron flow and interference in a two-dimensional electron gas.” Physics seminar, Boston University, Boston, MA (2005). *invited*

“Imaging electron motion with scanning probe microscopy.” Applied physics seminar, BBN Technologies, Cambridge, MA (2005). *invited*

“Imaging cyclotron orbits in a two-dimensional electron gas.” 16th International Conference on Electronic Properties of Two-Dimensional Systems, Albuquerque, NM (2005).

*Selected
Presentations*

Education and Diversity Talks:

“The Inclusive Liberal Arts,” Liberal Education Conference, Mount Royal University, Calgary, Canada (2017). *keynote address*

Panelist and breakout session leader at the Conference for Undergraduate Women in Physics at the Ohio State University in January, 2016. *invited*

“A physics educator at a womens college,” The Center for Education Integrating Science, Mathematics, and Computing, Georgia Institute of Technology, April 10, 2015. *invited*

“Why Aren’t More Women in Science, and is Physics Different? American Association of Physics Teachers Summer Meeting, Minneapolis, MN, July 29, 2014. *invited*

“Why aren’t more women in science?” National Renewable Energy Lab, February 4, 2015. *invited*

“Why aren’t more women in science? Smith College She is a Scientist series, October 20, 2014. *invited*

“Why aren’t more women in science?” Japan Women’s University, Tokyo, Japan, January 2013. *invited*

“Why aren’t more women in science?” Hayden Planetarium, New York, NY, August 2012. *invited*

Public Talks:

“Probing Materials at the Nanoscale,” MHC Alumnae Club of Britain, September 23, 2014, London, UK. *invited*

“Why aren’t more women in science?” SciTech Café, March 23, 2015, Amherst Brewing Company. *invited*

“How to wear pink when you’re short, Amherst Live Winter Show, January 17, 2015, Kirby Theater, Amherst College. (An 18 minute prepared monologue addressing being a short, woman physicist.) *invited*

“Science on Screen”: Introduction to the movie, “Fantastic Voyage,” addressing medical applications of nanoscience, May 2014, Amherst Cinema, Amherst, MA. *invited*

“Bits & Bytes: The Future of Data Storage.” SciTech Café, February 24, 2014, Amherst Brewing Company. *invited*

“Seeing at the Nanoscale.” SciTech Café, Amherst Brewing Company, June 2013. *invited*