# MATTHEW C. SULLIVAN

Ithaca College
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## EDUCATION

1998-2004 **University of Maryland**, College Park, MD
Ph.D. in Physics, 2004
M.S. in Physics, 2000
Dissertation: The Normal-Superconducting Phase Transition of YBCO in Zero Magnetic Field (C. J. Lobb, advisor)

1992-1996 **Stanford University**, Stanford, CA
B.A. in German Studies, 1996
B.S. in Physics, 1996

1990-1992 **Phillips Academy**, Andover, MA
Cum Laude graduate 1992

## TEACHING AND RESEARCH EXPERIENCE

2005-present ***Assistant Professor***. Ithaca College, Ithaca, NY.
Courses taught include:
*Introduction to Physics I (algebra-based), Lab instructor*
*Introduction to Physics II (algebra-based), Lecture, lab, and SCALE-UP instructor*
*Principles of Physics III: Heat & Optics (calculus-based)*
*Analytical Mechanics*
*Advanced Lab I and II*
*Independent Research – Introductory, Intermediate and Advanced*
Research in experimental low-temperature physics, with an emphasis on the properties of the cuprate superconductors.

2006-present ***Visiting Assistant Professor.*** Center for Superconductivity Research, Department of Physics, University of Maryland, College Park, MD.

2004-2005 ***Process Engineer.*** Intel Corporation, Hillsboro, OR.
Control and optimization of thin-film Si/Ge/B layer growth.

2002-2004 ***Research Mentor.*** Center for Superconductivity Research, University of Maryland, College Park, MD. Trained three graduate students and mentored two undergraduate students, working with Monica Lilly on her senior thesis:
*Richard Ott ('03):* Jerry B. Marion Award recipient, currently attending the Massachusetts Institute of Technology on a President's Fellowship seeking a Ph.D. in Physics

*Monica Lilly ('05):* Departmental High Honors, Recipient of Best Honors Thesis & Defense and the IPST Monroe Martin Award. M.S. in Physics ('07) from the University of California at Riverside.

2001-2004, 1998-2000 ***Graduate Research Assistant.*** Center for Superconductivity Research, University of Maryland, College Park, MD.
Research in experimental condensed-matter physics including growth, characterization, and optimization of the cuprate superconductors and other materials.

2000-2001 ***Physics Teacher.*** Phillips Academy, Andover, MA.
Taught two sections of college physics with a strong emphasis on laboratory skills.

1998-1999 ***Teaching Assistant.*** Physics Department, University of Maryland, College Park, MD. Led discussions and labs, graded and wrote tests, quizzes. Courses taught:
*Principles of Physics II (E&M, algebra-based)*
*General Physics I (mechanics, calculus-based)*

1996-1998 ***Peace Corps Volunteer (English teacher).*** Baraboi village, Republic of Moldova.
Taught English as a second language to grades 7-11, as well as to adults. Developed and led summer English camp.

1995-1996 ***Undergraduate Research Assistant.*** Gravity Probe B Magnetometry Labs, Stanford University, Stanford, CA.
Independent research on magnetic hysteresis of thin-film superconductors using an rf SQUID.

**PUBLICATIONS** (undergraduate researchers in bold)

1. **Charles P. Strehlow*, M. C. Sullivan***, "A Classroom Demonstration of Levitation and Suspension of a Superconductor over a Magnetic Track", submitted to the American Journal of Physics.
2. ***M. C. Sullivan***, B. G. Thompson, **A. Williamson**, "An experiment in the dynamics of thermal diffusion", accepted for publication in the American Journal of Physics.
3. ***M. C. Sullivan***, D. R. Strachan, Su Li, Hua Xu, K. Segawa, Yoichi Ando, Steven M. Anlage, C. J. Lobb, "Why can't experimentalists agree on the superconducting critical exponents?", Physica C **468** 284-287 (2008).
4. D. R. Strachan, ***M. C. Sullivan***, and C. J. Lobb, "Scaling of cross-over currents in current-voltage characteristics of $YBa_2Cu_3O_{7-\delta}$ films", Phys. Rev. B **73**, 012512 (2006).
5. ***M. C. Sullivan***, D. R. Strachan, T. Frederiksen, **R. A. Ott**, and C. J. Lobb, "Effects of self-field and low magnetic fields on the normal-superconducting phase transition", Phys. Rev. B **72**, 092507 (2005) .
6. S.C.Lee, ***M. C. Sullivan***, **G. R. Ruchti**, S. M. Anlage, B. S. Palmer, B. Maiorov, E. Osquiguil, "Doping-dependent nonlinear Meissner effect and spontaneous currents in high-Tc superconductors", Phys. Rev. B **70**, 014507 (2005).
7. R.K. Rakshit, R.C. Budhani, V.N. Kulkarni, ***M. C. Sullivan***, R.L. Greene, "Influence of buffer layers on superconductivity in $La_{1.85}Sr_{0.15}CuO_4$ epitaxial films", Physica C **415** 74 (2004).

8. ***M. C. Sullivan***, T. Frederiksen, J. M. Repaci, D. R. Strachan, **R. A. Ott**, and C. J. Lobb, "Normal-superconducting phase transition mimicked by current noise", Phys. Rev. B **70** (Rapid Communications), 140503(R) (2004).
9. ***M. C. Sullivan***, D. R. Strachan, T. Frederiksen, **R. A. Ott, M. Lilly**, and C. J. Lobb, "The superconducting phase transition obscured by finite-size effects in thick $YBa_2Cu_3O_{7-\delta}$ films", Phys. Rev. B **69**, 214524 (2004).
10. D. R. Strachan, ***M. C. Sullivan***, T. Frederiksen, **R. A. Ott**, and C. J. Lobb, "What a superconducting transition should look like: extrapolating data from scaling plots", Physica C **408-10**, 562 (2004).
11. D. R. Strachan, ***M. C. Sullivan***, and C. J. Lobb, "Probing the Limits of Superconductivity", Proc. SPIE Vol. 4811, Superconductivity and Related Oxides: Physics and Nanoengineering V, Ivan Bozovic and Davor Pavuna, Eds., pp. 65-77, (2002).
12. R. C. Budhani, ***M. C. Sullivan***, C. J. Lobb, and R. L. Greene, "Anomalous magnetothermopower in the mixed state of the electron-doped high-$T_c$ superconductors", Phys. Rev. B **66**, 052506 (2002).
13. R. C. Budhani, ***M. C. Sullivan***, C. J. Lobb, and R. L. Greene, "Thermopower and Hall conductivity in the magnetic-field-driven normal state of $Pr_{2-x}Ce_xCuO_{4-\delta}$ superconductors", Phys. Rev. B **65** (Rapid Communications), 100517(R) (2002).
14. D. R. Strachan, ***M. C. Sullivan***, P. Fournier, S. P. Pai, T. Venkatesan, and C. J. Lobb, "Do superconductors have zero resistance in a magnetic field?", Phys. Rev. Lett. **87**, 067007 (2001).
15. ***M. C. Sullivan***, J. Mester, J. Lockhart, "Superconducting thin-film absolute field magnetometer", Czech. Jour. Phys. **46 Suppl. 5** 2801 (1996).

**FUNDING AND GRANTS**

American Physical Society, Travel Grants for Women Speakers Program. Awarded $390 in 05/2007, and $500 in 05/2008.

"Measurement of the critical dynamics of the electron-doped cuprate superconductor $Pr_{2-x}Ce_xCuO_4$ as a function of doping." Submitted 10/2007 to the Ithaca College Center for Faculty Research and Development. Awarded $3600 in 12/2005 (release time for Fall 2008).

"Creation of a two-source evaporation system." Submitted 09/2007 to the School of Humanities and Sciences Educational Grant Initiative. Awarded $550 in 10/2007.

"RUI: Critical Dynamics of the Electron-Doped Cuprate Superconductors." Submitted 11/2006 to the National Science Foundation. Awarded $188,820 external with $13,400 internal matching in 06/2007.

"Expanding the Capabilities of the Ithaca College Metal Evaporator." Submitted 09/2006 to the School of Humanities and Sciences Ithaca Fund. Awarded $500 in 10/2006.

"Cryogenic Support for Testing of Low-Temperature Experimental Physics Measurement Systems." Submitted 08/2006 to the Ithaca College Academic Project Grant fund. Awarded $250 in 09/2006.

"Investigation of the Phase Transition in Bulk Crystal YBCO through Zero-Field Electronic Transport." Submitted 02/2006 to Ithaca College Summer Grants for Faculty Research. Awarded $3350 in 04/2006.

"Design and Construction of Low-Temperature Experimental Physics Measurement Systems: Electronic Transport and Specific Heat." Submitted 10/2005 to the Ithaca College Center for Faculty Research and Development. Awarded $3500 in 12/2005 (release time for Fall 2006).

**Student grants:**
"Measuring the static critical exponent in the thin-film superconductor $Pr_{2-x}Ce_xCuO_4$", Submitted 02/2008 to the Ithaca College Dana Internship Program. Research student Romaine Isaacs awarded $5000 in 04/2008 in stipend and scholarship.

"Measuring Critical Current Density in Thin-film Cuprate Superconductor $YBa_2Cu_3O_7$" Submitted 02/2008 to the Ithaca College Dana Internship Program. Research student Emily Backus awarded $5000 in 04/2008 in stipend and scholarship.

"Demonstrating Levitation and Suspension of a Superconductor on a Magnetic Track", presentation for the American Physical Society annual March Meeting, submitted to the Sigma Xi Research Society Travel grants. Research student Charles Strehlow awarded $500 in 02/2008.

"Demonstrating Levitation and Suspension of a Superconductor on a Magnetic Track", presentation for the American Physical Society annual March Meeting, submitted to the Humanities and Sciences Education Grant Initiative for Conference Travel. Research student Charles Strehlow awarded $400 in 02/2008.

"Measuring Critical Current Density in Thin-film Cuprate Superconductor $YBa_2Cu_3O_7$" Submitted 02/2007 to the Ithaca College Dana Internship Program. Research student Justin Sousa awarded $5000 in 04/2007 in stipend and scholarship.

"Design, Fabrication, and Characterization of Thin Metallic Films via Evaporation and the Hall Effect." Submitted 02/2006 to the Ithaca College Dana Internship Program. Research student Penyo Michev awarded $5000 in 04/2006 in stipend and scholarship.

**CONTRIBUTED TALKS** (undergraduate co-authors in bold)

"Doping dependence of the dynamic critical exponent in $Pr_{2-x}Ce_xCuO_4$, ***M.C. Sullivan***, J. Sousa, M. Salvaggio, and R. L. Greene, *American Physical Society March Meeting*, New Orleans, LA 2008.

"Why can't experimentalists agree on the superconducting critical exponents?", ***M. C. Sullivan***, D. R. Strachan, Su Li, Hua Xu, Steven M. Anlage, and C. J. Lobb, *Fluctuations & Phase Transitions in Superconductors*, Nazareth Ilit, Israel, June 2007.

"Normal-superconducting Phase Transition Obscured by Current Noise," ***M. C. Sullivan*** , S. Li , H. Xu , **M. Lilly** , C. J. Lobb, *American Physical Society March Meeting*, Los Angeles, CA 2005.

"Examination of the Critical Regime in High-Temperature Superconductors," ***M. C. Sullivan***, D. R. Strachan, Steven M. Anlage, C. J. Lobb, *American Physical Society March Meeting*, Indianapolis, IN, 2002.

"Superconducting Thin-Film Absolute Field Magnetometer," ***M. C. Sullivan***, J. Mester, J. Lockhart, *American Physical Society March Meeting*, St. Louis, MO, 1996.

**Student talks:**

"Growth and Patterning of Superconducting Thin Films", **Justin Sousa**, *James J. Whalen Academic Symposium*, Ithaca College, Ithaca NY, April 2008.

"Demonstrating Levitation and Suspension of a Superconductor on a Magnetic Track," **Charles P. Strehlow, *M.C. Sullivan***, *American Physical Society March Meeting*, New Orleans, LA 2008.

"Repair and Calibration of the Thin-film Metal Evaporator", **George S. DeBeck V**, *James J. Whalen Academic Symposium*, Ithaca College, Ithaca NY, April 2007.

**INVITED TALKS**

"Are superconductors really superconducting?", ***M. C. Sullivan***, Douglas R. Strachan, Su Li, Hua Xu, Thomas Frederiksen, **Monica Lilly, Richard Ott**, Kouji Segawa, Yoichi Ando, Steven M. Anlage, C. J. Lobb, Binghamton University Physics Colloquium, April 2008.

**CONTRIBUTED POSTERS**

"Integration of Lab and Lecture in Large Introductory Courses", ***M. C. Sullivan***, *New Faculty in Physics and Astronomy Workshop Reunion*, College Park MD, June 2007.

**RESEARCH STUDENTS**

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|---|---|
| Emily Backus<br>Class of 2011 | Critical current in YBCO as a function of temperature.<br>Dana Intern Summer 2008. |
| Adam Iaizzi<br>Class of 2011 | Wiring and thermal testing of a closed-cycle cryocooler.<br>One semester. |
| Judith Olson<br>Class of 2011 | Critical current in YBCO as a function of temperature.<br>One semester and Summer 2008. |
| Romaine Isaacs<br>Class of 2010 | Measurement of thin-film $Pr_{2-x}Ce_xCuO_4$ in a magnetic field.<br>Dana Intern Summer 2008. |
| Arnold Kotlyarevsky<br>Class of 2009 | Creation of a two-source metal evaporator, design and construction of a superconducting roller-coaster track.<br>Two semesters. |
| Justin Sousa<br>Class of 2009 | Growth, patterning, and measurement of thin-film $Pr_{2-x}Ce_xCuO_4$.<br>One semester and summer 2007. Dana Intern Summer 2007. |
| Charles Strehlow<br>Class of 2009 | Design, construction and modeling of levitation and suspension track demonstration.<br>Two semesters and summer 2007. |
| Nik Batruch<br>Class of 2008 | Re-wiring and maintenance of electrical circuitry.<br>One semester. |
| George DeBeck V<br>Class of 2008 | Design and construction of passive low-pass filters for use in the low-temperature probe. Growth of Au, Cr, NiCr, and Pt films via evaporation.<br>4 semesters. |
| Penyo Michev<br>Class of 2008 | Design, fabrication, and characterization of Al thin films via evaporation and the Hall effect.<br>2 semesters and summer 2006. Dana Intern Summer 2006. |
| Brendan Pratt<br>Class of 2008 | Machining, roller-coaster track design and filming.<br>One semester. |
| Brandon Sforzo<br>Class of 2008 | Design and fabrication of low-temperature apparatus.<br>2 semesters. |
| Zak Brown<br>Class of 2007 | Construction and testing of low-pass filters. Wiring and testing of critical current density in YBCO. Currently employed as a Test Engineer, Chester PA.<br>2 semesters. |

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| Nitin Rajan<br>Class of 2007 | Programming and testing of specific heat measurement apparatus.<br>2 semesters. Currently attending Yale University seeking a Ph.D. in Physics. |
| Marco Salvaggio<br>Class of 2007 | Growth, patterning, and measurement of thin-film $Pr_{2-x}Ce_xCuO_4$.<br>One semester and summer 2007. |
| Monica Lilly<br>Class of 2005 | Thickness and surface roughness characterization with an AFM. Critical current density in YBCO. Critical exponents in PCCO.<br>3 semesters and summers 2003, 2004. (University of Maryland) |
| Richard Ott<br>Class of 2003 | Thin-film growth and characterization.<br>4 semesters and summers 2001, 2002. (University of Maryland) |

## SERVICE

### Service to the College

Faculty Council member, 2007-present
Humanities and Sciences Curriculum Committee member, 2006-present.
Humanities and Sciences Curriculum Committee, General Education Subcommittee member, 2006-present.
Humanities and Sciences Committee on Academic Policies and Procedures, 2006-present.
Person to Person participant, 2005-present.
Ithaca Today Physics representative, Springs 2006, 2007, 2008.

### Service to the Department

Department of Physics seminar coordinator, 2005-present.
Physics Department Five-Year Planning and Assessment Committee member, 2005-present.

### Service to the Community

Community outreach to local schools through Ithaca College's Partnership in Teaching, program entitled "Temperature and Heat."

### Service to the Profession

Proposal Reviewer: National Science Foundation
Referee: Physical Review B, Physica C, IEEE transactions on Applied Superconductivity, Magnetism and Magnetic Materials Conference Proceedings, Theatre Design & Technology
National Defense Science and Engineering Graduate Fellowship Program selection panel member, representing Physics, 2006, 2007, 2008.
National Nanotechnology Infrastructure Network REU program evaluator, August 2006.

## PROFESSIONAL AFFILIATIONS

American Physical Society
American Association of Physics Teachers
Society of Physics Students
Sigma Pi Sigma

## HONORS AND AWARDS

Dean of Humanities and Sciences Merit Award to Physics Department, Spring 2006.
Physics Department Merit Award for Excellence in Teaching, Spring 2006.