

Cassandra R. Hunt

Curriculum Vitae

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Research Interests

My long-term research aims are to explore and understand phase competition, emergent order, and non-equilibrium states in correlated and other novel materials, and to develop methods to manipulate and control these systems using ultrafast techniques. Light pulses tailored to selectively perturb lattice, electronic, or spin degrees of freedom can tip the balance between competing orders, clarifying the origin of the equilibrium ground state. Targeted excitation can also generate new states that cannot be accessed in equilibrium, offering an avenue of materials control on the femtosecond to picosecond timescale.

Education and Employment

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|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10/2015-present | Miller Postdoctoral Fellow , University of California, Berkeley |
| 08/2008-05/2015 | Doctor of Philosophy in Physics, University of Illinois at Urbana-Champaign, Thesis title: "Manipulating superconductivity in cuprates with selective ultrafast excitation", Advisors: Laura H. Greene and Andrea Cavalleri |
| 11/2010-06/2015 | Visiting graduate student, Max Planck Institute for the Structure and Dynamics of Matter, Hamburg, Germany, in the group of Andrea Cavalleri |
| 08/2008-05/2011 | Masters in Physics, University of Illinois at Urbana-Champaign |
| 09/2006-06/2007 | Exchange student, University of Cambridge, Emmanuel College, Cambridge-MIT Exchange (CME) program, Physics Part IIb |
| 08/2004-05/2008 | Bachelor of Science in Physics, Massachusetts Institute of Technology |
| 08/2002-06/2004 | Associate of Science , Northwest Missouri State University, Missouri Academy of Science Mathematics and Computing |

Academic Distinctions

- ◆ Miller Research Fellow, postdoctoral fellowship award, University of California, Berkeley, awarded December 2014

- ◆ Scott Anderson Outstanding Graduate Assistant Award, UIUC, awarded March 2014
- ◆ Excellence in Teaching Award, UIUC, awarded Spring 2009 and Spring 2010
- ◆ Graduate fellowship, UIUC, fellowship awarded academic year 2008-09
- ◆ Sarah Cooper Circle Scholar, MIT, scholarship awarded academic year 2005-06, renewed for 2006-07 and 2007-08

Research Experience

University of California, Berkeley, **postdoctoral research**, Fall 2015-present
 Group leader: Alessandra Lanzara

Developing high fluence, mid-infrared pumping capabilities for time-resolved angle-resolved photoemission spectroscopy (tr-ARPES), and utilizing this system to investigate complex materials.

Max Planck Institute for the Structure and Dynamics of Matter (MPSD), Center for Free Electron Science (CFEL), **graduate research**, Fall 2010-Spring 2015
 Advisor: Andrea Cavalleri

Understanding and manipulating phase competition in cuprate superconductors via selective, ultrafast excitation of phonon modes using mid-infrared light.

University of Illinois at Urbana-Champaign, **graduate research**, Fall 2009-Spring 2015
 Advisor: Laura Greene

Measuring order parameter symmetry and electron-boson coupling in pnictide superconductors using point contact spectroscopy.

Massachusetts Institute of Technology, Gravitation and Cosmology Research Group, MIT Kavli Institute for Astrophysics and Space Research, **Bachelor thesis research**, Summer 2007- Spring 2008
 Advisor: Mike Zucker

Thesis title: "Baffle material characterization for Advanced LIGO"

For research experience prior to 2007, please see: <http://CassandraHunt.com/cv.php?id=research>

Teaching Experience

- ◆ Mentor, "Be A Scientist" science outreach program for 7th grade students, Community Resources for Science, Spring 2016, Fall 2016
- ◆ Discussion Leader, Physics 211 (Classical Mechanics), UIUC, Spring 2010
- ◆ Discussion Leader, Physics 213/214 (Thermodynamics/Quantum Mechanics), UIUC, Spring 2009
- ◆ Grader, Physics 8.02T (Electricity and Magnetism), MIT, Spring 2006, Spring 2008
- ◆ Tutor, Physics 8.01L (Classical Mechanics), MIT, January 2008
- ◆ Teaching Assistant, Physics and Music 8.A14, seminar for freshman aimed to help participants with

issues regarding transition to undergraduate life, MIT, Fall 2007

- ◆ Teaching Assistant, Physics 8.01T (Classical Mechanics), MIT, Fall 2005, Fall 2007
- ◆ Course Instructor, Introduction to Western Music, HSSP, designed and taught 6 week course aimed at students in grades 7-12, MIT, Summer 2007
- ◆ Teaching Assistant, The STIMULUS Project, assisted with science lessons and labs in 3rd grade classroom, University of Cambridge, Spring 2007

Organization of Conferences/Workshops

Committee member, Miller Institute Symposium, Marconi Conference Center on Tomales Bay, CA, USA, *forthcoming* June 2017.

Organizer and Chair, Gordon Research Seminar: Correlated Electron Systems, Mount Holyoke College, South Hadley, MA USA, June 25-26, 2016.

Organizer, Center for Emergent Superconductivity EFRC Junior Researchers Fall 2010 Workshop, Stony Brook, New York, November 11, 2010.

Invited Presentations

"What relaxation pathways reveal about light-induced coherent coupling in cuprate superconductors," Harvard Condensed Matter Theory Kid's Seminar, Harvard University, Cambridge, MA, USA, *forthcoming* December 6, 2016.

"Manipulating superconductivity in cuprates by selective ultrafast light excitation," Materials Science and Engineering Seminar, Northwestern University, Evanston, IL, USA, October 4, 2016.

"Light-Induced Superconducting-Like Phases in Organic and High-T_c Cuprate Materials," 2015 Materials Research Society (MRS) Fall Meeting, Boston, MA, USA, November 30, 2015.

"Optically enhanced superconductivity in YBa₂Cu₃O_x by ultrafast redistribution of interlayer coupling," Gordon Research Seminar: Ultrafast Phenomena in Cooperative Systems Ventura, CA, USA, February 1, 2014.

"Light-induced coherence in underdoped YBa₂Cu₃O_x far above equilibrium T_c," invited student talk, International Summer School on Superconductivity – Theory, Experiments, and Phenomena (STEP 2013), Cargèse, France, August 15, 2013.

"Light-induced coherence in underdoped YBCO far above equilibrium T_c," Frontiers in Quantum Materials' Control (Q-MAC) Meeting, Paris, France, December 2013.

Contributed Presentations

"Light-induced coherence in underdoped YBa₂Cu₃O_x far above equilibrium T_c," Photoinduced Phase Transitions and Cooperative Systems (PIPT 5), Bled, Slovenia, June 11, 2014.

"Light-induced coherence in underdoped $\text{YBa}_2\text{Cu}_3\text{O}_x$ far above equilibrium T_c ," poster, International Summer School on Superconductivity – Theory, Experiments, and Phenomena (STEP 2013), Cargèse, France, August 15, 2013.

"Superconducting gap measurements on Co-doped SrFe_2As_2 single crystals by point contact spectroscopy", American Physical Society March Meeting 2011, Dallas, Texas. March, 2011.

"Effects of multiple bands on point contact spectra in the iron chalcogenide superconductors", American Physical Society March Meeting 2010, Portland, Oregon. March 17, 2010.

Publications

- [1] **C. R. Hunt**, D. Nicoletti, S. Kaiser, D. Proepper, T. Loew, B. Keimer and A. Cavalleri, " Dynamical decoherence of the light induced interlayer coupling in $\text{YBa}_2\text{Cu}_3\text{O}_{6+\delta}$," *Phys. Rev. B* Accepted.
- [2] **C. R. Hunt**, D. Nicoletti, S. Kaiser, T. Takayama, H. Takagi, and A. Cavalleri. "Two distinct kinetic regimes for the relaxation of light-induced superconductivity in $\text{La}_{1.675}\text{Eu}_{0.2}\text{Sr}_{0.125}\text{CuO}_4$," *Phys. Rev. B* **91**, 020505(R) (2015). Editor's Suggestion
- [3] D. Nicoletti, E. Casandruc, Y. Laplace, V. Khanna, **C. R. Hunt**, S. Kaiser, S. S. Dhesi, G. D. Gu, J. P. Hill, and A. Cavalleri. "Optically induced superconductivity in striped $\text{La}_{2-x}\text{Ba}_x\text{CuO}_4$ by polarization-selective excitation in the near infrared," *Phys. Rev. B* **90**, 100503(R) (2014).
- [4] S. Kaiser, **C. R. Hunt**, D. Nicoletti, W. Hu, I. Gierz, H. Y. Liu, M. Le Tacon, T. Loew, D. Haug, B. Keimer, and A. Cavalleri. "Optically induced coherent transport far above T_c in underdoped $\text{YBa}_2\text{Cu}_3\text{O}_{6+\delta}$," *Phys. Rev. B* **89**, 184516 (2014).
- [5] **C. R. Hunt***, W. Hu*, S. Kaiser*, D. Nicoletti*, I. Gierz, M. C. Hoffmann, M. Le Tacon, T. Loew, B. Keimer and A. Cavalleri, "Optically enhanced coherent transport in $\text{YBa}_2\text{Cu}_3\text{O}_{6.5}$ by ultrafast redistribution of interlayer coupling," *Nature Materials* **13**, 705–711 (2014).
- [6] H. Z. Arham, **C. R. Hunt**, W. K. Park, J. Gillett, S. D. Das, S. E. Sebastian, Z. J. Xu, J. S. Wen, Z. W. Lin, Q. Li, G. Gu, A. Thaler, S. Ran, S. L. Bud'ko, P. C. Canfield, D. Y. Chung, M. G. Kanatzidis, and L. H. Greene, "Detection of orbital fluctuations above the structural transition temperature in the iron pnictides and chalcogenides", *Phys. Rev. B* **85**, 214515 (2012).
- [7] H. Z. Arham, **C. R. Hunt**, W. K. Park, J. Gillett, S. D. Das, S. E. Sebastian, Z. J. Xu, J. S. Wen, Z. W. Lin, Q. Li, G. Gu, A. Thaler, S. L. Budko, P. C. Canfield, and L. H. Greene, "Gap-like feature in the normal state of $\text{X}(\text{Fe}_{1-x}\text{Co}_x)_2\text{As}_2$, $\text{X} = \text{Ba}$, Sr and Fe_{1+y}Te revealed by Point Contact Spectroscopy", *J. Phys.: Conf. Ser.* **400**, 022001 (2012).
- [8] Laura H. Greene, Hamood Z. Arham, **Cassandra R. Hunt**, Wan Kyu Park, "Design of New Superconducting Materials, and Point-Contact Spectroscopy as a Probe of Strong Electron Correlations", *Journal of Superconductivity and Novel Magnetism* **25**, 7, pp. 2121-2126 (2012).
- [i] W. K. Park, **C. R. Hunt**, H. Z. Arham, Z. J. Xu, J. S. Wen, Z. W. Lin, Q. Li, G. D. Gu, and L. H. Greene, "Strong Coupling Superconductivity in Iron-Chalcogenide $\text{FeTe}_{0.55}\text{Se}_{0.45}$ ", arXiv:1005.0190

Attended Conferences/Workshops

Gordon Research Conference: Correlated Electron Systems, Mount Holyoke College, South Hadley, MA, June 26-July 1, 2016.

Gordon Research Seminar: Correlated Electron Systems, Mount Holyoke College, South Hadley, MA, June 25-26, 2016.

Materials Research Society (MRS) 2015 Fall Meeting, Boston, MA, USA, November 29-December 4, 2015.

Photoinduced Phase Transitions and Cooperative Systems (PIPT 5), Bled, Slovenia, June 8-13, 2014.

Gordon Research Conference: Ultrafast Phenomena in Cooperative Systems, Ventura, CA, USA, February 2-7, 2014.

Gordon Research Seminar: Ultrafast Phenomena in Cooperative Systems, Ventura, CA, USA, February 1-2, 2014.

International Summer School on Superconductivity – Theory, Experiments, and Phenomena (STEP 2013), Cargèse, France, August 5-17, 2013.

Materials and Mechanisms of Superconductivity (M2S) 2012, Washington DC, July 29-August 3, 2012.

Low Energy Electrodynamics of Solids (LEES) 2012, Napa, CA, July 22-27, 2012.

American Physical Society March Meeting 2011, Dallas, TX, March 21-25, 2011.

Center for Emergent Superconductivity EFRC Fall 2010 Workshop, Stony Brook, NY, November 12-13, 2010.

Gordon Research Conference: Correlated Electron Systems, Mount Holyoke College, South Hadley, MA, June 13-18, 2010.

American Physical Society March Meeting 2010, Portland, OR, March 15-19, 2010.

ICAM Cargèse Summer Workshop: Quantum phenomena from the nano to the macro world, Cargèse, Corsica, France, July 6-19, 2009.

Advanced Materials Characterization Workshop, Urbana, IL, June 3-4, 2009.