Cassandra R. Hunt

Curriculum Vitae

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Research Statement

My research interests lie in exploring phase competition in correlated and other novel materials, and developing 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 Positions

10/2015-present	**Miller Postdoctoral Fellow**, University of California, Berkeley
08/2008-05/2015	University of Illinois at Urbana-Champaign, **Doctor of Philosophy** in Physics, 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	University of Illinois at Urbana-Champaign, **Masters** in Physics
2006-2007	Exchange student, University of Cambridge, Emmanuel College, Cambridge-MIT Exchange (CME) program, Physics Part IIb
2004-2008	Massachusetts Institute of Technology, **Bachelor of Science** in Physics
2002-2004	Northwest Missouri State University, Missouri Academy of Science Mathematics and Computing, **Associate of Science** degree

Academic Distinctions

- Miller 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 mid-infrared and THz pumping capabilities for time- and spin-resolved angle-resolved photoemission spectroscopy (ARPES) systems, and utilizing these systems 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"

Massachusetts Institute of Technology, Gravitation and Cosmology Research Group, MIT Kavli Institute for Astrophysics and Space Research, **undergraduate research**, Summer 2006
Advisor: David Ottaway

Massachusetts Institute of Technology, **undergraduate research**, Spring 2005-Spring 2006
Advisor: Dick Yamamoto

Los Alamos National Laboratory, **internship**, Summer 2005
Advisor: Bob Nemzek

Northwest Missouri State University, **undergraduate research**, Spring 2004
Advisor: John Shaw

Saint Louis University, **student research program**, Summer 2003
Advisor: Jean Potvin

Teaching Experience

Mentor, "Be A Scientist" science outreach program, Community Resources for Science, Spring 2016, Fall 2017

- Volunteered in a 7th grade science classroom once a week for 6 weeks (twice a week 2017). Worked directly with four students per class to help them design, carry out, and analyze research experiments. Discussed careers in science and STEM.

Discussion Leader, Physics 211 (Classical Mechanics), UIUC, Spring 2010

- Led a discussion class (24 students) once a week. Responsibilities included writing and presenting an introductory lecture to the material, assisting with in-class assignments, and administering a weekly quiz. Graded in-class group work and quizzes. Proctored exams.

Discussion Leader, Physics 213/214 (Thermodynamics/Quantum Mechanics), UIUC, Spring 2009

- Led two discussion classes (24 students each) each week. Responsibilities as in Physics 211.

Grader, Physics 8.02T (Electricity and Magnetism), MIT, Spring 2006, Spring 2008

- Corrected problem sets assigned to participants in the Physics II course.

Tutor, Physics 8.01L (Classical Mechanics), MIT, January 2008

- Led small group tutoring sessions.

Teaching Assistant, Physics and Music 8.A14, MIT, Fall 2007

- Assisted professor in leading weekly discussions with freshman seminar participants. Helped participants with issues regarding transition to undergraduate life.

Teaching Assistant, Physics 8.01T (Classical Mechanics), MIT, Fall 2005, Fall 2007

- Assisted course participants with laboratory experiments. Graded in-class quizzes, assignments, and lab write-ups.

Course Instructor, Introduction to Western Music, HSSP, MIT, Summer 2007

- Designed and taught a six-week course in western music history with asides to look at other musical traditions (one of two instructors for course). Emphasized historical context of modern music.

Teaching Assistant, The STIMULUS Project, University of Cambridge, Spring 2007

- Volunteered to assist with science lessons and labs in a third grade classroom once a week.

Organization of Conferences/Workshops

Organization committee member, Miller Institute Symposium, Marconi Conference Center on Tomales Bay, CA, USA, June 1-3, 2018.

Organization committee member, Miller Institute Symposium, Marconi Conference Center on Tomales Bay, CA, USA, June 2-4, 2017.

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

- Two day seminar for junior researchers (PhD/Postdoc), precedes the related Gordon Research Conference. Responsibilities include selecting and inviting speakers, arranging schedule, assisting with fundraising.

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

- One of two organizers for this one day workshop for junior (PhD/Postdoc) researchers in the CES. Selected and invited speakers, arranged schedule. Chaired one session of the workshop.

Invited Presentations

"What relaxation pathways reveal about light-induced coherent coupling in cuprate superconductors," Boston College Department of Physics Colloquium, Boston, MA, USA, January 25, 2017.

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

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

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

"Optically enhanced superconductivity in $YBa_2Cu_3O_x$ 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 $YBa_2Cu_3O_x$ far above equilibrium Tc," 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 Tc," Frontiers in Quantum Materials' Control (Q-MAC) Meeting, December 2013.

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 $YBa_2Cu_3O_{6+\delta}$," *Phys. Rev. B* **94**, 224303 (2016).

[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 $La_{1.675}Eu_{0.2}Sr_{0.125}CuO_4$," *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 $La_{2-x}Ba_xCuO_4$ 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 $YBa_2Cu_3O_{6+\delta}$," *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 $YBa_2Cu_3O_{6.5}$ 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 $X(Fe_{1-x}Co_x)_2As_2$, X = 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 $FeTe_{0.55}Se_{0.45}$", arXiv:1005.0190

Contributed Presentations

"Light-induced coherence in underdoped $YBa_2Cu_3O_x$ far above equilibrium Tc," Photoinduced Phase Transitions and Cooperative Systems (PIPT 5), Bled, Slovenia, June 11, 2014.

"Light-induced coherence in underdoped $YBa_2Cu_3O_x$ far above equilibrium Tc," 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.

Attended Conferences/Workshops

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

Gordon Reasearch 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, California, July 22-27, 2012.

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

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

Gordon Research Conference on Correlated Electron Systems, Mount Holyoke College, Massachusetts, June 13-18, 2010.

American Physical Society March Meeting 2010, Portland, Oregon, 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, Illinois, June 3-4, 2009.