

Barry L. Zink

CONTACT

Department of Physics and Astronomy
University of Denver
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EDUCATION

Ph.D. in Materials Science and Engineering	UC San Diego, 2002
M.S. in Physics	UC San Diego, 1998
B.S. in Physics	UC Santa Cruz, 1996

APPOINTMENTS

University of Denver Associate Professor, Department of Physics and Astronomy	Sept. 2011-
University of Denver Associate Dean, Natural Sciences and Mathematics	Sept. 2011-Dec. 2011
University of Denver Assistant Professor, Department of Physics and Astronomy	Sept. 2006-Aug. 2011
National Institute of Standards and Technology Postdoctoral Researcher, Quantum Sensors Project	Dec. 2002-Aug. 2006
UC San Diego Graduate Student Researcher, Frances Hellman Lab	Jul. 1996-Dec. 2002

HONORS AND AWARDS

George T. Piercy Distinguished Visiting Professor, University of Minnesota, Chemical Eng. and Materials Sci.	2015
DU Natural Sciences and Mathematics Excellence in Research Award	2013
Outstanding Referee, <i>Review of Scientific Instruments</i>	2013
National Science Foundation CAREER Award	2009
National Research Council Postdoctoral Fellow	2002-04
Honors in Physics, UC Santa Cruz	1996
NSF REU Student, Santa Cruz Institute for Particle Physics	1995
Dean McHenry Scholar, UC Santa Cruz	1992-93

RESEARCH INTERESTS

Experimental condensed matter and materials physics, focusing on thermal, electronic, and thermoelectric properties of nanostructures and novel materials. Current projects include: thermal transport, thermoelectric effects, and spin transport in ferromagnetic thin films and nanostructures; materials for spintronics and spin current detection; thermal transport in nanostructures and hybrid organic semiconductors for thermoelectric applications; heat capacity and thermal conductance in amorphous dielectrics, metals and superconductors below 1 Kelvin; and growth and characterization of thermoelectric amorphous semiconductor alloy films. Applications of interest range from energy harvesting to nanoelectronics to gamma-ray detectors for nuclear security.

CURRENT AND PENDING SUPPORT

National Science Foundation, Division of Materials Research "Heat, Charge, and Spin: Thermal Spintronics in Ferromagnetic Films and Nanostructures"	2014-16
Center for Integrated Nanotechnologies (CINT) User Program "Micromachined Thermal Platforms for Nanoscale Thermoelectric Materials and Quantum Information Research"	2012-2017

PREVIOUS SUPPORT

Intelligence Community Postdoctoral Program "High Atomic Number Absorbers: A Path for Gamma-Ray Microcalorimeters to Exceed the Efficiency of Germanium Sensors (CO-PI with J. Ullom, NIST Boulder)	2012-15 \$240k
University of Denver, PROF Magnetic Materials and Interfaces for Energy Generation: Fundamental Physics and Materials for "Spin Caloritronic" Transport	2014-15
National Science Foundation, CAREER (DMR-Condensed Matter Physics) "CAREER: Electrons, Phonons, and Magnons in Nanostructures and Novel Materials"	2009-2014 \$550k
National Consortium of MASINT Research FY12 Research Opportunity "Ultra-High Energy Resolution Microcalorimeter Gamma Imagers: Proof of Concept"	2012-2013 \$150k
Department of Energy SBIR (sub-contract from Plasma Controls, LLC) "Measurement Services for Thin Film Thermoelectric Generators"	2010-2013 \$57k
National Nuclear Security Agency, (DOE) "Materials Research for High-Resolution Gamma-Ray Detectors for Nonproliferation Applications"	2009-2013 \$650k
National Consortium for MASINT Research (NCOMR) "Thermal pathways in ultra-high resolution gamma-ray detector materials for nuclear material detection"	2008-11 \$319k

Nano Electronics Research Corporation (NERC) "Direct measurement of thermal spin currents and torques in nanoscale systems" (CO-PI with M. R. Pufall, NIST Boulder)	2008-10 \$255k
American Chemical Society, Petroleum Research Fund, Type G "Exploring Improved Petroleum Utilization Via Nanoscale Thermal Engineering of Thermoelectric Materials"	2007-09 \$40k
University of Denver, PROF "Exploring Better Energy Efficiency Through Thermal Engineering of Nanoscaled Materials"	2007-09 \$13k
NIST (sub-contract under NASA Grant NDPR NNG04WF06I) "Magnetic Microcalorimeters and Thermometers"	FY 2007 \$95k

RESEARCH GROUP _____

Alex Hojem (*Ph.D. student*)

Devin Wesenberg (*Ph.D. student*)

FORMER POSTDOCTORAL SCHOLARS _____

James Hays-Wehle currently Physicst, NIST Boulder Quantum Sensors Project	2013-2015
Jason Underwood currently Physicist, NIST Gaithersburg Quantum Voltage/Quantum Electronics	2012-13
Robert Horansky currently NIST Boulder Quantum Electronics and Photonics Division	2009-13
Nikhil Jethava currently NASA Goddard Space Flight Center	Jan-Mar, 2009

FORMER GRADUATE STUDENTS

- Sarah J. Mason Ph.D. 2014
Nanoscale Thermoelectrics: A Study of the Absolute Seebeck Coefficient of Thin Films
 currently Process Engineer, Avago Technologies, Fort Collins, CO
- Dain Bassett Ph.D. 2014
Measurement of Low Temperature Thermal Properties of Microcalorimeters using Johnson Noise Thermometry
 currently Process Engineer, Intel, Hillsboro, OR
- Azure D. Avery Ph.D. 2013
Thermal and Electrical Transport in Ferromagnetic Metal Thin Films
 currently Postdoctoral Scholar, National Renewable Energy Laboratory, Golden, CO
- Rubina Sultan Ph.D. 2010
Measurement of Thermoelectric Properties of Amorphous Silicon Based Thin Films
 currently Senior Process Engineer, Intel, Hillsboro, OR
- Farhana Baset M.S. 2007
Defect and Magnetic States in Amorphous Magnetic Semiconductors
 currently Ph.D. student, University of Ottawa, Canada

FORMER UNDERGRADUATE STUDENTS, OTHERS

- Gail Cotteril (Undergraduate Research Assistant, 2011-2013), B. S. 2013
- Di Wei (Undergraduate Research Assistant, 2010-2012), B. S. 2012
 Thesis: *Measurements of Thin Film and Nano Hybrid Thermoelectric Materials*
 currently Graduate Student, Harvard University, SEAS
- Joseph Rauch (Undergraduate Research Assistant, 2010-2012), B. S. 2012
 currently Graduate Student, Brandeis University, Department of Physics
- Jessica Olson (Visiting Researcher, Cherry Creek High School Physics Teacher, 2010)
- Greg Stiehl (Undergraduate Research Assistant, 2008-2010), B. S. 2010
Measurement and Reduction of Sensitivity to External Magnetic Fields for NIST SQUID amplifiers
 currently Graduate Student, Cornell University, Department of Physics
- Erik Partridge (Undergraduate Research Assistant, 2009-10), B. S. 2010
Exploring Temperature Dependent Resistance of Semiconducting Thin Film Thermometers
- Andrew Bacino (Undergraduate Research Assistant, 2009)
- Abby Johnson (Undergraduate Research Assistant, 2008-09)
 currently Lecturer, University of Denver, Department of Mathematics

ZINK RESEARCH LAB DEVELOPMENT

Below is a brief description of experimental capabilities and facilities available at the University of Denver. For more information, see <http://portfolio.du.edu/ZinkLab>.

UHV Deposition Chamber A load-locked, cryo- and ion-pumped vacuum system with base pressure of $\sim 10^{-10}$ Torr, designed for co-deposition of two materials via thermal and e-beam evaporation.

e-Beam Nanolithography We use a commercial hardware/software package (NPGS) to perform e-beam lithography using a JEOL 848a 40 kV Scanning-Electron Microscope installed in our lab. We have demonstrated < 80 nm linewidths and continue to improve our techniques.

LN₂ Cryostats Two sample-in-vacuum liquid nitrogen cryostats allow measurements from 77–350 K. Custom designed sample mounts include radiation shields, and provide a highly stable reference temperature for careful thermal experiments. Measurements can be made in applied magnetic fields up to ~ 1 kOe.

Low Temperature Facilities A sample-in-vacuum ³He refrigerator allows thermal, electrical and thermoelectric transport measurements from 0.3 – 100 K and an Adiabatic Demagnetization Refrigerator, equipped with two separate two-stage SQUID amplifier channels, allows measurements and detector characterization to below 50 mK. We have recently acquired a 7 Tesla superconducting split-pair magnet cryostat that allows experiments from 2-300 K in high magnetic fields.

Supporting Equipment In addition to the central growth, processing and measurement equipment, an ultrasonic wire-bonder, thermal evaporator, spin-coater, oven, and limited wet-chemistry facilities are available for device and sample preparation.

PUBLICATIONS IN PREPARATION OR SUBMITTED

(* indicates DU student author)

- a. “Thermoelectric Effects in Spintronic Materials and The Search for Thermal Spin Currents (working title),” A. D. Avery and **B. L. Zink**, (invited review in preparation for *IEEE Advances in Magnetism*).
- b. “Determining Absolute Seebeck Coefficients from Relative Thermopower Measurements of Thin Films (working title),” S. J. Mason, D. Bassett, and **B. L. Zink**, in preparation.
- c. “Violation of Wiedemann-Franz Law through reduction of thermal conductivity in gold thin films (working title),” S. J. Mason, D. Wesenberg, A. Hojem, and **B. L. Zink**, in preparation.
- d. “Relation of Planar Hall and Planar Nernst effects in thin film Permalloy,” D. Wesenberg, A. Hojem, and **B. L. Zink**, in preparation.
- e. “Thermal spin injection and interface insensitivity in permalloy/aluminum metallic non-local spin valves,” A. Hojem, D. Wesenberg, and **B. L. Zink**, submitted to *Nature Communications*
- f. “Efficient Spin Transport Through Native Oxides of Nickel and Permalloy with Platinum and Gold Overlayers,” **B. L. Zink**, M. Manno, L. O’Brien, J. Lotze, M. Weiler, S. J. Mason, S. T. B. Goennenwein, M. Johnson, and C. Leighton, submitted to *Physical Review B*

- g. “Tailored Semiconducting Carbon Nanotube Networks with Enhanced Thermoelectric Properties,” A. D. Avery, B. H. Zhou, J. Lee, E-S Lee, E. M. Miller, R. Ihly, D. Wesenberg*, K. S. Mistry, S. L. Guillot, **B. L. Zink**, Y-H Kim, J. L. Blackburn, and A. J. Ferguson, submitted to *Nature Energy*

JOURNAL PUBLICATIONS

Note that entering the text string “Zink BL OR (Zink B AND Basov)” in the Author search field of ISI Web of Science gives the full list of publications that appear below. A google scholar profile is also available at <http://scholar.google.com/citations?user=Ibx-KckAAAAJ>

42. “Thermal and electrical conductivity of ~ 100 nm Permalloy, Al, Ni, Co, and Cu films and examination of the Wiedemann-Franz Law,” A. D. Avery, S. J. Mason, D. Bassett, D. Wesenberg, and **B. L. Zink**, *Physical Review B*, **92** 214410 (2015).
41. “Peltier Cooling and Onsager Reciprocity in Ferromagnetic Thin Films,” A. D. Avery*, **B. L. Zink**, *Physical Review Letters*, **111** 126602 (2013).
40. “Heat Transport by Long Mean Free Path Vibrations in Amorphous Silicon-Nitride Near Room Temperature,” R. Sultan*, A. D. Avery*, J. M. Underwood, S. J. Mason* D. Bassett*, and **B. L. Zink**, *Physical Review B*, **87** 214305 (2013).
39. “Anomalous thermal decay in gamma-ray microcalorimeter detectors,” R. D. Horansky, D. A. Bennet, D. R. Schmidt, **B. L. Zink**, and J. N. Ullom, *Applied Physics Letters*, **103** 212602 (2013).
38. “Lattice Damage in Superconducting Microcalorimeter Detectors,” R. D. Horansky, K. E. Koehler, M. P. Croce, G. J. Kunde, M. W. Rabin, **B. L. Zink**, and J. N. Ullom, *IEEE Transactions on Applied Superconductivity*, **23** 2101104 (2013).
37. “Predicting the Planar Nernst Effect From Magnetic Field Dependent Thermopower and Resistance in Nickel and Permalloy Thin Films,” A. D. Avery*, M. R. Pufall, and **B. L. Zink**, *Physical Review B* **86** 184408 (2012).
36. “Observation of the Planar Nernst Effect in Permalloy and Nickel Thin Films with In-plane Thermal Gradients.” A. D. Avery*, M. R. Pufall, and **B. L. Zink**, *Physical Review Letters* **109** 196602 (2012).
35. “Time-division SQUID Multiplexers with Reduced Sensitivity to External Magnetic Fields,” G. M. Stiehl*, H. M. Cho, G. C. Hilton, K. D. Irwin, J. A. B. Mates, C. D. Reintsema, and **B. L. Zink**, *IEEE Transactions on Applied Superconductivity*, **21** 298 (2011).
34. “Thermopower and resistivity in ferromagnetic thin films near room temperature,” A. D. Avery*, Rubina Sultan*, D. Bassett*, D. Wei*, and **B. L. Zink**, *Physical Review B–Rapid Communications* **83** 100401(R) (2011)
33. “Exploring Thermoelectric Effects and Wiedemann-Franz Violation in Magnetic Nanostructures Via Micromachined Thermal Platforms” **B. L. Zink**, A. D. Avery*, R. Sultan*, D. Bassett*, and M. R. Pufall, *Solid State Communications* **150** 514 (2010) (*invited*)
32. “Electronic and Vibrational Density of States Through the Metal-Insulator Transition in Amorphous Yttrium-Silicon Alloy Thin Films,” **B. L. Zink** and F. Hellman, *Physical Review B* **79** 235105 (2009)

31. “Thermal conductivity of micromachined low-stress silicon-nitride beams from 77 – 325 K,” R. Sultan*, A. Avery*, G. Stiehl*, **B. L. Zink**, *Journal of Applied Physics* **105** 043501 (2009). (Also featured in *Virtual Journal of Nanoscale Science and Technology* **19**, March 2, 2009.)
30. “Design, Fabrication, and Multiplexing of Magnetic Calorimeter X-ray Detectors with High-Efficiency SQUID Readout” R. Sultan*, **B. L. Zink**, K. D. Irwin, G. C. Hilton, J. N. Ullom, L. R. Vale, *Journal of Low Temperature Physics* **151** 363 (2008).
29. “Toward a 256-pixel array of gamma-ray microcalorimeters for nuclear-materials analysis,” W. B. Doriese, J. N. Ullom, J. A. Beall, W. D. Duncan, L. Ferreira, G. C. Hilton, R. D. Horansky, K. D. Irwin, J. A. B. Mates, C. D. Reintsema, D. R. Schmidt, L. R. Vale, Y. Xu, Y., **B. L. Zink**, M. K. Bacrania, A. S. Hoover, C. R. Rudy, M. W. Rabin, C. A. Kilbourne, K. R. Boyce, L. E. Brown, J. M. King, F. S. Porter, *Journal of Low Temperature Physics* **151** 754 (2008)
28. “Application of calorimetry on a chip to high-pressure materials,” A. Navrotsky, M. Dorogova, F. Hellman, D. W. Cooke, **B. L. Zink**, C. E. Leshner, J. Boerio-Goates, B. F. Woodfield, and B. Lang, *Proceedings of the National Academy of Sciences*, **104** 9187 (2007).
27. “14-pixel, multiplexed array of gamma-ray microcalorimeters with 47 eV energy resolution at 103 keV,” W. B. Doriese, J. N. Ullom, J. A. Beall, W. D. Duncan, L. Ferreira, G. C. Hilton, R. D. Horansky, K. D. Irwin, J. A. B. Mates, C. D. Reintsema, L. R. Vale, Y. Xu, **B. L. Zink**, A. S. Hoover, M. W. Rabin, C. R. Rudy, and D. T. Vo, *Applied Physics Letters*, **90** 193508 (2007).
26. “Multiplexed microcalorimeter arrays for precision measurements from microwave to gamma-ray wavelengths,” J. N. Ullom, W. B. Doriese, J. A. Beall, W. D. Duncan, L. Ferreira, G. C. Hilton, R. D. Horansky, K. D. Irwin, T. Jach, B. Mates, N. A. Miller, G. C. O’Neill, C. D. Reintsema, N. Ritchie, D. R. Schmidt, L. R. Vale, Y. Xu, **B. L. Zink**, A. Hoover, C. R. Rudy, D. M. Tournear, D. T. Vo, and M. W. Rabin, *Nuclear Instruments and Methods in Physics Research A*, **579** 161-164 (2007).
25. “Superconducting absorbers for use in ultra-high resolution gamma-ray spectrometers based on low temperature microcalorimeter arrays,” R. D. Horansky, J. N. Ullom, J. A. Beall, W. B. Doriese, W. D. Duncan, L. Ferreira, G. C. Hilton, K. D. Irwin, C. D. Reintsema, L. R. Vale, **B. L. Zink**, A. Hoover, C. R. Rudy, D. M. Tournear, D. T. Vo, and M. W. Rabin, *Nuclear Instruments and Methods in Physics Research A*, **579** 169-172 (2007).
24. “Excess modes and enhanced scattering in rare-earth doped amorphous silicon thin films,” **B. L. Zink**, R. Islam, D. J. Smith, F. Hellman, *Physical Review B*, **74** 205209 (2006).
23. “An array-compatible transition-edge sensor microcalorimeter γ -ray detector with 42 eV energy resolution at 103 keV,” **B. L. Zink**, J. N. Ullom, J. A. Beall, K. D. Irwin, W. B. Doriese, W. D. Duncan, L. Ferriera, G. C. Hilton, R. D. Horansky, C. D. Reintsema, and L. R. Vale, *Applied Physics Letters* **89**, 124101 (2006). (Also featured in *Virtual Journal of Applications of Superconductivity* **11**, Oct. 1, 2006.)
22. “Specific heat and thermal conductivity of thin-film amorphous silicon,” **B. L. Zink**, R. Pietri, and F. Hellman, *Physical Review Letters*, **96**, 055902 (2006).
21. “Erbium-doped Gold Sensor Films for Magnetic Microcalorimeter X-ray Detectors,” **B. L. Zink**, K. D. Irwin, G. C. Hilton, J. N. Ullom and D. P. Pappas, *Journal of Applied Physics*, **99**, 08B303 (2006).

20. "Optimization of transition-edge calorimeter performance," J. N. Ullom, J. A. Beall, W. B. Doriese, W. D. Duncan, L. Ferreira, G. C. Hilton, K. D. Irwin, C. D. Reintsema, L. R. Vale and **B. L. Zink**, *Nuclear Instruments and Methods in Physics Research A*, **559**, 422 (2006).
19. "Microwave SQUID multiplexers for low-temperature detectors," K. D. Irwin, J. A. Beall, W. B. Doriese, W. D. Duncan, G. C. Hilton, J. A. B. Mates, C. D. Reintsema, D. R. Schmidt, J. N. Ullom, L. R. Vale, **B. L. Zink** and K. W. Lehnert, *Nuclear Instruments and Methods in Physics Research A*, **559**, 802 (2006).
18. "Fabrication of prototype imaging arrays for SCUBA-2," G. C. Hilton, J. A. Beall, W. B. Doriese, W. D. Duncan, L. S. Ferreira, K. D. Irwin, C. D. Reintsema, J. N. Ullom, L. R. Vale, Y. Xu, **B. L. Zink**, W. Parkes, A. S. Bunting, C. C. Dunare, A. M. Gundlach, J. T. M. Stevenson, A. J. Walton, E. Schulte, E. Corrales, J. P. Sienicki, Dan Bintley, P. A. R. Ade, Rashmi V. Sudiwala, Adam L. Woodcraft, Mark Halpern, W. Holland, M. D. Audley and M. Macintosh, *Nuclear Instruments and Methods in Physics Research A*, **559**, 513 (2006).
17. "Si-N membrane-based microcalorimetry: heat capacity and thermal conductivity of thin films," B. Revaz, **B. L. Zink** and F. Hellman, *Thermochimica Acta* **432**, 158-168 (2005).
16. "Measurement of thermal conductivity of thin film samples using micromachined Si-N membrane calorimeters," **B. L. Zink**, B. Revaz, J. J. Cherry, F. Hellman, *Review of Scientific Instruments* **76**, 024901 (2005).
15. "Specific heat and thermal conductivity of low-stress amorphous Si-N membranes" **B. L. Zink**, F. Hellman, *Solid State Communications* **129**, 199-204 (2004).
14. "Lithographically patterned magnetic calorimeter x-ray detectors with integrated SQUID read-out" **B. L. Zink**, K. D. Irwin, G. C. Hilton, D. P. Pappas, J. N. Ullom and M. E. Huber, *Nuclear Instruments and Methods in Physics Research A* **520**, 52-55 (2004).
13. "Thermodynamic properties of excess-oxygen-doped $\text{La}_2\text{CuO}_{4.11}$ near a simultaneous transition to superconductivity and long-range magnetic order" G. A. Jorge, M. Jaime, L. Civale, C. D. Batista, **B. L. Zink**, F. Hellman, B. Khaykovich, M. A. Kastner, Y. S. Lee and R. J. Birgeneau, *Physical Review B* **69**, 174506 (2004).
12. "Numerical simulation of the heat transfer in amorphous silicon nitride membrane-based microcalorimeters" B. Revaz, **B. L. Zink**, D. O'Neill, L. Hull and F. Hellman, *Review of Scientific Instruments* **74**, 4389-4403 (2003).
11. "Mean-field behavior with Gaussian fluctuations at the ferromagnetic phase transition of SrRuO_3 " D. Kim, **B. L. Zink**, F. Hellman, S. McCall, G. Cao and J. E. Crow, *Physical Review B* **67**, 100406(R) (2003).
10. "Finite size effects on the moment and ordering temperature in antiferromagnetic CoO layers," Y. J. Tang, D. J. Smith, **B. L. Zink**, F. Hellman and A. E. Berkowitz, *Physical Review B* **67**, 054408 (2003).
9. "Magnetic moments and interactions near the metal-insulator transition in amorphous magnetic semiconductors," **B. L. Zink**, V. Preisler, D. R. Queen and F. Hellman, *Physical Review B* **66**, 195208 (2002).
8. "Thin film microcalorimeter for measurement of specific heat in high magnetic fields," **B. L. Zink**, B. Revaz, R. Sappey and F. Hellman, *Review of Scientific Instruments* **73**, 1841 (2002).

7. "Tricritical point and the doping dependence of the order of the ferromagnetic phase transition of $\text{La}_{1-x}\text{Ca}_x\text{MnO}_3$," D. Kim, B. Revaz, **B. L. Zink**, F. Hellman, J. J. Rhyne and J. F. Mitchell, *Physical Review Letters* **89**, 227202 (2002).
6. "Critical behavior of $\text{La}_{0.75}\text{Sr}_{0.25}\text{MnO}_3$," D. Kim, **B. L. Zink**, F. Hellman and J. M. D. Coey, *Physical Review B* **65**, 214424 (2002).
5. "Infrared probe of metal-insulator transition in $\text{Si}_{1-x}\text{Gd}_x$ and $\text{Si}_{1-x}\text{Y}_x$ amorphous alloys in magnetic field," D. N. Basov, A. M. Bratkovsky, P. F. Henning, **B. Zink**, F. Hellman, Y. J. Wang, C. C. Homes, and M. Strongin, *Europhysics Letters* **57**, 240-246 (2002).
4. "Enhancement of the electronic contribution to the low-temperature specific heat of a Fe/Cr multilayer," B. Revaz, M.-C. Cyrille, **B. L. Zink**, Ivan K. Schuller, and F. Hellman, *Physical Review B* **65**, 094417 (2002).
3. "Spin-glass freezing and RKKY interactions near the metal-insulator transition in amorphous Gd-Si alloys," F. Hellman, D. R. Queen, R. M. Potok and **B. L. Zink**, *Physical Review Letters* **84**, 5411-14 (2000).
2. "Large magnetic entropy in giant magnetoresistive amorphous gadolinium silicon," **B. L. Zink**, E. Janod, K. Allen and F. Hellman, *Physical Review Letters* **83**, 2266-9 (1999).
1. "Low-temperature magnetoresistance in insulating $a\text{-Gd}_x\text{Si}_{1-x}$ alloys," P. Xiong, **B. L. Zink**, S. I. Applebaum, F. Hellman and R. C. Dynes, *Physical Review B* **59**, R3929-R3933 (1999).

INVITED TALKS

59. "Thermal spin injection and thermoelectric effects in nanoscale metallic non local spin valves," EMN (Energy Materials Nanotechnology) Fall Meeting, Las Vegas, NV Nov 16-19, 2015
58. "Heat, Charge, and Spin: What's Hot in Thermoelectrics, Spintronics, and Magnetic Materials," Physics & Astronomy Colloquium, University of Denver, Oct. 14, 2015
57. "In-plane heat and charge transport in sub-100 nm thin films and "violations" of the Wiedemann-Franz law," CECAM Hot Nanostructures Workshop, Mainz, Germany, Sept 30, 2015
56. "Thermal Spin Injection in Non-Local Spin Valves, Spin Transport in Native FM Oxides, and Large Spin Hall Angle in Gold Thin Films," Interdisciplinary Spintronics Research Group (INSPIRE) Seminar, Johannes Gutenberg University Mainz, Germany, Sept. 29, 2015
55. "Heat, Charge, and Spin: What's Hot in Spintronics and Magnetic Materials," Front Range Advanced Magnetism Symposium (FRAMS), Colorado State University, Fort Collins, CO, Sept. 22, 2015
54. "Thermal spin injection and empirical thermal modeling in metallic nanoscale spin valves," Workshop on Non-linear spin-heat interactions, Ohio State University, Columbus, OH, Sept 16-17, 2015
53. "Measuring Thermal Properties of Thin Films and Nanostructures with Suspended Thermal Platforms," Carbon Nanotube Bolometer Workshop, NIST, Boulder, July 22, 2015
52. "Thermal Gradients in spin caloritronics: From thermal spin injection to nernst and Hall effects," Max Planck Institute for Physical Chemistry of Solids, Dresden, Germany, June 30, 2015

51. "Seebeck, Peltier effects and Wiedemann-Franz violations in nanoscale thin films using micro-machined thermal isolation platforms," International Conference on Thermoelectrics, Dresden, Germany, June 29, 2015
50. "Thermal Spin Injection and Transport in Non-Local Spin Valves and Comments on Spin Pumping and Native FM Oxides," Spin Mechanics III, Munich, Germany, June 22, 2015
49. "Spin caloritronics with suspended thermal platforms," 31st Annual Piercy Lecture, University of Minnesota, Department of Chemical Engineering and Materials Science, Jan 29, 2015
48. "Seebeck and Peltier effects in ferromagnetic thin films and nanostructures," University of Minnesota Magnetism Seminar, Jan. 23, 2015
47. "Spin caloritronics with suspended thermal platforms: Nernst and Hall effects, Magnon Drag, Wiedemann-Franz "violations" and other stories," November 19, 2014, Nebraska Center for Materials and Nanoscience, University of Nebraska, Lincoln NB
46. "Probing fundamental physics and materials properties of spin caloritronic systems with suspended thermal platforms," August 20, 2014, Spintronics VII Symposium of the SPIE Optics & Photonics Conference, San Diego, CA
45. "Spin caloritronics with suspended thermal platforms," July 17, 2014, Sixth International Spin caloritronics Workshop, Irsee, Germany
44. "Heat, Charge, and Spin: Can Magnetic Materials Solve Tomorrow's Energy and Information Challenges?" March 31, 2014, College of Engineering Seminar, University of Tennessee, Knoxville
43. "Spin caloritronics with in-plane thermal gradients: Can Hot Spins Solve Tomorrow's Energy and Information Materials Challenges?," March 24, 2014, Physics Colloquium, Colorado State University
42. "Peltier, Seebeck, and Nernst Effects in Ferromagnetic Metals with In-Plane Thermal Gradients," November 21, 2013, Condensed Matter Physics Seminar, CU Boulder
41. "Peltier, Seebeck, and Nernst Effects in Ferromagnetic Metals with In-Plane Thermal Gradients." November 7, 2013, 58th Magnetism and Magnetic Materials Conference, Denver, CO
40. "Diffusive, Ballistic, and Quantum Thermal Transport in Thin Films and Nanostructures." October 18-19, 2013, Fall 2013 Meeting of the American Physical Society Four Corners Section, Denver, CO
39. "Thermoelectric effects in ferromagnetic thin films and the search for thermal spin currents" October 7-9 2013, 2013 Advanced Light Source User Meeting, Lawrence Berkeley Lab, Berkeley, CA
38. "Planar Nernst effects and the search for thermal spin currents with in-plane gradients" August 25, 2013, Spintronics VI Symposium of the SPIE Optics & Photonics Conference, San Diego, CA

37. "Planar Nernst effects and the search for thermal spin currents in ferromagnetic metals"
May 15, 2013, Fifth International Spincaloritronics Workshop, Columbus, Ohio
36. "Thermal Transport and Heat Capacity of Suspended Silicon-Nitride Structures: Two Regimes, Two Surprises"
April 25, 2013, Institut Néel, CNRS Grenoble, Grenoble, France
35. "Search for thermal spin currents in ferromagnetic metals with in-plane thermal gradients"
April 22-23 2013, DFG Spin Caloric Transport Conference, Bad Honnef, Germany
34. "Observation of the Planar Nernst Effect in Permalloy and Nickel Thin Films with In-plane Thermal Gradients."
March 18, 2013, March Meeting of the American Physical Society
33. "The Planar Nernst Effect and the Search for Thermal Spin Currents in Ferromagnetic Metals,"
March 13, 2013, DPG (German Physical Society) Spring Meeting
32. "Thermal Transport and Heat Capacity of Suspended Silicon-Nitride Structures: Two Regimes, Many Questions"
January 30, 2013, University of Denver, Physics & Astronomy Colloquium
31. "Thermal Transport and Heat Capacity of Suspended Silicon-Nitride Structures: Two Regimes, Many Questions"
January 29, 2013, JPL Microdevice Lab Seminar
30. "The Planar Nernst Effect and the Search for Thermal Spin Currents in Ferromagnetic Metals"
October 26, 2012, Fall 2012 Meeting of the American Physical Society Four Corners Section, Socorro, NM
29. "The Planar Spin Seebeck Effect?"
June 2012, Fourth International Spincaloritronics Workshop, Sendai, Japan
28. "Nanoscience and Nanotechnology: What's So Big About Small?"
October 1, 2011, University of Denver Alumni Symposium
27. "Measuring thermoelectric effects in magnetic thin films and nanostructures via micromachined thermal isolation platforms"
May 2011 Third International Spincaloritronics Workshop, Leyden, The Netherlands
26. "Thermoelectric Effects and Thermal Spin Currents in Magnetic Nanostructures"
October 19, 2010, Texas A&M University, Physics Colloquium
25. "Thermoelectric effects and thermal spin currents in magnetic nanostructures"
August 31, 2010, Nanoelectronics Research Initiative, e-Workshop
24. "Heating Up Thin Films and Nanostructures: New Measurements of Thermal Properties for Thermoelectrics and Spintronics,"
April 26, 2010, Arizona State University, Nanoscience Seminar
23. "Heating Up Thin Films and Nanostructures: New Measurements of Thermal Properties for Thermoelectrics and Spintronics,"
March 8, 2010, University of South Florida, Physics Colloquium

22. "Heating Up Thin Films and Nanostructures: New Measurements of Thermal Properties for Thermoelectrics and Spintronics,"
June 17 2009, University of Texas, Dallas Physics Colloquium
21. "Electron and Phonon Transport in Thermoelectric Thin Films and Nanostructures,"
April 2, 2009, Colorado State University Mechanical Engineering Seminar
20. "Electrons, Phonons, and Magnons in Thin Films and Nanostructures,"
February 6, 2009, SUNY Stony Brook, Solid State Physics Seminar
19. "Electron, Phonon, and Magnon Heat Transport in Thin Films and Nanostructures,"
November 21, 2008, University of Wyoming, Physics and Astronomy Colloquium
18. "Electron and Phonon Transport in Thermoelectric Thin Films and Nanostructures,"
Fall 2008 Meeting of the American Physical Society Four Corners/Texas Sections, El Paso, TX
17. "Electron and Phonon Transport in Thermoelectric Thin Films and Nanostructures,"
September 24, 2008, University of Colorado, Boulder, Physics Colloquium
16. "Thermal Pathways in Ultra-high Resolution Gamma-ray Detector Materials for Nuclear Material Detection,"
Intelligence Community Academic Summit, June 2008
15. "In Search of a Tunable Tunneling State: Thermal Properties of Amorphous Silicon Alloys,"
December 10, 2007, MRSEC Seminar, University of Minnesota
14. "Nanoscience and Nanotechnology: What's So Big About Small?"
September 5, 2007, University of Denver Discoveries All Campus Lecture
13. "Thermal Adventures in Amorphous Thin Films,"
August 27, 2007, Physics Colloquium, Colorado State University
12. "Tunneling States, Excess Modes, and Other Thermal Adventures in Amorphous Thin Films,"
July 20, 2007, Imperial College, London
11. "Possible New Directions For Bulk-Sample Chip Calorimetry?,"
March 15, 2007, COMPRES Calorimetry on a Chip Workshop, UC Berkeley
10. "Quantum Calorimeter Gamma-ray Detectors: New Tools for Non-proliferation,"
March 2007 Meeting of the American Physical Society, Denver, CO
9. "Quantum Calorimetry for Non-proliferation,"
April 3, 2006, Physics Colloquium, University of Denver
8. "Tunneling States, Excess Modes, and Other Thermal Adventures in Amorphous Thin Films,"
February 21, 2006, Condensed Matter Seminar, Oregon State University
7. "Quantum Calorimetry for Non-proliferation,"
February 20, 2006, Physics Colloquium, Oregon State University
6. "Quantum Calorimetry for Non-proliferation,"
January 26, 2006, Chemical Engineering and Materials Science Department, UC Davis

5. “Quantum Calorimetry for Non-proliferation,”
January 23, 2006, Physics Colloquium, University of Central Florida
4. “Quantum Calorimetry for Non-proliferation,”
December 16, 2005, Quantum Devices Group Seminar, NIST
3. “Quantum Calorimetry for Non-proliferation,”
November 17, 2005, Condensed Matter Physics Seminar, CU Boulder
2. “Development of Magnetic Microcalorimeter X-ray Detectors at NIST,”
April 30, 2004, Cryogenic Particle Detection Group Seminar, Kirchoff-Institut für Physik,
University of Heidelberg, Germany
1. “Si-N Membrane Microcalorimetry: Thermal Conductivity and Specific Heat of Thin Films
from 2 – 500 K in Magnetic Fields to 8 Tesla,”
March 2003 Meeting of the American Physical Society, Austin, TX

ZINK GROUP MEMBER INVITED TALKS

“GMAG PhD Dissertation Research Award: Observation of the Planar Nernst Effect in Permalloy
and Nickel Thin Films With In-Plane Thermal Gradients,”
(presented by A. D. Avery) March 2013, March Meeting of the American Physical Society

ZINK GROUP CONTRIBUTED TALKS/POSTERS (2006-PRESENT)

Azure (Barry) MAR2016

Alex MMM

Devin MMM

Barry MMM

Alex FRAMS

Devin Griefswald

“Thermal effects on spin currents in non-local metallic spin valves,”
(presented by A. Hojem) 59th Conference on Magnetism and Magnetic Materials, Honolulu,
HI, November 2014

“Thermal gradients, Nernst effects, and new limits on spin-current generation in metallic ferromag-
nets using suspended thermal platforms,”
(presented by D. Wesenberg) 59th Conference on Magnetism and Magnetic Materials, Hon-
olulu, HI, November 2014

“Absolute Seebeck Coefficient Measurements of Thermoelectric Thin Films,”
(presented by S. Mason) APS March Meeting 2014, Denver, CO

“Modifying magnetic switching in permalloy film nanostructures using the native oxide,”
(presented by A. Hojem) APS March Meeting 2014, Denver, CO

- “Measuring Thermal and Electrical Transport in Single-Walled Carbon Nanotube Thin Films,”
A. D. Avery, M. Olsen, P. Parilla, B. L. Zink, J. L. Blackburn, and A. J. Ferguson, 2013 Fall Meeting of the Materials Research Society
- “Development of Polymer:Single-walled Carbon Nanotube Composites for Optimized Thermoelectric Efficiency,”
A. D. Avery, M. Olsen, P. Parilla, and B. L. Zink, J. L. Blackburn, and A. J. Ferguson, 2013 Fall Meeting of the Materials Research Society
- “Seebeck Coefficient of Ferromagnetic Thin Films Near Room Temperature,”
(presented by S. Mason) 58th Conference on Magnetism and Magnetic Materials, Denver, CO, November 2013
- “Thermal Transport in Silicon Nitride Membranes from 50 mK to 3 K,”
(presented by J. Underwood) 15th International Workshop on Low Temperature Detectors, Pasadena, CA, June 24, 2013
- “Observation of Excess Heat Capacity in Cu Thin Films at Low Temperatures,”
(presented by D. Bassett) 15th International Workshop on Low Temperature Detectors, Pasadena, CA, June 24, 2013
- “Observation of the Planar Nernst Effect in Ferromagnetic Thin Films with In-plane Thermal Gradients,” (presented by A. Avery, Finalist for Best Student Presentation) 12th Joint MMM/INTERMAG Conference, Chicago, Illinois, January 15, 2013
- “Thermal properties of Silicon Nitride membranes using Johnson Noise Thermometry from 50mK,”
(presented by D. Bassett) 2012 Applied Superconductivity Conference, October 2012, Portland, OR
- “Heat Transport by Long Mean Free Path Vibrations in Amorphous Silicon-Nitride near Room Temperature,” PHONONS 2012 (XIV International Conference on Phonon Scattering in Condensed Matter), July 12, 2012, Ann Arbor, Michigan
- “Nanoscale Thermal Transport Measurements: Bridging Ultrafast and Steady State,”
(poster presented by M. Siemens), PHONONS 2012 (XIV International Conference on Phonon Scattering in Condensed Matter), July 12, 2012, Ann Arbor, Michigan
- “Spin Seebeck Effect Measurements on Ferromagnetic Thin Films Using Micromachined Thermal Isolation Platforms,” (presented by A. D. Avery) APS March Meeting 2012, Boston, MA
- “Measuring the Spin Seebeck Effect Using Micromachined Thermal Platforms,”
(presented by A. Avery) Annual Conference on Magnetism and Magnetic Materials, Scottsdale, AZ, November 2011
- “Detection of the Transverse Voltage Associated with the Spin Seebeck Effect in Ferromagnetic Thin Films,”
(presented by A. Avery) APS March Meeting 2011, Dallas, TX
- “Thermal Transport and Surface Sensitivity in Suspended Amorphous Silicon-Nitride Thin Films,”
(presented by D. Bassett) APS March Meeting 2011, Dallas, TX
- “Exploration of Thermal Conductivity, Seebeck Coefficient, and Lorenz Number Deviations in Ni-Fe Alloy Thin Films,”
(presented by A. Avery) APS March Meeting 2011, Dallas, TX

- “Measurements of Thermoelectric Properties in Thin Films as a Function of Temperature Using Micromachined Thermal Isolation Platforms,”
(presented by R. Sultan) APS March Meeting 2010, Portland, OR
- “Thermoelectric Measurements of Magnetic Nanostructures Using Thermal Isolation Platforms,”
(presented by A. Avery) APS March Meeting 2010, Portland, OR
- “Direct measurements of magneto-thermoelectric effects in thin films and nanostructures[†],”
(presented by A. Avery) 11th Joint MMM/Intermag Conference, Jan. 2010, Washington, D.C.
- “Measurements and Modeling of Thermal Transport in Microcalorimeter Detectors and Materials”,
13th International Workshop on Low Temperature Detectors, Stanford, CA, July 2009
- “Direct Measurements of Figure-of-Merit in Amorphous Silicon-based Thermoelectric Thin Films,”
(presented by R. Sultan) APS March Meeting 2009, Pittsburgh, PA
- “Thermoelectric Transport and Thermal Spin Currents in Ferromagnetic Films and Nanostructures,”
(presented by A. Avery) APS March Meeting 2009, Pittsburgh, PA
- “Thermal and Thermoelectric Transport in Thin Films and Nanostructures,”
APS March Meeting 2009, Pittsburgh, PA
- “Exploring Magnon Heat Transport and Thermal Spin Currents in Ferromagnetic Thin Films,”
53rd Annual Conference on Magnetism and Magnetic Materials, Austin, TX
- “Micromachined thermal isolation devices for measuring in-plane thermal conductivity of thin films from 77 to 325 K[†],”
(Presented by A. Azure) Fall 2008 Meeting of the American Physical Society Four Corners/Texas Sections, El Paso, TX
- “Direct measurements of thermoelectric properties of thin films and nanostructures[†],”
(Presented by R. Sultan) Fall 2008 Meeting of the American Physical Society Four Corners/Texas Sections, El Paso, TX
- “Micromachined tools for measuring thermopower and in-plane thermal conductivity of thermoelectric thin films,”
(Presented by A. Avery) APS March Meeting 2008, New Orleans, LA
- “Design, Fabrication, and Multiplexing of Magnetic Calorimeter X-ray Detectors with High-Efficiency SQUID Readout,”
12th International Workshop on Low Temperature Detectors, Paris, France, July 2007
- “SQUID-based magnetic thermometry for fundamental physics and applications below 1 K,”
(Presented by R. Sultan) APS March Meeting 2007, Denver, CO
- “Micro- and nanomachined tools for measuring in-plane thermal conductivity of thermoelectric thin films,”
APS March Meeting 2007, Denver, CO

[†] Winner of “Best Student Poster” Award.

OUTREACH/PRESS

Ninth Annual Cherry Creek High School Science Symposium

Judge, April 14, 2008

On the physics of baseball at high altitudes...

Live interview on KOA 850 AM Morning News Saturday, October 27th, 2007

Live interview on CBS 4 Denver Morning Show, October 27th, 2007

Quote in, "In the thick of the series, thin air may toss Sox a curve," by Colin Nickerson, *Boston Globe*, Saturday, October 27th, 2007

On the physics of Ubaldo Jimenez' pitching...

Interview by Alan Gionet for "That's a Good Question" series for CBS 4 Denver, Aired July, 2010

On simple cryogenics...

Live interview on FOX 31 Morning Show, October 23rd, 2007 (with Prof. Jennifer Hoffman and DU Physics majors Kathy Giese, Matt Dahl and Naomi Pequette)

On gamma-ray detectors for nuclear non-proliferation...

news@nature.com, "The quest for a finer gamma ray detector," by Sarah Tomlin, March 16, 2006

COURSES TAUGHT

PHYS 1211 <i>University Physics I</i>	Winter 2007
PHYS 1212 <i>University Physics II</i>	Spring 2007
PHYS 1213 <i>University Physics III</i>	Fall 2007
PHYS 1211 <i>University Physics I</i>	Winter 2008
PHYS 1212 <i>University Physics II</i>	Spring 2008
PHYS 1223 <i>University Physics III</i>	Fall 2008
PHYS 4001 <i>Introduction to Research</i> (Team-taught with several other P&A Faculty)	Fall 2008
PHYS 1211 <i>University Physics I</i>	Winter 2009
PHYS 1212 <i>University Physics II</i>	Spring 2009
PHYS 1213 <i>University Physics III</i>	Fall 2009
PHYS 3112 <i>Quantum Physics II</i>	Winter 2010
PHYS 4811 <i>Statistical Mechanics</i>	Spring 2010
PHYS 3111 <i>Quantum Physics I</i>	Fall 2010

PHYS 3112 <i>Quantum Physics II</i>	Winter 2011
PHYS 4811 <i>Statistical Mechanics</i>	Spring 2011
PHYS 4003 <i>Introduction to Research</i>	Spring 2011
PHYS 3111 <i>Quantum Physics I</i>	Winter 2012
PHYS 3112 <i>Quantum Physics II</i>	Spring 2012
PHYS 4112 <i>Quantum Mechanics II</i>	Winter 2013
PHYS 4811 <i>Statistical Mechanics</i>	Spring 2013
PHYS 1213 <i>University Physics III</i>	Fall 2013

TEACHING RELATED

-
- Participant in AAPT New Faculty Workshop Reunion, March 15, 2009
- Participant in AAPT Workshop for New Physics and Astronomy Faculty, Nov. 8-11, 2007
- Participant in DU Clicker Workshop, August 2007
- Participant in DU Center for Teaching and Learning New Faculty Workshop series, Fall 2006

SERVICE TO THE UNIVERSITY

Ammi Hyde Interview Team Leader	Fall 2006,2007; Winter 2007,2008
Undergraduate Committee, Department of Physics and Astronomy	Fall 2006-2009
Chairman, 2007-2008	
Physics and Astronomy Faculty Search Committee	2006-2007
IMLSB Biophysics Faculty Search Committee	2006-2007
Life Sciences Users Group	2007
IMLSB Biochemistry Faculty Search Committee	2006-2007
IMLSB Biophysics Faculty Search Committee	2007-2008
PROF Review NSM/SECS Area Review Group and Campus-wide Review Committee	2008
IMLSB Biophysics Faculty Search Committee	2008-2009
Center for Nanoscale Science and Engineering @ DU	2007-
Associate Director (Physics), 2008-	
Finance Committee Chairman, 2008-09	
Provost's General Education Review Committee	2008-09
Natural Science and Mathematics Inclusive Excellence Committee	2009-

Graduate Committee, Department of Physics and Astronomy	Fall 2009-
University Physics Committee, Department of Physics and Astronomy	Fall 2009-2011
Chairman, 2009-2011	
Physics and Astronomy Faculty Search Committee	2009-2010
Chairman	
DU Strategic Planning for Research Task Force	2010-2011
DU Strategic Visioning: Research Committee	2011
“Renew DU:” Research Committee	2012-

SERVICE TO THE SCIENTIFIC COMMUNITY

Journal Referee for *Physical Review Letters*, *Physical Review B*, *Applied Physics Letters*, *Reviews of Modern Physics*, *Nature Photonics*, *AIP Advances*, *Europhysics Letters*, *Philosophical Magazine*, *Journal of Applied Physics*, *Journal of Physics: Condensed Matter*, *Solid State Communications*, *Review of Scientific Instruments*, *Measurement Science & Technology*, *Nanotechnology*, *Journal of Physics D: Applied Physics*, and *Journal of Micromechanics and Microengineering*

Proposal Review for the National Science Foundation (DMP), American Chemical Society Petroleum Research Fund, Army Research Office, Defense Threat Reduction Agency, and the NASA Post-doctoral Program

Member of the American Physical Society, Materials Research Society, IEEE Magnetics Society, and American Association for Advancement of Science

Elected Member-at-Large of the APS Topical Group on Instruments and Measurement Sciences (GIMS), 2011-2014

Program Committee, 12th Joint MMM/Intermag Conference (Chicago, IL, January 2013)

Panelist for NSF-DMR Condensed Matter Physics Program, March 2012

Mail Review for NSF-DMR Materials Genomics Program, June 2013

Panelist for DFG (German Research Foundation), 2014

Steering Committee, 59th Conference on Magnetism and Magnetic Materials, Chair for student awards and travel (Hawaii, November 2014)

Program Committee, International Conference on Magnetism 2015 (Barcelona, Spain)

Steering Committee, 12th Joint MMM/INTERMAG Meeting, Chair for student awards and travel (San Diego, January 2016)

Steering Committee, 61st Conference on Magnetism and Magnetic Materials, Chair for student awards and travel (New Orleans, LA, November 2016)