

**N. Peter Armitage**

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### RESEARCH INTERESTS

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Correlated electrons, quantum phase transitions, quantum measurement, topological states of matter, superconductivity, quantum magnetism, electron glasses, optical spectroscopy, terahertz instrumentation, microwave spectroscopy

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### EDUCATION AND EMPLOYMENT

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**Professor**, Dept of Physics and Astronomy, The Johns Hopkins University, March 2017 - Present

**Vice-Chair for Research and Facilities**, Dept of Physics and Astronomy, The Johns Hopkins University, Sept. 2013 – Present

**Associate Professor with tenure**, Dept of Physics and Astronomy, The Johns Hopkins University, Feb. 2013 – March 2017

**Asst. Professor**, Dept of Physics and Astronomy, The Johns Hopkins University, July 2006 – Feb. 2013 (*on leave July 2005 – July 2006*)

**NSF International Research Fellow**, University of Geneva, Switzerland, September 2004-July 2006: group of Dirk van der Marel

**Postdoctoral Fellow**, University of California, Los Angeles, October 2001-August 2004: group of George Gruner

**Stanford University**, Stanford, CA, 2002

**Ph.D.** in Physics

Dissertation: "Doping the copper-oxygen planes with electrons: The view with photoemission", Advisor: Z.-X. Shen

**Rutgers University**, New Brunswick, NJ, 1994

**B.Sc.** in Physics,

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## AWARDS AND HONORS

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- **2016 Ludwig Genzel Prize** for exceptional contributions to the field of condensed-matter spectroscopy
- **2011, 2010, 2009 Kavli Frontiers Fellow, National Academy of Sciences**
- **2010 DARPA Young Faculty Award**
- **2009 NSF Career Award**
- **2007 Alfred P. Sloan Research Fellowship**
- **2005 William L. McMillan Award** for outstanding contributions in condensed matter physics from University of Illinois
- **2004 W.E. Spicer Award** for scientific excellence from *Stanford Synchrotron Radiation Laboratory*
- **2004 NSF International Research Fellowship Award** for research at University of Geneva 2004-2005
- **Richard T. Weidner Prize** for Physics Honors, Rutgers University, 1994
- **Mary Wheeler Wigner Memorial Scholarship** for undergraduate research, Rutgers University, 1993

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## PUBLICATIONS

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Publications: 90 Citations: 2,700+, 4440+ h-index: 28, 33 [ISI, Google Scholar]

90. **N.P. Armitage**, E. J. Mele, Ashvin Vishwanath  
Weyl and Dirac Semimetals in Three Dimensional Solids  
Submitted Rev. Mod. Phys. (2017).

89. N. J. Laurita, Yi Luo, Rongwei Hu, Meixia Wu, S. W. Cheong, O. Tchernyshyov, and **N. P. Armitage**  
Anomalous exchange interactions between  $RE^{+3}$  and  $Mn^{+3}$  moments in multiferroic  $h-REMnO_3$   
Submitted 2017.

88. N. J. Laurita, G. G. Marcus, B. A. Trump, J. Kindervater, M. B. Stone, T. M. McQueen, C. L. Broholm, **N. P. Armitage**  
Low energy magnon dynamics and magneto-optics of the skyrmionic Mott insulator

Cu<sub>2</sub>OSeO<sub>3</sub>

Submitted Phys. Rev. B 2017.

87. Dipanjan Chaudhuri, Bing Cheng, Alexander Yaresko, Quinn D. Gibson, R. J. Cava, **N.P. Armitage**

Optical investigation of the strong spin-orbital coupled magnetic semimetal YbMnBi<sub>2</sub>

Submitted Phys. Rev. B. (2017).

86. R. M. Ireland, Liang Wu, M. Salehi, S. Oh, **N. P. Armitage**, H. E. Katz

Nonvolatile Solid-State Charged-Polymer Gating of Topological Insulators into the Topological Insulating Regime

Submitted 2017

85. Liang Wu, M. Salehi, N. Koirala, J. Moon, S. Oh, **N.P. Armitage**

Quantized Faraday and Kerr rotation and axion electrodynamics of the surface states of three-dimensional topological insulator

Science 354, 1124-1127 (2016).

84. L. Zhao, C. A. Belvin, R. Liang, D. A. Bonn, W. N. Hardy, **N. P. Armitage**, D. Hsieh

A global inversion-symmetry-broken phase inside the pseudogap region of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>y</sub>

Nature Physics (2016).

83. Bing Cheng, Liang Wu, S. K. Kushwaha, R. J. Cava, and **N. P. Armitage**

Measurement of the topological surface state optical conductance in bulk-insulating Sn-doped Bi<sub>1.1</sub>Sb<sub>0.9</sub>Te<sub>2</sub>S single crystals

Phys. Rev. B **94**, 201117(R) (2016).

82. N. J. Laurita, C. M. Morris, S. M. Koohpayeh, P. F. S. Rosa, W. A. Phelan, Z. Fisk, T. M. McQueen, **N. P. Armitage**

Anomalous three-dimensional bulk ac conduction within the Kondo gap of SmB<sub>6</sub> single crystals

Phys. Rev B 94, 165154 (2016).

81. A. Akrap, M. Haki, S. Tchoumakov, I. Crassee, J. Kuba, M. O. Goerbig, C. C.

Homes, O. Caha, J. Novak, F. Teppe, S. Koohpayeh, Liang Wu, **N. P. Armitage**, A.

Nateprov, E. Arushanov, Q. D. Gibson, R. J. Cava, D. van der Marel, C. Faugeras, G.

Martinez, M. Potemski, M. Orlita

Magneto-optical signature of massless Kane electrons in Cd<sub>3</sub>As<sub>2</sub>

Phys. Rev. Lett. 117, 136401 (2016).

80. Matthew Brahlek, Nikesh Koirala, Maryam Salehi, Jisoo Moon, Wenhan Zhang,

Haoliang Li, Xiaoqing Zhou, Myung-Geun Han, Liang Wu, Thomas Emge, Hang-Dong

Lee, Can Xu, Seuk Joo Rhee, Torgny Gustafsson, **N. Peter Armitage**, Yimei Zhu,

Daniel S. Dessau, Weida Wu, Seongshik Oh

Disorder-driven topological phase transition in Bi<sub>2</sub>Se<sub>3</sub> films

Phys. Rev. B 94, 165104 (2016).

79. **N. Peter Armitage**

Kitaev's exact solution approximated

Nature Materials 15, 701–702 (2016).

78. A. Farid, N.J. Laurita, B. Tehrani, J. Hester, M.M. Tenteris, **N.P. Armitage**  
Inkjet Printed Wire-Grid Polarizers for the THz Frequency Range  
Accepted Infrared Milli Terahz Waves (2016).

77. N.J. Laurita, Bing Cheng, R. Barkhouser, V.A. Neumann, and **N.P. Armitage**  
A Modified 8f Geometry With Reduced Optical Aberrations For Improved Time Domain Terahertz Spectroscopy  
Infrared Milli Terahz Waves (2016).

76. G. Bosse, Youcheng Wang, Y. Lubashevsky, J. P. Sheckelton, D. E. Shai, C. Adamo, D. G. Schlom, K. M. Shen, and **N.P. Armitage**  
THz investigation of non-Drude transport in the strongly correlated ferromagnetic metal SrRuO<sub>3</sub>  
Submitted Phy. Rev. B (2016).

75. Liang Wu, Tim Mueller, **N.P. Armitage**  
A compact broadband Terahertz range quarter-wave plate  
Submitted Journal of Infrared, Millimeter and Terahertz waves (2016).

74. M. Neshat, Liang Wu, and **N.P. Armitage**  
THz ellipsometry for thickness determination of buried dielectric layers  
Submitted Journal of Applied Physics (2016).

73. Liang Wu, R.M. Ireland, M. Salehi, B. Cheng, N. Koirala, S. Oh, H. E. Katz, **N.P. Armitage**  
Tuning and Stabilizing Topological Insulator Bi<sub>2</sub>Se<sub>3</sub> in the Intrinsic Regime by Charge Extraction with Organic Overlayers  
Appl. Phys. Lett. 108, 221603 (2016).

72. Bing Cheng, Liang Wu, N. J. Laurita, Harkirat Singh, Madhavi Chand, Pratap Raychaudhuri, and **N.P. Armitage**  
Anomalous gap edge dissipation in disordered superconductors on the brink of localization  
Phys. Rev. B 93, 180511(R) (2016).

71. Y. Lubashevsky, T. Kirzhner, G. Koren, **N.P. Armitage**  
Superconducting fluctuations probed in YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> with THz spectroscopy  
Submitted Phys. Rev. B (2016).

70. G. Bossé, LiDong Pan, Y. Li, L. H. Greene, J. Eckstein, and **N.P. Armitage**  
Hund's coupling and anomalous frequency and temperature dependent scattering in the almost quantum critical heavy fermion system CeFe<sub>2</sub>Ge<sub>2</sub>  
Phys. Rev. B 93, 085104 (2016).

69. Nikesh Koirala, Matthew Brahlek, Maryam Salehi, Liang Wu, Jixia Dai, Justin Waugh, Thomas Nummy, Myung-Geun Han, Jisoo Moon, Yimei Zhu, Daniel Dessau, Weida Wu, **N. Peter Armitage**, Seongshik Oh

Record surface state mobility and quantum Hall effect in topological insulator thin films via interface engineering

Nano Letters 15, 8245-8249 (2015).

68. LiDong Pan, Christopher M. Morris, Kate A. Ross, Edwin Kermarrec, Bruce D. Gaulin, S. M. Koohpayeh, and **N.P. Armitage**

Measurement of monopole inertia in a quantum spin ice

Nature Physics December (2015) doi:10.1038/nphys3608.

67. Liang Wu, Wang-Kong Tse, M. Brahlek, C. M. Morris, R. Valdés Aguilar, N. Koirala, S. Oh, and **N.P. Armitage**

High-Resolution Faraday Rotation and Electron-Phonon Coupling in Surface States of the Bulk-Insulating Topological Insulator  $\text{Cu}_{0.02}\text{Bi}_2\text{Se}_3$

Phys. Rev. Lett. 115, 217602 (2015).

66. Maryam Salehi, Matthew Brahlek, Nikesh Koirala, Jisoo Moon, Liang Wu, **N.P. Armitage**, Seongshik Oh

Stability of low-carrier-density topological-insulator  $\text{Bi}_2\text{Se}_3$  thin films and effect of capping layers

APL Materials 3, 091101 (2015).

65. V. A. Neumann, N. J. Laurita, LiDong Pan, **N.P. Armitage**

Reduction of Effective Terahertz Focal Spot Size By Means Of Nested Concentric Parabolic Reflectors

AIP Advances 5, 097203 (2015)

64. N. J. Laurita, J. Deisenhofer, LiDong Pan, C. M. Morris, A. Loidl, and **N.P. Armitage**

Singlet-triplet excitations in the spin-orbital liquid candidate  $\text{FeSc}_2\text{S}_4$

Phys. Rev. Lett. 114, 207201 (2015).

63. LiDong Pan, Se Kwon Kim, A. Ghosh, Christopher M. Morris, Kate A. Ross, Edwin Kermarrec, Bruce D. Gaulin, S. M. Koohpayeh, Oleg Tchernyshyov and **N.P. Armitage**

Low Energy Electrodynamics of Novel Spin Excitations in the Quantum Spin Ice  $\text{Yb}_2\text{Ti}_2\text{O}_7$

Nature Communications 5, 4970 (2014).

62. **N.P. Armitage**

Cuprate superconductors: Dynamic stabilization?

Nature Materials 7, (2014).

61. Wei Liu, LiDong Pan, and **N.P. Armitage**

Broadband Corbino spectrometer at  $^3\text{He}$  temperatures and high magnetic fields

Rev. Sci. Instrum. 85, 093108 (2014).

60. **N.P. Armitage**

Constraints on Jones transmission matrices from time-reversal invariance and discrete spatial symmetries

Phys. Rev. B 90, 035135 (2014).

59. Y. Lubashevsky, LiDong Pan, T. Kirzhner, G. Koren, and **N.P. Armitage**  
Optical Birefringence and Dichroism of Cuprate Superconductors in the THz regime  
Phys. Rev. Lett. 112, 147001 (2014).
58. C.M. Morris, R. Valdes Aguilar, S. M. Koohpayeh, J. Krizan, R. J. Cava, O. Tchernyshyov, T. M. McQueen, and **N.P. Armitage**  
A hierarchy of bound states in the 1D ferromagnetic Ising chain  $\text{CoNb}_2\text{O}_6$  investigated by high resolution time-domain terahertz spectroscopy  
Phys. Rev. Lett. 112, 137403 (2014).
57. J.P. Sheckelton, F. Foronda, LiDong Pan, R. D. McDonald, **N.P. Armitage**, T. Imai, S. J. Blundell, and T. M. McQueen  
Local magnetism and electronic correlations in the geometrically frustrated cluster magnet  $\text{LiZn}_2\text{Mo}_3\text{O}_8$   
Phys. Rev. B 89, 064407 (2014).
56. M. Neshat and **N.P. Armitage**  
Developments in time-domain THz ellipsometry  
Journal of Infrared, Millimeter, and Terahertz Waves 34, 682–708 (2013).
55. Wei Liu, LiDong Pan, Jiajia Wen, Minsoo Kim, G. Sambandamurthy, and **N.P. Armitage**,  
Microwave Spectroscopy Evidence of Superconducting Pairing in the Magnetic-Field-Induced Metallic State of  $\text{InO}_x$  Films at Zero Temperature  
Phys. Rev. Lett. 111, 067003 (2013).
54. Liang Wu, R. Valdés Aguilar, M. Brahlek, A. V. Stier, L. S. Bilbro, Y. Lubashevsky, N. Bansal, S. Oh, **N.P. Armitage**  
A sudden collapse in the transport lifetime across the topological phase transition in  $\text{Bi}_{2-x}\text{In}_x\text{Se}_3$   
Nature Physics 9, 410–414 (2013).
53. R. Valdes Aguilar, L. Wu, A.V. Stier, L.S. Bilbro, M. Brahlek, N. Bansal, S. Oh, **N.P. Armitage**  
Aging and reduced bulk conductance in thin films of the topological insulator  $\text{Bi}_2\text{Se}_3$   
Journal of Applied Physics 113, 153702 (2013).
52. M. Neshat and **N.P. Armitage**  
Terahertz time-domain spectroscopic ellipsometry: Instrumentation and calibration  
Optics Express Vol. 20, No. 27 29063 (2012).
51. James R. Neilson, Anna Llobet, Andreas V. Stier, Liang Wu, Jiajia Wen, Jing Tao, Yimei Zhu, Zlatko B. Tesanovic, **N.P. Armitage**, Tyrel M. McQueen  
Mixed-Valence-Driven Heavy-Fermion Behavior and Superconductivity in  $\text{KNi}_2\text{Se}_2$   
Phys. Rev. B 86, 054512 (2012).
50. G. Bossé, L. S. Bilbro, R. Valdés Aguilar, LiDong Pan, Wei Liu, A. V. Stier, Y. Li, L. H. Greene, J. Eckstein, and **N.P. Armitage**

Low energy electrodynamics of the Kondo-lattice antiferromagnet CeCu<sub>2</sub>Ge<sub>2</sub>  
Phys. Rev. B 85, 155105 (2012).

49. C. Morris, R.Valdés Aguilar, A.V. Stier, and **N.P. Armitage**  
Polarization modulation time-domain terahertz polarimetry  
Imaging and Applied Optics (2012), *Proceedings 2012 OSA Optical Sensors Meeting*

48. C. Morris, R.Valdés Aguilar, A.V. Stier, and **N.P. Armitage**  
Polarization modulation time-domain terahertz polarimetry  
Optics Express, Vol. 20 Issue 11, pp.12303-12317 (2012).

47. M. Neshat and **N.P. Armitage**  
Improved measurement of polarization state in terahertz polarization spectroscopy  
Optics Letters, Vol. 37, Issue 11, pp. 1811-1813 (2012).

46. M. Neshat and **N.P. Armitage**  
Polarization State Measurements of Terahertz Time-Domain Pulses  
CLEO Technical Digest, San Jose California 2012.

45. R. Valdés Aguilar, A. V. Stier, W. Liu, L. S. Bilbro, D. K. George, N. Bansal, L. Wu, J. Cerne, A. G. Markelz, S. Oh, and **N.P. Armitage**  
Terahertz Response and Colossal Kerr Rotation from the Surface States of the Topological Insulator Bi<sub>2</sub>Se<sub>3</sub>  
Phys. Rev. Lett. 108, 087403 (2012).

44. G. Sambandamurthy, and **N.P. Armitage**  
Magnetic field-induced novel insulating phase in 2D superconductors  
Chapter in “Conductor Insulator Quantum Phase Transitions”, Ed. V. Dobrosavljevic, N. Trivedi, and J.M. Valles Jr., Oxford University Press 2012, Available at arXiv:1109.4087

43. W. Liu, R. Valdés Aguilar, Yufeng Hao, R. S. Ruoff, and **N.P. Armitage**  
Broadband microwave and time-domain terahertz spectroscopy of chemical vapor deposition grown graphene  
J. Appl. Phys. **110**, 083510 (2011).

42. L.S. Bilbro, R. Valdes-Aguilar, G. Logvenov, O. Pelleg, I. Bozovic, **N.P. Armitage**  
On the possibility of fast vortices in the cuprates: A vortex plasma model analysis of THz conductivity and diamagnetism in La<sub>2-x</sub>Sr<sub>x</sub>CuO<sub>4</sub>  
Phys. Rev. B 84, 100511(R) (2011).

41. L.S. Bilbro, R. Valdes-Aguilar, G. Logvenov, O. Pelleg, I. Bozovic, **N.P. Armitage**  
Probing the time scales of superconducting correlations above T<sub>c</sub> in La<sub>2-x</sub>Sr<sub>x</sub>CuO<sub>4</sub> by THz spectroscopy  
Nature Physics 7, 298 (2011).

40. Wei Liu, Minsoo Kim, G. Samandamurthy, **N.P. Armitage**,  
Dynamical study of phase fluctuations and their critical slowing down in amorphous superconducting films  
Phys. Rev B 84, 024511 (2011).

39. V.K. Thorsmølle and **N.P. Armitage**  
Ultrafast Many-body Relaxation in an Electron Glass  
Phys. Rev. Lett. 105, 086601 (2010).
38. R. Valdés Aguilar, L.S. Bilbro, S. Lee, C. W. Bark, J. Jiang, J.D. Weiss, E.E. Hellstrom, D.C. Larbalestier, C. B. Eom, and **N.P. Armitage**  
Pair-breaking effects and coherence peak in the terahertz conductivity of superconducting in  $\text{BaCo}_{2-x}\text{Fe}_{2-2x}\text{As}_2$  thin films  
Phys. Rev. B Rapid Comm., 82 180514 (2010).
37. **N.P. Armitage**, P. Fournier, R. Greene  
Progress and Perspectives in the Electron-Doped Cuprates  
Rev. of Mod. Phys. 82, 2421 (2010).
36. **N.P. Armitage**, Riccardo Tediosi, E. Giannini, L. Forro, D. van der Marel  
Infrared Conductivity of Elemental Bismuth under Pressure: Evidence for an Avoided Lifshitz-Type Semimetal-Semiconductor Transition  
Phys. Rev. Lett. 104, 237401 (2010).
35. V. Guritanu, **N.P. Armitage**, R. Tediosi, S. S. Saxena, A. Huxley, and D. van der Marel van Mechelen, D. van der Marel  
Optical spectra of the heavy fermion uniaxial ferromagnet  $\text{UGe}_2$   
Phys. Rev. B 78, 172 (2008).
34. J. L. M. van Mechelen, D. van der Marel, C. Grimaldi, A. B. Kuzmenko, **N.P. Armitage**, N. Reyren, H. Hagemann, and I. I. Mazin  
Electron-Phonon Interaction and Charge Carrier Mass Enhancement in  $\text{SrTiO}_3$   
Phys. Rev. Lett. 100, 226403 (2008).
33. **N.P. Armitage**, R. Crane, A. Johansson, G. Sambandamurthy, D. Shahar, and G. Gruner  
Direct observation of quantum superconducting fluctuations in an insulating groundstate  
Physica B 403, 1208–1210 (2008).
32. Riccardo Tediosi, **N.P. Armitage**, E. Giannini, D. van der Marel  
Charge carrier interaction with a purely electronic collective mode: Plasmarons and the infrared response of elemental bismuth  
Phys. Rev. Lett. 99, 016406 (2007).
31. R. Crane, **N.P. Armitage**, A. Johansson, G. Sambandamurthy, D. Shahar, and G. Gruner  
Fluctuations, dissipation, and nonuniversal superfluid jumps in two-dimensional superconductors  
Phys. Rev. B 75, 094506 (2007).
30. R. Crane, **N.P. Armitage**, A. Johansson, G. Sambandamurthy, D. Shahar, and G. Gruner



Survival of Superconducting Correlations Across the 2D Superconductor-Insulator Transition: A finite frequency study

Phys. Rev. B 75, 184530 (2007).

29. S. R. Park, Y. S. Roh, Y. K. Yoon, C. S. Leem, J. H. Kim, B. J. Kim, H. Koh, H. Eisaki, **N.P. Armitage**, C. Kim

Electronic structure of electron-doped order  $\text{Sm}_{1.85}\text{Ce}_{0.15}\text{CuO}_4$ : Strong pseudogap effects, nodeless gap, and signatures of short-range

Phys. Rev. B 75, 060501(R) (2007).

28. F. Ronning, K. M. Shen, **N.P. Armitage**, A. Damascelli, D.H. Lu, Z.-X. Shen, L. L. Miller, C. Kim

Anomalous high energy dispersion in photoemission spectra from insulating cuprates

Phys. Rev. B 71, 094518 (2005).

27. S. R. Park, Y. S. Roh, Y. K. Yoon, C. S. Leem, J. H. Kim, B. J. Kim, H. Koh, H. Eisaki, **N.P. Armitage**, and C. Kim

Angle resolved photoemission studies on  $\text{Sm}_{2-x}\text{Ce}_x\text{CuO}_4$ : remnant Fermi surfaces and coupling to (p,p) scattering

JOUR. PHYS. CHEM. SOL. 65 (8-9): 1403-1407 (2004).

26. K.M. Shen, F. Ronning, D.H. Lu, W.S. Lee, N.J.C. Ingle, W. Meevasana, F. Baumberger, A. Damascelli, **N.P. Armitage**, L.L. Miller, Y. Kohsaka, M. Azuma, M. Takano, H. Takagi, Z.-X. Shen

Missing Quasiparticles and the Chemical Potential Puzzle in the Doping Evolution of the Cuprate Superconductors

Phys. Rev. Lett. 93, 267002 (2004).

25. **N.P. Armitage** and Jiangping Hu

On the detection of time-reversal symmetry breaking by photoemission with circularly polarized light in  $\text{Bi}_2\text{Tl}_2$

Phil. Mag. Lett. 84, 105–107 (2004).

24. M. Briman, **N.P. Armitage**, E. Helgren, G. Gruner

Dipole Relaxation Losses in DNA

NanoLetters 4, 733 (2004).

23. **N.P. Armitage**, J.-C. P. Gabriel, G. Gruner

Quasi-Langmuir-Blodgett Thin Film Deposition of Carbon Nanotubes

J. App. Phys. 95, 3228 (2004).

22. E. Helgren, **N.P. Armitage**, G. Gruner

Frequency-dependent conductivity of electron glasses

Phys. Rev. B 69, 014201 (2004)

21. K.M. Shen, T. Yoshida, D.H. Lu, F. Ronning, **N.P. Armitage**, W.S. Lee, X.J. Zhou, A. Damascelli, D.L. Feng, N.J.C. Ingle, H. Eisaki, Y. Kohsaka, H. Takagi, T. Kakeshita, S. Uchida, P.K. Mang, M. Greven, Y. Onose, Y. Taguchi, Y. Tokura, Seiki Komiya, Yoichi Ando, M. Azuma, M. Takano, A. Fujimori, Z.-X. Shen

Fully Gapped Single-Particle Excitations in the Lightly Doped Cuprates  
Phys. Rev. B 69, 054503 (2003).

20. **N.P. Armitage**, M. Briman, G. Gruner  
Charge Transfer and Charge Transport on the Double Helix  
Phys. Stat. Sol. (b) 241, 69 (2003).

19. **N.P. Armitage**, E. Helgren, G. Gruner  
'Taxonomy' of Electron Glasses  
Proceedings of the NATO ARW on 'Concepts in Electron Correlation', Kluwer Academic Publishers, The Netherlands 2003.

18. F. Ronning, T. Sasagawa, Y. Kohsaka, K.M. Shen, A. Damascelli, C. Kim, T. Yoshida, **N.P. Armitage**, D.H. Lu, D.L. Feng, L.L. Miller, H. Takagi, Z.-X. Shen  
Evolution of a metal to insulator transition in  $\text{Ca}_{2-x}\text{Na}_x\text{CuO}_2\text{Cl}_2$ , as seen by angle-resolved photoemission  
Phys. Rev. B 67, 165101 (2003).

17. E. Helgren, **N.P. Armitage**, G. Gruner  
Electrodynamics of a Coulomb Glass in n-type Silicon  
Phys. Rev. Lett. 89, 246601 (2002).

16. **N.P. Armitage**, D. H. Lu, C. Kim, A. Damascelli, K. M. Shen, F. Ronning, D. L. Feng, P. Bogdanov, X. J. Zhou, W. L. Yang, Z. Hussain, P. K. Mang, N. Kaneko, M. Greven, Y. Onose, Y. Taguchi, Y. Tokura, and Z.-X. Shen  
Angle-resolved photoemission spectral function analysis of the electron-doped cuprate  $\text{Nd}_{1.85}\text{Ce}_{0.15}\text{CuO}_4$   
Phys. Rev. B 68, 064517 (2003).

15. D.L. Feng, A. Damascelli, K. M. Shen, N. Motoyama, D. H. Lu, H. Eisaki, K. Shimizu, J.-i. Shimoyama, K. Kishio, N. Kaneko, M. Greven, G. D. Gu, X.J. Zhou, C. Kim, F. Ronning, **N.P. Armitage**, Z.-X. Shen  
Electronic structure of the tri-layer cuprate  $\text{Bi}_2\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_{10+d}$   
Phys. Rev. Lett. 88, 107001 (2002).

14. C. Kim, A. Mehta, D.L. Feng, K.M. Shen, **N.P. Armitage**, K. Char, S.H. Moon, Y.Y. Xie, and J. Wu  
X-ray diffraction measurements of the c-axis Debye-Waller factors of  $\text{YBa}_2\text{Cu}_3\text{O}_7$  and  $\text{HgBa}_2\text{CaCu}_2\text{O}_6$   
Phys. Rev. B(Rapid Comm.) 67, 092508R (2003).

13. **N.P. Armitage**, F. Ronning, D.H. Lu, C. Kim, A. Damascelli, K.M. Shen, Z.X. Shen, P. Mang, N. Kaneko, M. Greven, Y. Onose, Y. Taguchi, Y. Tokura  
Doping Dependence of  $\text{Nd}_{2-x}\text{Ce}_x\text{CuO}_4$  investigated by angle-resolved photoemission  
Phys. Rev. Lett. 88 257001 (2002).

12. F. Ronning, C. Kim, K.M. Shen, **N.P. Armitage**, A. Damascelli, D.H. Lu, Z.-X. Shen, L.L. Miller  
Universality of the electronic structure from a half filled  $\text{CuO}_2$  plane.

Phys. Rev. B 67, 035113 (2003).

11. D. L. Feng, C. Kim, H. Eisaki, D. H. Lu, K. M. Shen, F. Ronning, **N.P. Armitage**, A. Damascelli, N. Kaneko, M. Greven, J.-i. Shimoyama, K. Kishio, R. Yoshizaki, G. D. Gu, Z.-X. Shen  
Nature of the Electronic Excitations near the Brillouin Zone Boundary of  $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+d}$   
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Anomalous Electronic Structure and Pseudogap Effects in  $\text{Nd}_{1.85}\text{Ce}_{0.15}\text{CuO}_4$   
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Surface electronic structure of  $\text{Sr}_2\text{RuO}_4$   
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Superconducting Gap and Strong In-Plane Anisotropy in Untwinned  $\text{Y}_2\text{Ba}_2\text{Cu}_3\text{O}_{7-d}$   
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6. **N.P. Armitage**, D.H. Lu, D.L. Feng, C. Kim, A. Damascelli, K.M. Shen, F. Ronning, Y. Onose, Y. Taguchi, Y. Tokura, Z.X. Shen  
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Phys. Rev. Lett. 86, 1126 (2001).
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Phys. Rev. Lett. 85, 5194 (2000).
4. **N.P. Armitage**, D.H. Lu, C. Kim, A. Damascelli, K.M. Shen, F. Ronning, Z.-X. Shen, Y. Onose, Y. Taguchi, Y. Tokura.  
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Fermi Surface of  $\text{Sr}_2\text{RuO}_4$  from Angle Resolved Photoemission.  
J. Electron Spectr. Relat. Phenom., 114-116 (2001) 641-646.

2. **N.P. Armitage**, D.H. Lu, C. Kim, A. Damascelli, K.M. Shen, F. Ronning, Y. Onose, Y. Taguchi, Y. Tokura, Z.X. Shen

Electronic Structure of  $\text{Nd}_{1.85}\text{Ce}_{0.15}\text{CuO}_4$ : Evidence for a Disparity Between Hole and Electron Doped Cuprate Superconductors

Physica C 341-348 (2000) 2083-2086.

1. F. Ronning, C. Kim, A. Damascelli, **N.P. Armitage**, D.H. Lu, K.M. Shen, L.L. Miller, Y.J. Kim, M.A. Kastner, R.J. Birgeneau, and Z.-X. Shen

ARPES Features of the AF Insulators  $\text{Sr}_2\text{CuO}_2\text{Cl}_2$  and  $\text{Ca}_2\text{CuO}_2\text{Cl}_2$  Close to the AF Zone Boundary

Physica C 341-348 (2000) 2087-2090

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**INVITED TALKS AND PRESENTATIONS**

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168 **CRACKING THE ENIGMA OF CUPRATES SUPERCONDUCTORS,**

Jouvence Quebec: May 2017

167 **THz Mansion Meeting: Newport Rhode Island:** May 2017

Electrodynamics of Topological Insulators

166 **Ohio State University Materials Week:** May 2017

Electrodynamics of Topological Insulators

165 **Iowa State University Colloquium:** April 2017

«On Ising's model of Ferromagnetism»

164 **Pennsylvania State University Colloquium:** April 2017

«On Ising's model of Ferromagnetism»

163 **Pennsylvania State University Seminar:** April 2017

Electrodynamics of Topological Insulators

162. **March Meeting** 2017

Low energy electrodynamics of the quantum spin ice of  $\text{Yb}_2\text{T}_2\text{O}_7$

161. **Topological Phases and Functionality of Correlated Electron Systems 2017:**

February 2017

160. **Quantum Materials: For Design By Design, College Park MD:** January 2017

THz spectroscopy as a tool for new materials characterization

159. **EPIQS-TMS Trans-Pacific Conference on Topological Quantum Materials, Moorea:** December 2016

Electrodynamics of Topological Insulators

158 **Boston College, Physics Department Colloquium:** November 2016

«On Ising's model of Ferromagnetism»

- 157 **Q-MAC Symposium, Venice International University**: November 2016  
Electrodynamics of the frustrated magnetic pyrochlore  $\text{Yb}_2\text{Ti}_2\text{O}_7$
- 156 **Material Science Colloquium, University of Delaware**: October 2016  
Electrodynamics of Topological Insulators
155. **Condensed Matter Seminar CUNY**: October 2016  
Electrodynamics of the frustrated magnetic pyrochlore  $\text{Yb}_2\text{Ti}_2\text{O}_7$
154. **Conference on Highly Frustrated Magnetism 2016**: September 2016  
Electrodynamics of the frustrated magnetic pyrochlore  $\text{Yb}_2\text{Ti}_2\text{O}_7$
153. **Condensed Matter Seminar, Academia Sinica Taiwan**: September 2016  
Electrodynamics of Topological Insulators
152. **Low Energy Electrodynamics of Solids 2016**, Osaka Japan: June 2016  
Electrodynamics of Topological Insulators
151. Workshop on **Interacting Quantum Systems Out of Equilibrium**, Houston Texas:  
May 2016  
Many-body relaxation in electron glasses
150. **Indiana University, Physics Department Colloquium**: April 2016  
«On Ising's model of Ferromagnetism»
149. **Photonics and Physics Seminar**, Brown University  
Electrodynamics of Topological Insulators
148. **University of Maryland – College Park, Physics Department Colloquium**:  
February 2016  
«On Ising's model of Ferromagnetism»
147. **Workshop on “Anomalous Transport in Multipolar and Topological Materials”**  
Baltimore Maryland: March 2016
146. **Workshop on Topological Phenomena in Novel Quantum Matter: Laboratory  
Realization of Relativistic Fermions and Spin Liquids**, Dresden Germany: February  
2016
145. **Temple University, Physics Department Colloquium**: February 2016  
«On Ising's model of Ferromagnetism»
144. **Ohio State University, Physics Department Colloquium**: January 2016  
«On Ising's model of Ferromagnetism»
143. **Big Ideas in Quantum Materials**: UCSD Meeting: December 2015
142. **University of Toronto, Colloquium**: November 2015

141. **University of Toronto, Condensed Matter Seminar:** November 2015
140. **University of California Los Angeles, Condensed Matter Seminar:** November 2015
139. **University of California Berkeley, Condensed Matter Seminar:** November 2015
138. **UBC-Max Planck: Spin-Orbit Coupling and Relativistic Quantum Materials Summer School:** October 2015
137. **University of Illinois, Urbana Champaign, Condensed Matter Seminar:** October 2015
136. Conference on **Materials and Mechanisms of Superconductivity, Geneva:** August 2015
135. Conference on **Superconductivity on the Verge, Lorentz Center, Leiden:** July 2015
134. Conference on **Strongly Correlated Topological Insulators, University of Michigan:** May 2015
133. **Quantum Materials Meeting, Shanghai:** May 2015  
Shining (low frequency) light on quantum magnets: Ising spin chains, quantum spin ice, and spin-orbital liquids
132. **APS Upgrade Workshop of Condensed Matter Physics:** May 2015  
The unreasonable irrelevance of quantum mechanics to condensed matter physics (And what to do about it)
131. **March Meeting Invited Talk:** March 2015  
Low energy electrodynamics of topological insulator thin films
130. **Princeton Condensed Matter Seminar:** February 2015  
Shining (low frequency) light on quantum magnets: Ising spin chains, quantum spin ice, and spin-orbital liquids
129. **Notre Dame Dept. of Physics Colloquium:** February 2015  
Shining (low frequency) light on quantum magnets: Ising spin chains, quantum spin ice, and spin-orbital liquids
128. **Army Research Laboratory Colloquium:** January 2015  
Donuts, Coffee Cups and "Topological" Insulators
127. **Caltech Condensed Matter Seminar:** November 2014  
Shining (low frequency) light on quantum magnets: Ising spin chains, quantum spin ice, and spin-orbital liquids

126. **Tulane University Department of Physics Colloquium:** October 2014  
Shining (low frequency) light on quantum magnets: Ising spin chains, quantum spin ice, and spin-orbital liquids
125. **MPI-CIFAR Meeting, Stuttgart:** October 2014  
Shining (low frequency) light on quantum magnets: Ising spin chains, quantum spin ice, and spin-orbital liquids
124. **NHMFL, User Strategic Planning Workshop:** October 2014  
New opportunities for magnetic fields in the spectroscopy of quantum correlated states of matter.
123. **EMRS Fall Meeting Warsaw:** September 2014  
Quantum phase transitions in topological insulators
122. **EMRS Fall Meeting Warsaw:** September 2014  
Low energy electrodynamics of disordered superconductors
121. **PSI Summer School - Zug Switzerland:** August 2014  
Low Energy Electrodynamics of Quantum Matter
- 120 **Neutron Scattering Program Principal Investigators Meeting:** July 2014  
A hierarchy of “meson” bound states in the 1D ferromagnetic Ising chain  $\text{CoNb}_2\text{O}_6$  investigated by high resolution time-domain terahertz spectroscopy
119. **International School in Solid State Physics “Superstripes” on “Multi-condensate superconductivity”, Erice, Sicily:** July 2014  
Optical Birefringence and Dichroism of Cuprate Superconductors in the THz Regime
118. **Low Energy Electrodynamics of Solids:** July 2014  
Loire Valley France  
Optical Birefringence and Dichroism of Cuprate Superconductors in the THz Regime
117. **University of Maryland Condensed Matter Seminar:** May 2014  
Low energy electrodynamics of heavy fermion states
116. **University of Colorado, Condensed Matter Seminar:** April 2014  
Recent work on the superconductor-metal quantum phase transition
115. **University of Colorado, Dept. of Physics Colloquium:** April 2014  
THz investigations of exotic quantum states of matter
114. **Princeton Center for Theoretical Science, Workshop on Many body localization and related experiments:** April 2014  
Ultrafast (but Many-Body) Relaxation in Low-Density Electron Glasses and Spin Systems
113. **Stanford University Colloquium:** April 2014  
THz investigations of exotic quantum states of matter

112. **University of Utah, Dept. of Physics Colloquium:** March 2014  
THz investigations of exotic quantum states of matter
111. **Rutgers University , Condensed Matter Seminar:** March 2014  
Optical Birefringence and Dichroism of Cuprate Superconductors in the THz Regime
110. **2014 Quantum Materials Symposium, Korea :** February 2014  
THz investigations of exotic quantum states of matter
109. **Workshop Strongly Disordered Superconductors and the Superconductor-Insulator Transition, Villard de Lans France:** February 2014  
Recent work on the superconductor-metal quantum phase transition
108. **Johns Hopkins University, Dept. of Physics and Astronomy Colloquium:**  
February 2014  
THz investigations of exotic quantum states of matter
107. **Aspen Winter Conference on “Unconventional Order in Strongly Correlated Electron Systems”:** January 2014  
Optical Birefringence and Dichroism of Cuprate Superconductors in the THz Regime
106. **SudipFest, 65th birthday Festschrift for Sudip Chakravarty, Stanford CA:**  
Dec. 2013  
Recent work on the superconductor-metal quantum phase transition
105. **Massachusetts Institute of Technonlogy, Condensed Matter Seminar:** Dec. 2013  
How to kill a topological insulator
104. **University of Michigan Condensed Matter Seminar:** Oct. 2013  
How to kill a topological insulator
103. **SLAC Workshop on Ultrafast Phenomena in Solids:** Oct. 2013  
THz investigations of exotic quantum states of matter
102. **Lousiana State University Condensed Matter Seminar:** Sept. 2013  
How to kill a topological insulator
101. **Stanford Oxide Workshop:** August 2013  
THz investigations of exotic quantum states of matter
100. **Conference on ”Spectroscopies in Novel Superconductors” – 11, Berkeley CA:** June 2013  
Faraday and Kerr Effect Measurements of Cuprates in THz Regime
99. **ISSP, University of Tokyo, Condensed Matter Seminar:** May 2013  
How to kill a topological insulator



99. **Osaka University Condensed Matter Seminar:** May 2013  
How to kill a topological insulator
98. **6th International Conference on Spectroscopic Ellipsometry, Kyoto Japan:**  
May 2013  
THz magneto-ellipsometry of high- $T_c$  superconductors and topological band insulators
- 97 **Argonne National Laboratory Colloquium:** May 2013  
THz investigations of exotic quantum states of matter
96. **University of Waterloo Condensed Matter Seminar:** April 2013  
How to kill a topological insulator
95. **Rutgers University Condensed Matter Seminar:** March 2013  
How to kill a topological insulator
94. **DPG Spring Meeting, Invited talk at German Physical Society, Regensburg:**  
March 2013  
The THz response of topological insulator surface states
93. **University of Pennsylvania Condensed Matter Seminar:** Feb. 2013  
How to kill a topological insulator
92. **Banff International Research Station workshop on «Topological Phenomena in Quantum Dynamics and Disordered Systems»:** Feb. 2013  
Low frequency electrodynamics of topological insulator surface states
91. **2013 EMN West Meeting on Topological Insulators:** Jan. 2013  
Low frequency electrodynamics of topological insulator surface states
90. **UCSB Physics Dept. Colloquium:** Nov. 2012  
THz investigations of exotic quantum states of matter
89. **Rice University Condensed Matter Seminar:** Nov. 2012  
Low frequency electrodynamics of topological insulator surface states
88. **University of British Columbia Condensed Matter Seminar:** Oct. 2012  
Low frequency electrodynamics of topological insulator surface states
87. **University of Maryland - College Park CNAM Colloquium:** Sept. 2012  
Low frequency electrodynamics of topological insulator surface states
86. **Strongly Correlated Physics in the Cuprates – Montauk Conference:** Sept. 2012  
THz measurements of cuprate superconductors
85. **Materials and Mechanisms of Superconductivity:** July 2012  
Washington DC  
THz measurements of cuprate superconductors

- 84. Low Energy Electrodynamics of Solids:** July 2012  
Napa Valley California  
The low energy electrostatics of topological surface states
- 83. Non-equilibrium and coherent phenomena at nanoscale:** June 2012  
Chernogolovka, RUSSIA  
Broadband microwave measurements of disordered superconductors
- 82. NSLS/CFN Workshop on Topological Insulators:** May 2012  
The low energy electrostatics of topological surface states
- 81. DARPA DSRC meeting: Solid State Devices with Vacuum Tube-like Electron:**  
May 2012  
The THz response of topological surface states
- 80. Villa Conference on Energy, Materials and Nanotechnology - Topological Insulators:** April 2012  
The low energy electrostatics of topological surface states
- 79. Caltech Condensed Matter Seminar:** Dec. 2011  
How fast are vortices in the cuprates?
- 78. UIUC Condensed Matter Seminar:** October 2011  
THz measurements of the topological insulator  $\text{Bi}_2\text{Se}_3$  (and its superconducting bilayers).
- 77. KITP meeting on topological insulators:** October 2011  
THz measurements of the topological insulator  $\text{Bi}_2\text{Se}_3$  (and its superconducting bilayers).
- 76. Univ. of Delaware Condensed Matter Seminar:** October 2011  
THz measurements of the topological insulator  $\text{Bi}_2\text{Se}_3$  (and its superconducting bilayers).
- 75. Superconducting hybrids: from conventional to exotic, Villard de Lans, France:** September 2011  
THz measurements of the topological insulator  $\text{Bi}_2\text{Se}_3$  (and its superconducting bilayers).
- 74. Lorentz Center workshop on Strongly disordered superconductors and electronic segregation:** August 2011  
AC Transport in Really Really Dirty Superconductors and near Superconductor-Insulator Quantum Phase Transitions
- 73. Low Temperature Physics 26: Beijing, China:** August 2011  
Fast vortices and fluctuations in underdoped cuprates
- 72. Princeton Summer School for Condensed Matter Physics:** August 2011  
The 2D Superconductor-Insulator Transition
- 71. SuperStripes 2011 Rome Italy:** July 2011  
Fast vortices and fluctuations in underdoped cuprates and amorphous superconductors

70. **Millersville University Colloquium:** April 2011  
Donuts, Coffee Cups, and Topological Insulators
68. **NHMFL “BigLight” Workshop:** April 2011  
Opportunities for strongly correlated electrons at high magnetic field and intensities.
67. **Hamburg DESY Condensed Matter Colloquium:** February 2011  
Fast vortices and fluctuations in underdoped cuprates and amorphous superconductors
66. **Landau Institute Condensed Matter Seminar, Moscow:** January 2011  
Fast vortices and fluctuations in underdoped cuprates and amorphous superconductors
65. **University of Minnesota Condensed Matter Seminar:** December 2010  
Ultrafast (but many-body) relaxation of a low density electron glass
64. **Argonne Conference on the Superconductor-Insulator Transition:** November 2010  
From classical to quantum: Broadband microwave studies of superconducting fluctuations in 2D InO thin films
63. **KITP Conference on Out of Equilibrium Quantum Systems:** August 2010  
Ultrafast (but many-body) relaxation of a low density electron glass
62. **Los Alamos National Laboratory Condensed Matter Colloquium:** March 2010  
Dynamical measurements of superconducting fluctuations in underdoped cuprates and amorphous superconductors: Classical to Quantum
61. **Walther-Meissner-Institut, Condensed Matter Colloquium:** Feb. 2010  
Dynamical measurements of superconducting fluctuations in underdoped cuprates and amorphous superconductors: Classical to Quantum
60. **Pennsylvania State University, Condensed Matter Seminar:** Dec. 2009  
Dynamical measurements of superconducting fluctuations in underdoped cuprates and amorphous superconductors: Classical to Quantum
59. **Rutgers University, Condensed Matter Seminar:** Sept. 2009  
Dynamical measurements of superconducting fluctuations in underdoped cuprates and amorphous superconductors: Classical to Quantum
58. **Max-Planck-Institute of solid state physics:** July 2009  
Dynamical measurements of superconducting fluctuations in underdoped cuprates and amorphous superconductors: Classical to Quantum
57. **Aspen Workshop of vortices in superconductors, Aspen Colorado:** July. 2009  
The extent of phase fluctuations in the high temperature superconductors
56. **ICTP Conference on Superconductor-Insulator Transitions, Trieste, Italy:** May. 2009  
Electrodynamics of the 2D Superconductor-Insulator Quantum Phase Transition

- 55. Superconductivity: From Collective Modes to Quantum Phase Transitions, Allen Goldman Symposium, Minneapolis, Minnesota:** May 2009  
Coopers Pairs in Flatland: Electrodynamics of the 2D Superconductor-Insulator Quantum Phase Transition
- 54. WE-Heraeus-Seminar, Microwaves for Condensed Matter Physics, Bad Honnef Germany:** April. 2009  
A broadband microwave study of the superconducting fluctuations in 2D InOx thin films
- 53. Yale University, Condensed Matter Seminar:** Jan. 2009  
Towards the Lifshitz point in elemental bismuth: Light electrons gone heavy at the metal-insulator transition?
- 52. University of Tennessee – Knoxville Physics Dept. Colloquium:** Jan. 2009  
Between Electronics and Photonics: Terahertz Investigations of Complex Condensed Matter
- 51. SUNY – Buffalo, Condensed Matter Seminar:** Nov. 2008  
Towards the Lifshitz point in elemental bismuth: Light electrons gone heavy at the metal-insulator transition?
- 50. Brookhaven National Laboratory:** Oct. 2008  
Towards the Lifshitz point in elemental bismuth: Light electrons gone heavy at the metal-insulator transition?
- 49. Boston College, Condensed Matter Seminar:** Oct. 2008  
Towards the Lifshitz point in elemental bismuth: Light electrons gone heavy at the metal-insulator transition?
- 48. University of Maryland – College Park, Condensed Matter Seminar:** Oct. 2008  
Towards the Lifshitz point in elemental bismuth: Light electrons gone heavy at the metal-insulator transition?
- 47. Conference on Concepts in Electron Correlation, Hvar Croatia:** Sept. 2008  
Towards the Lifshitz point in elemental bismuth: Light electrons gone heavy at the metal-insulator transition?
- 46. Boulder Colorado, Condensed Matter Physics Summer School:** July 2008  
“Optical” Spectroscopies for Correlated Systems.
- 45. March Meeting: Invited Session, Quantum fluctuations near the superconductor-insulator transition:** March 2008  
Survival of superconducting correlation across the 2D superconductor-insulator transition: An AC conductivity study
- 44. Conductor-Insulator Quantum Phase Transitions - ICAM Exploratory Workshop, Columbus, Ohio:** January 2008

A Cooper solid?: Electrodynamics of the 2D Superconductor-Insulator Quantum Phase Transition

43. **Stanford University, Condensed Matter Seminar:** October 2007

Cooper pairs in Flatland: Electrodynamics of the 2D Superconductor-Insulator Quantum Phase Transition

42. **Purdue University Condensed Matter Seminar:** October 2007

A Cooper solid?: Electrodynamics of the 2D Superconductor-Insulator Quantum Phase Transition

41. **Cornell University Condensed Matter Seminar:** September 2007

A Cooper solid?: Electrodynamics of the 2D Superconductor-Insulator Quantum Phase Transition

40. **Univ. of Maryland – College Park, Condensed Matter Seminar:** December 2006

A Cooper solid?: Electrodynamics of the 2D Superconductor-Insulator Quantum Phase Transition

39. **Columbia University, Condensed Matter Seminar:** November 2006

A Cooper solid?: Electrodynamics of the 2D Superconductor-Insulator Quantum Phase

38. **Johns Hopkins Dept. Of Physics and Astronomy Colloquim:** October 2006

Between Electronics and Photonics: Terahertz Investigations of Complex Condensed Matter

37. **University of Maryland – Baltimore County Colloquim:** October 2006

Chasing the Cooper Solid: Electrodynamics of the Superconductor. Insulator Transition.

36. **Florida State University Condensed Matter Seminar:** September 2006

Chasing the Cooper Solid: Electrodynamics of the Superconductor. Insulator Transition

35. **LEES 2006, Tallinn Estonia:** July 2006

Coopers Pairs in Flatland: Electrodynamics of the 2D Superconductor-Insulator Quantum Phase Transition.

34. **ETH Zurich Condensed Matter Seminar:** June 2006

Coopers Pairs in Flatland: Electrodynamics of the 2D Superconductor-Insulator Quantum Phase Transition.

33. **Weizmann Institute of Science Seminar:** April 2006

Coopers Pairs in Flatland: Electrodynamics of the 2D Superconductor-Insulator Quantum Phase Transition.

32. **BESSY Sychtrontron Special Seminar:** February 2006

Between Electronics and Photonics: *Terahertz Investigations of Complex Condensed Matter*

- 31 **APCTP Winter Post-Workshop on Strongly Correlated Electron Systems:** January 2006  
Between Electronics and Photonics: *Terahertz Investigations of Complex Condensed Matter*
30. **APCTP Winter Workshop on Strongly Correlated Electron Systems:** January 2006  
Shining light on the electron-doped cuprates: The view with angle-resolved photoemission
29. **APCTP Winter Workshop on Strongly Correlated Electron Systems:** January 2006  
Coopers Pairs in Flatland: Electrodynamics of the 2D Superconductor-Insulator Quantum Phase Transition.
28. **University of Geneva, DPMC Seminar:** November 2005,  
Shining light on the electron-doped cuprates: The view with angle-resolved photoemission
27. **Concepts in Electron Correlation, Hvar Croatia:** September 2005  
Coopers Pairs in Flatland: Electrodynamics of the 2D Superconductor-Insulator Quantum Phase Transition.
26. **Seminar - University of Stuttgart:** June 2005  
Coopers Pairs in Flatland: Electrodynamics of the 2D Superconductor-Insulator Quantum Phase Transition
25. **University of Geneva, DPMC Seminar:** April 2005,  
ARPES as a momentum space microscope: Angle-resolved photoemission on the n-type cuprates
24. **Johns Hopkins University, Condensed Matter Seminar:** March 2005,  
Between Electronics and Photonics: *Terahertz Investigations of Complex Condensed Matter*
23. **University of Chicago, Condensed Matter Seminar:** March 2005, Between Electronics and Photonics: *Terahertz Investigations of Complex Condensed Matter*
22. **University of Oregon, Physics Dept. Colloquium:** February 2005, Between Electronics and Photonics: *Terahertz Investigations of Complex Condensed Matter*
21. **Boston University, Condensed Matter Seminar:** February 2005, Between Electronics and Photonics: *Terahertz Investigations of Complex Condensed Matter*
20. **Aspen Winter Conference in High-Temperature Superconductivity:** January 2005, Recent progress in the n-type cuprate superconductors
19. **Spectroscopies of Novel Superconductors, Sitges, Spain:** July 2004  
An ARPES view of the electron-doped cuprates

18. **University of California, San Diego, Condensed Matter Seminar:** April 2004  
ARPES as a momentum space microscope: Angle-resolved photoemission on the n-type cuprates
17. **Massachusetts Institute of Technology, Condensed Matter Seminar:** March 2004  
ARPES as a momentum space microscope: Angle-resolved photoemission on the n-type cuprates
16. **University of Washington – Seattle, Condensed Matter Seminar:** March 2004  
A ‘Taxonomy’ of Electron Glasses
15. **University of Washington – Seattle, Department Colloquium:** March 2004  
ARPES as a momentum space microscope: Angle-resolved photoemission on the n-type cuprates
14. **University of Illinois, Urbana-Champaign, Condensed Matter Seminar:** February 2004  
ARPES as a momentum space microscope: Angle-resolved photoemission on the n-type cuprates
13. **10th Hopping and Related Phenomena Conference (HRP-10), Trieste, Italy:** September 2003  
*Electrons on the Double Helix*
12. **March Meeting: Invited Session, Electron-Doped Superconductors: Austin, TX:** March 2003  
*ARPES Studies of NCCO as a function of doping*
11. **Gordon Research Conference on ‘Superconductivity:** January 2003  
*ARPES on the electron-doped cuprates*
10. **2<sup>nd</sup> Hvar Workshop on Strongly Correlated Electrons:** October 2002  
*Electrodynamics of a Coulomb glass*
9. **NATO ARW on ‘Concepts in Electron Correlation’:** September 2002  
*Mott Gaps, pseudogaps, and superconducting gaps: ARPES on the electron doped cuprates*
8. **University of Southern California, Condensed Matter Seminar:** May 2002  
*Mott Gaps, pseudogaps, and superconducting gaps: ARPES on the electron doped cuprates*
7. **UCLA, Condensed Matter Seminar:** October 2001  
*Mott Gaps, pseudogaps, and superconducting gaps: ARPES on the electron doped cuprates*
6. **University of Tokyo, Condensed Matter Seminar:** March 2001  
*Anomalous Electronic Structure and Pseudogap Effects in  $Nd_{1.85}Ce_{0.15}CuO_4$*

**5. 5TH HIROSHIMA INTERNATIONAL SYMPOSIUM ON SYNCHROTRON RADIATION: Hiroshima, Japan March 2001**

*Recent Advances in the ARPES Measurements of Correlated Electron Systems*

**4. March Meeting: Invited Session, Pairing Symmetry in Electron-Doped Cuprates: Seattle, WA March 2001**

*ARPES measurements of the superconducting gap in an electron-doped cuprate*

**3. International Conference on Materials and Mechanisms of Superconductivity and High-Temperature Superconductors: Houston, TX February 2000**

*Electronic Structure and Energy Gap of  $Nd_{1.85}Ce_{0.15}CuO_4$ : Disparity Between Hole and Electron Doped Superconductors*

**2. Stanford Synchrotron Radiation Lab User's Meeting: Menlo Park, CA October 1999**

*High Resolution Photoemission on the Electron Doped Cuprate Superconductors*

**1. International Conference on Correlated Electron Systems: Hvar, Croatia September 1999**

*Photoemission Results on  $Nd_{1.85}Ce_{0.15}CuO_4$*

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**PROFESSIONAL SERVICE**

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- 2017 LANL LDRD external site visit panel member
- 2017 Quantum 4 Africa; Program Committee Member
- 2016 Materials and Mechanisms of Superconductivity; Program Committee Member
- Site visit Harvard/MIT/Howard STC Center for Integrated Quantum Materials
- Panelist and Author for DOE report on "Basic Research Needs (BRN) for Quantum Materials for Energy Relevant Technology"
- DMP Focus session organizer for Topological Materials 2016 March Meeting
- External Thesis referee, University of Augsburg
- Chair 2014 Gordon Conference on "Correlated Electron Systems"
- Lecturer 2014 Paul Scherrer Institut Summer School
- Vice-Chair 2013-2015 Proposal Review Panel, LCLS, SLAC
- 2014 APS March Meeting DMP Topological Materials Focus Session coorganizer
- 2013 External Review Committee Member Cornell Center for Materials Research
- 2011-2015 Proposal Review Panel, LINAC Coherent Light Source, SLAC
- External Thesis referee, University of British Columbia
- European Research Council External Referee
- External Referee Dutch Science Foundation
- External Referee Georgian Science Foundation
- Vice-Chair 2012 Gordon Conference on "Correlated Electron Systems"
- Co-Organizer Lorentz Center Conference on "Strongly disordered superconductors and electronic segregation", Leiden August 2011.
- Lecturer 2011 Princeton Summer School for Condensed Matter Physics



- External Referee for Phd. Thesis Sophie Charpetier, Univ. of Sherbrooke
- Subject Organizer for Strong Correlated Electron Systems for APS March meeting, 2009, 2010
- Organizer 2010, 2011 National Academy Kavli Frontiers of Science Conference
- Multiple time Professor Extraordinaire Demonstration Show at JHU Physics Fair
- Multiple time Demonstration Show for Roland Park Elementary Sch. 5<sup>th</sup> Grade
- Lecturer 2008 Boulder Summer School for Condensed Matter Physics
- Co-Organizer for 2010 JHU Conference on “Exotic Insulating States of Matter”
- Proposal Referee for US DOE, *Office of Basic Energy Sciences*
- Civilian Research and Development Foundation Proposal Referee
- *NSF* Proposal Referee and Panelist
- *Petroleum Research Fund* Proposal Referee
- Faculty reviewer for updated edition Tipler/Mosca's *Physics for Scientists & Engineers*
- Referee- *Nature*
- Referee- *Science*
- Referee- *Nature Physics*
- Referee- *Nature Materials*
- Referee- *Proceedings of the National Academy*
- Referee - *Physical Review Letters*
- Referee - *Physical Review B*
- Referee – *New Journal of Physics*
- Referee – *Europhysics Letters*
- Referee - *Journal of Electron Spectroscopy and Related Phenomena*
- Referee – *Journal of Physics and Chemistry of Solids*
- Referee - *Physica Status Solidi*

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## GRANTS

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Total funding received: \$8,377,840 in 9.5 years  
*(Contribution from multi-investigator grants given as a proportion considering the total number of PIs)*

Statically Polarized Polymer Heterostructures for Charge Carrier Density Control in Energy-relevant Semiconductors  
 Department of Energy  
 \$275,000 (with 4 PIs)

Engineering topological surface states in 2D chalcogenide heterostructures  
 National Science Foundation  
 \$330,000 10/01/15 - 10/01/18 (with 4 PIs)

THz Measures of Axion Electrodynamics and Exotic Superconducting Interfaces in Topological Insulator Films and Their Heterostructures  
 Army Research Office  
 \$440,000 9/01/15 - 9/01/18

Low energy electrodynamics of strongly interacting disordered systems: quantum phase transitions and many-body localization  
National Science Foundation  
\$360,000 7/01/15 - 7/01/18

Johns Hopkins Institute for Quantum Matter, Department of Energy, 09/01/14 - 08/31/17,  
\$714,000 (7 co-PIs)

NSF, "Gate-Modulated Charge Density-Dependent Physics of Low-Dimensional Inorganic Semiconductors in Organic Multilayers," with Howard E. Katz, Seongshik Oh, Norman P. Armitage, 09/01/13 - 08/31/16 \$520,000

CERDEC-STCD US Army, "A Novel Low Cost Fabrication Technique for Produce Topological Insulators for use in RF switches - Bismuth Selenide Thin Films", \$20,000 03/2012 – 03/2013

Johns Hopkins Institute for Quantum Matter, Department of Energy, 09/01/11 - 08/31/14,  
\$660,000 (6 co-PIs)

Funding for workshop "2012 Low energy electrodynamics of solids", 07/11, Institute of Complex Adaptive Matter, \$15,000, (with Dmitri Basov)

Funding for workshop "Lorentz Center workshop on Strongly disordered superconductors and electronic segregation", 02/11, Institute of Complex Adaptive Matter, \$5,000 (with Lev Ioffe)

Moore Foundation "Terahertz investigations of complex condensed matter", 9/10/- 9/15,  
\$2,401,755

DARPA Young Faculty Award, Department of Defense, 07/01/10 – 06/30/12, \$299,066

Equipment Supplement for IQM: Acquisition of a high-resolution Raman spectrometer for measurements on correlated electron systems, 09/01/10 – 08/31/11, (Lead PI, but with C. Broholm) \$417,625

JHU Workshop on "Exotic superconducting and insulating phases of quantum matter", 01/10, Institute of Complex Adaptive Matter, \$20,000

NSF Career Award: Terahertz and microwave investigations of complex quantum matter, National Science Foundation, 07/01/09 - 06/30/14, \$691,160

Time-Domain Terahertz Ellipsometer (TDTE) for Reflection-Mode Sensing, Department of Defense, 07/01/08 - 12/31/08, \$50,000

Johns Hopkins Institute for Quantum Matter, Department of Energy, 09/01/08 - 08/31/11,  
\$642,860 (5 co-PIs)

NSF MRI: Acquisition of a high field, multi-probe cryogenic system for quantum and nanostructured materials research, National Science Foundation, 10/01/08 - 09/30/09, \$501,374 (8 co-PIs)

Invention, Development, and Application of a Time-domain THz Ellipsometer, JHU Applied Physics Laboratory Partnership Award, 02/15/06 - 02/15/07, ~ \$20,000

Alfred P. Sloan Foundation Fellowship, 09/16/07 - 09/15/09, \$45,000

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### PATENTS

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Patent No. 7,956,525 - Flexible Nanostructure Electronic Devices  
 Issued to UCLA Technology Transfer office, June 7, 2011.

Patent filed with JHU Technology Transfer on –*Time-domain THz ellipsometry*  
 Public disclosure March 2012  
 Provisional patent filed January 2013  
 Patent approved 2016

Provisional patent under preparation  
*A Broad-band THz quarter wave plate*

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### TEACHING

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	Course taught		Enrollment
Fall 2016	171.312	Statistical Mechanics	10
Spring 2016	171.104	Into to Physics for Biological Sciences Major	250
Fall 2015	171.312	Statistical Mechanics	10
Spring 2015	171.104	Into to Physics for Biological Sciences Major	250
Fall 2014	171.105	Intro to Mechanics for Phys. Maj.	35
Spring 2014	171.622	Advan. Cond Matter Physics	5
Fall 2013	171.105	Intro to Mechanics for Phys. Maj.	35
Spring 2013	171.622	Advan. Cond Matter Physics	5
Fall 2012	171.105	Intro to Mechanics for Phys. Maj.	34
Spring 2012	171.62	Advan. Cond Matter Physics	15
Fall 2011	171.15	Intro to Mechanics for Phys. Maj.	30
Fall 2010	171.405 / 171.621	Intro to Condensed Matter	10
Fall 2009	172.114	Frontier Physics w/ Tchernyshyov	20
Fall 2009	171.405 / 171.621	Intro to Condensed Matter	10
Spring 2009	173.308	Advanced Laboratory	20
Fall 2008	171.405 / 171.621	Intro to Condensed Matter	10
Spring 2008	173.308	Advanced Laboratory	20
Fall 2007	171.405 / 171.621	Intro to Condensed Matter	10
Spring 2007	172.114	Frontier Physics w/ Markovic	20

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**MENTORING**

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**Postdoctoral Fellows:**

Fahad Mahmood	August – 2016 - present
Mintu Mondal	June – 2016 - present
Chris Morris	Oct. 2011 – July 2015: Industry
Yuval Lubashevky	Aug. 2011 – May 2014: Industry
Andreas Stier	Aug. 2011 – April 2013, post doc LANL
LiDong Pan	June 2011 – August 2015: Industry
Mohammad Neshat	Nov. 2010 – Oct. 2012, Asst. Prof. University of Tehran
Rolando Valdes Aguilar	Nov. 2008 – Aug. 2012, Asst. Prof. Ohio State

**Graduate Students:**

Xinshu Zhang	Fall 2015 - present
Dipanjan Chaudhuri	Fall 2015 -present
Youcheng Wang	Spring 2015 -present
Bing Chen	June 2014 - present
Nicholas Laurita	June 2012 - present
Liang Wu	Jan. 2011 – December 2015, Now postdoc UC Berkeley
Grace Bosse	June 2011 – August 3015, Now Lecturer Univ. N. Florida
Wei Liu	May 2007 – Dec. 2012, Now Postdoc University of Geneva
Lucas Bilbro	January 2007 - July 2012, Now <i>Ab Initio Software</i>

**Undergraduate:**

Alec Farid	Fall 2014 - present
Daniel Weissglass	Summer 2012 – Fall 2013
Jiyeong Kim	Summer 2010 – Spring 2012
Alex Day	Fall 2008 – Summer 2010
Matthew Pines	Summer 2007
James McGiver	Spring 2007, Harvard Graduate, now postdoc Hamburg

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**DEPARTMENTAL SERVICE**

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Department Vice-chair for Research: September 2013 – present  
 Managed space and renovations to laboratory buildings

Lead acquisition of \$500,000 project for Helium Recliuifier in Bloomberg Center

Faculty Czar of Helium Requiifier in Bloomberg Center August 13 – present

Member of Department Graduate Admissions Committee Fall 2012- present

Physical Science Machine Shop Faculty Advisor Spring 2007 –Sept. 2013

- Managed staff appointments
- Set strategy for acquisition of machines
- Consulted on budget issues
- Consulted on scheduling of large jobs and prioritization
- Lead reorganization of shop in Fall of 2010 when Engineering group manager, Steven Smee also became operations manager of shop with Dean Carpenter as head machinist.

Chairman of Recruitment Committee Fall 2009 –Fall 2012

- With department administrative staff organized 5 Open Houses for prospective undergraduate and graduate students per year.
- Worked with departmental graduate admissions committee to attract the best of admitted students to choose JHU

Dept. of Physics and Astronomy, Graduate Admissions Committee  
Spring 2013

Dept. of Physics and Astronomy, Faculty Search Committee  
Spring 2013

Served on approximately 10 PhD. thesis defenses, 15 Graduate Board Orals, and 15 Preliminary Oral Exams, and a reader of 6 PhD. theses.

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### PERSONAL

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Interests: World history, Politics, Philosophy, Bicycling, Running, Skiing, Mountaineering, Anything outdoors...

2 time National Collegiate Cycling Champion  
Multiple-time State Cycling Champion (New Jersey and California)