

RESUME

DEPARTMENT OF PHYSICS AND ASTRONOMY IOWA STATE UNIVERSITY

(November 2019)

JIGANG WANG

PROFESSOR

B BASE, GRAD. FACULTY FULL

PERSONAL HISTORY

July 2017 – present	Professor, Department of Physics and Astronomy Iowa State University
February 2019 – present	Senior Staff Scientist in Materials Science and Engineering Division Project leader: Light-Matter Quantum Control Ames Laboratory of US-DOE
August 2013 – June 2017	Associate Professor, Department of Physics and Astronomy Iowa State University
August 2008 – March 2013	Assistant Professor, Department of Physics and Astronomy Iowa State University
August 2008 – February 2019	Associate Staff Scientist in Materials Science and Engineering Division Ames Laboratory of US-DOE
March 2005 – August 2008	Physicist Postdoctoral Fellow Materials Sciences Division Lawrence Berkeley National Laboratory
August 2005	Ph.D., Electrical Engineering, Rice University
May 2002	M.S., Electrical Engineering, Rice University
July 2000	B.S., Physics, Jilin University, P. R. China

MEMBERSHIPS AND HONORS

2017	Ames Laboratory Inventor Incentive Award
2016	Ames Laboratory Inventor Incentive Award
2016	The M. W. Keck Award for Extreme Quantum Terahertz Nanoscope
2015	Ames Laboratory Inventor Incentive Award
2011	National Science Foundation Faculty Early Career Development (CAREER) Award
2011	LAS Award for Early Achievement in Research, Iowa State University
2007	Luis Alvarez Award for Best Experimental Research, American Physical Society, 2007 California Section
2006	Top Ten Papers of 2006, <i>Journal of Physics: Condensed Matter</i>

SYNERGISTIC ACTIVITIES:

- Group leader, Light-Matter Quantum Control, U.S. Department of Energy
- Tutorial Speaker, Materials Research Society (MRS) Spring meeting, April 2020

- Program Committee, SPIE conference Ultrafast Nonlinear Imaging and Spectroscopy V, San Diego, 2017-2019
- Focus Session Co-Organizer, International Conference of Progress In Electromagnetics Research Symposium (PIERS 2016), Shanghai, China, 2016
- Program Committee, SPIE conference Ultrafast Nonlinear Imaging and Spectroscopy IV, San Diego, 2016
- Program Committee, Optical Excitations and Ultrafast Phenomena in Condensed Matter, 2016 International Conference of Quantum Electronics (2016 CLEO/QELS)
- International Organizing Committee, The EMN Ultrafast Meeting 2015, Energy Materials Nanotechnology
- Program Committee, Optical Excitations and Ultrafast Phenomena in Condensed Matter, 2015 International Conference of Quantum Electronics (2015 CLEO/QELS)
- Organizer, DoD workshop on Non-equilibrium Quantum Matter and Phase Transitions Created by Strongly-Correlated Ultrafast Excitations, 2014
- Program Committee, Optical Excitations and Ultrafast Phenomena in Condensed Matter, 2014 International Conference of Quantum Electronics (2014 CLEO/QELS)
- Discussion Leader, Gordon Research Conference (GRC) for Ultrafast Cooperative Phenomena, Galveston, TX, February, 2012
- Review panelist for NSF Condensed Matter Physics, Division of Materials Research (DMR), Arlington, Virginia, March, 2011, 2016, 2019
- Proposal reviewer for U.S. National Science Foundation, U.S. Civilian Research & Development Foundation, U.S. Department of Energy
- Frequent referee for Nature, Science, Physical Review Letters, Nature Nanotechnology, Nature Photonics, Nature Physics, Nature Materials, Nature Communications, Physical Review B, Nano Letter, Physical Review X, Applied Physics Letters

CURRENTLY FUNDED GRANTS

- 2019-2022: Single PI, NSF DMR, \$399,000, National Science Foundation
- 2019-2021: Group leader, Lead PI, DOE: Light-Matter Quantum Control, \$2,700,000, U.S. Department of Energy
- 2018-2021: Co-PI, DOE: Metamaterials, \$1,461,000, U.S. Department of Energy
- 2016–2020: Single PI, NSF EECS, \$377,231 total, National Science Foundation
- 2015-2019: Single PI, \$465,333 total, Army Research Office, Department of Defense
- 2016–2019: Lead PI, KECK award for Extreme Quantum Terahertz Nanoscope for Ultrafast Nanoscale Phase Switching, \$2,073,671 total, including \$1,300, 000 from the M.W. KECK Foundation
- 2016-2019 Co-PI, USDA: Development of a novel enzyme-enabled Raman spectroscopic imaging (e2RSI) system for deciphering and improving the molecular arrangement of the outer polymeric barrier of plant cells, \$487,150 total

U.S. PATENT

- January 2015 Broadband Terahertz Generation of Metamaterials, #8,054,146

GRADUATE ADVISING**(Current)**

1. Zhaoyu Liu, Ph.D,
2. Di Chen, Ph.D,
3. Chirag Vaswani, Ph.D,
4. Chuankun Huang, Ph.D,
5. Din Herath Mudiyansele, Master

(Completed)

6. Tianqi Li, Ph.D, 2014
7. Liang Luo, Ph.D 2015
8. Aaron Patz, Ph.D 2016
9. Xu, Yang, Ph.D 2019

POSTDOC FELLOWS**(Current)**

Dr. Richard Kim

(Completed)

Dr. Liang Luo, 2016-2019
Dr. Chatzakis, Ioannis, 2009-2012

STUDENT HONORS AND AWARDS

1. **Xu Yang**, LAS College Graduate Student Research Award, Iowa State University, 2019
2. **Xu Yang**, Best student presentation award, the 4th International Symposium on Microwave/Terahertz Science and Applications (MTSA2017)
3. **Aaron Patz**, LAS College Graduate Student Research Award, Iowa State University, 2015
4. **Tianqi Li**, National Award for Outstanding Self-Financed Chinese Students Abroad, 2014
5. **Liang Luo**, LAS College Graduate Student Research Award, Iowa State University, 2013
6. **Tianqi Li**, Fox Research Award, Department of Physics and Astronomy, Iowa State University, 2012
7. **Tianqi Li**, MRS student travel award for Symposium: Ultrafast Processes in Materials Science, 2009 MRS Fall meeting
8. **Aaron Patz**, travel award for XVIIIth International Conference on Ultrafast Phenomena (UP2012), July 2012, Lausanne, Switzerland

RESEARCH SUMMARY AND HIGHLIGHTS

Our research investigates driven quantum systems from nanoscale to strongly correlated electron materials. Our studies both provide a fundamental understanding of light driven quantum systems and make progress towards achieving coherent control of quantum phenomena from "simplicity" to complexity. This also involves the development and applications of ultrafast laser spectroscopy and nano-imaging techniques over a wide frequency spectrum, spanning from terahertz to ultraviolet to study quantum non-equilibrium processes and many-body correlation effects.

Selective highlights

1. THz-driven superconductivity: we demonstrate light tuning of a metastable quasi-particle phase with vanishing scattering hidden by superconductivity by a single-cycle terahertz (THz) quench (*Nature Materials*, 2018).

2. THz-driven forbidden Anderson pseudo—spin precessions: we show light--induced subcycle symmetry breaking by driving long-lived gapless superfluidity, quantum beats forbidden by the equilibrium symmetry and strong high harmonic peaks (*Nature Photonics*, 2019, cover article).

3. Discovery of new collective modes in iron pnictides: we show the buildup of excitonic inter-pocket correlation between electron-hole (e-h) quasiparticles (QP) in FeAs superconductors after fs photoexcitation leading to a long-lived excitonic state (*Phys. Rev. Lett.*, 2018); Using non-adiabatic THz quench we recently discover a new hybrid Higgs mode driven by interband pairing fluctuations, controlled by light, and measure its coherent dynamics (2019).

4. Manipulating coherent transport in topologically protected states: We observe frequency-dependent carrier cooling times of THz conductivity after ultrabroadband pumping from THz, mid-IR to visible spectral regions that differentiate topological surface from bulk contributions (*Nature Communications*, 2019). Recently we also report that coherent lattice vibrations periodically driven by a single-cycle terahertz (THz) pulse can significantly suppress surface-bulk coupling (*submitted*, 2019).

5. Quantum coherence and collective modes in metal halide perovskites: we use coherent time-frequency visualization methods to reveal symmetry-selective quantum beats from excitons (*Nature Communications*, 2017), polarons to phonons (2019).

6. Dark excitons in single-walled carbon nanotubes: we access the dark excitonic ground state in resonantly-excited (6,5) SWNTs via internal, direct dipole-allowed transitions between lowest lying dark-bright pair state (*Phys. Rev. Lett.* 2015). This follows our early discovery of ultrafast mid-infrared intra-excitonic resonances in single-walled carbon nanotubes (*Phys. Rev. Lett.* 2010).

7. Study ultrafast dynamics of the Ising-Nematic phase: we pioneered in femtosecond-resolved polarimetry approach to quantum materials. One example is to distinguish macroscopic critical fluctuations associate with the Ising symmetry breaking from microscopic softening of magnetic order in the normal state of iron pnictide superconductors (*Nature Communications*, 2014).

8. Broadband terahertz generation in metamaterials: We showed single-cycle, broadband terahertz (THz) emission up to 4 THz from deep subwavelength structures of split ring resonator metamaterials of a few tens of nanometers (*Nature Communications*, 2014).

9. Ultrafast quantum spin switching in manganites: we demonstrate fs quantum coherence of quasi-particles in a colossal magnetoresistive manganite to manipulate magnetic orders (*Nature*, 2013).

10. Discovery of femtosecond population inversion of extremely dense Dirac fermions in graphene monolayer (*Phys. Rev Lett*, 2012)

11. Ultrafast demagnetization in ferromagnetic semiconductors (3 *Phys. Rev Lett* papers published in 2005, 2008, 2010)

12. Tool development: Recently we focus on pushing the terahertz instruments at space-time limits of nanometer and femtosecond using customer-build laser-coupled scanning probe microscopies (SPMs) under extreme environments of high magnetic field and cryogenic temperature.

Preprint

3) Zhaoyu Liu, et al., "Cryogenic spatial-temporal imaging of surface photocarrier dynamics in MAPbI₃ at the single grain level",

2) Z. Liu*, C. Vaswani*, X. Yang, X. Zhao, Y. Yao, Z. Song, D. Cheng, Y. Shi, L. Luo, D.-H. Mudiyansele, C. Huang, J.-M. Park, J. Zhao, Y. Yan, K.-M. Ho, J. Wang, Discovery of Hidden Rashba Fine Structure by Mode-Selective Quantum Beats in Perovskites, 1905.12373,

1) Z. Liu, C. Vaswani, L. Luo, D. Cheng, X. Yang, X. Zhao, Y. Yao, Z. Song, R. Brenes, R. Kim, J. Jean, V. Bulovic, Y. Yan, K.-M. Ho, J. Wang, Room Temperature Polaron Coherence in Perovskite Revealed by Terahertz Band Edge Modulation,

Refereed Publications in Print

56) Light Control of Surface–Bulk Coupling by Terahertz Vibrational Coherence in a Topological Insulator, X. Yang, C. Vaswani, L. Luo, X. Zhao, Y. Yao, D. Cheng, Z. Liu, R. H. J. Kim, X. Liu, M. Dobrowolska, J. K. Furdyna, I. E. Perakis, C-Z Wang, K-M Ho and J. Wang, **npj-Quantum Materials** (Nature publishing group) (2020)

55) D. T. Harris, N. Cambell, C. Di, J.-M. Park, L. Luo, H. Zhou, G.-Y. Kim, K. Song, S.-Y. Choi, J. Wang, M. S. Rzchowski, C. B. Eom, Charge Density Wave Modulation in Superconducting BaPbO₃/BaBiO₃ Superlattices, Submitted, arXiv:1812.08589, **Phys. Rev. B** accepted (2020).

54) Helicity-Dependent Terahertz Photocurrent and Coherent Phonon Dynamics in Hybrid Metal Halide Perovskites, D. Cheng*, Z. Liu*, L. Luo, C. Vaswani, J.-M. Park, Y. Yao, Z. Song, C. Huang, D. -H. Mudiyansele, R. Kim, Y. Yan, K.-M. Ho, J. Wang, **Journal of Chemical Physics**, in press *equal contribution (2019)

53) Bradley J. Ryan, et al., Silicene, Siloxene, or Silicane? Revealing the Structure and Optical Properties of Silicon Nanosheets Derived from Calcium Disilicide, **Chemistry of Materials**, dx.doi.org/10.1021/acs.chemmater.9b04180. (2019)

52) Tianbai Cui, Xu Yang, Chirag Vaswani, Jigang Wang, Rafael M. Fernandes, and Peter P. Orth, "Impact of damping on superconducting gap oscillations induced by intense Terahertz pulses", **Phys. Rev. B**, 100, 054504 (2019)

51) X. Yang, C. Vaswani, C. Sundahl, M. Mootz, L. Luo, J. H. Kang, I. E. Perakis, C. B. Eom, J. Wang, Lightwave-Driven Gapless Superconductivity and Forbidden Quantum Beats by Terahertz Symmetry Breaking. **Nature Photonics**, 13, 707 (2019)

50) Liang Luo, Zhaoyu Liu, Xu Yang, Chirag Vaswani, Di Cheng, Joong-Mok Park and Jigang Wang, "Anomalous variations of spectral linewidth in internal excitonic quantum transitions of ultrafast resonantly-excited single-walled carbon nanotubes," Accepted, **Phys. Rev. Materials**, 3, 026003 (2019).

49) X. Yang, X. Zhao, C. Vaswani, et al. Ultrafast nonthermal terahertz electrostatics and possible quantum energy transfer in the Nb₃Sn superconductor, to appear, **Physics Review B**, 99, 094504 (2019).

48) Joong-Mok Park, Di Cheng, Aaron Patz, Liang Luo, Zhaoyu Liu, Fadzai Fungura, Ruth Shinar, Kaiming Ho, Joseph Shinar, and Jigang Wang*, "Ultrafast nonlinear transparency driven at a telecom wavelength in an organic semiconductor system, **AIP Advances** 9, 025303 (2019) <https://doi.org/10.1063/1.5042542>

47) Andreas Herklotz, Stefania F. Rus, Nina Balke Wisinger, Christopher Rouleau, Er-Jia Guo, Amanda Huon, Santosh KC, Robert Roth, Xu Yang, Chirag Vaswani, Jigang Wang, Peter P. Orth, Mathias S. Scheurer and Thomas Z. Ward, Designing Morphotropic Phases with Strain Doping, **Nano. Lett.**, 10.1021/acs.nanolett.8b04322 (2019)

46) L. Luo, X. Yang, X. Liu, Z. Liu, C. Vaswani, D. Cheng, M. Mootz, X. Zhao, Y. Yao, C.-Z. Wang, K.-M. Ho, I. E. Perakis, M. Dobrowolska, J. K. Furdyna, and J. Wang*, "Ultrafast Manipulation of Topologically Enhanced Surface Transport Driven by Mid-Infrared and Terahertz Pulses in Bi₂Se₃", **Nature Communications**, doi.org/10.1038/s41467-019-08559-6 (2019)

- 45) X. Yang, C. Vaswani, C. Sundahl, M. Mootz, P. Gagel, L. Luo, J. H. Kang, P. P. Orth, I. E. Perakis, C. B. Eom, J. Wang, Terahertz-light quantum tuning of a metastable emergent phase hidden by superconductivity. **Nature Materials**. 17, 586 (2018).
- 44) X. Yang, L. Luo, M. Mootz, A. Patz, S. L. Bud'ko, P. C. Canfield, I. E. Perakis, and J. Wang, Nonequilibrium Pair Breaking in $\text{Ba}(\text{Fe}_{1-x}\text{Co}_x)_2\text{As}_2$ Superconductors: Evidence for Formation of a Photoinduced Excitonic State, **Phys. Rev. Lett.** 121, 267001 (2018)
- 43) Z. Liu, K. C. Bhamu, L. Liang, S. Shah, J. M. Park, D. Cheng, M. Long, R. Biswas, F. Fungara, R. Shinar, J. Shinar, J. Vela, J. Wang, Spatial-temporal spectroscopy characterizations and electronic structure of methylammonium perovskites. **MRS Commun.**, 8, 961 (2018).
- 42) X. Yang, C. Vaswani, C. Sundahl, M. Mootz, P. Gagel, L. Luo, J. H. Kang, P. P. Orth, I. E. Perakis, C. B. Eom, and J. Wang*, "Terahertz Light-Quantum-Tuning of a Metastable Emergent Phase Hidden by Superconductivity," **Nature Materials** 17, 586 (2018)
- 41) Liang Luo, Long Men, Zhaoyu Liu, Yaroslav Mudryk, Xin Zhao, Yongxin Yao, Joong M. Park, Ruth Shinar, Joseph Shinar, Kai-Ming Ho, Ilias E. Perakis, Javier Vela and Jigang Wang*, "Directly Revealing Dark Excitonic Ground States of Selective Chirality Single-Walled Carbon Nanotubes via Ultrafast Terahertz Spectroscopy," **Nature Communications**, 8, 15565 doi: 10.1038/ncomms15565 (2017).
- 40) A. Patz, T. Li, L. Luo, X. Yang, S. Bud'ko, P. C. Canfield, I. E. Perakis, and J. Wang*, "Critical speeding-up of non-equilibrium electronic relaxation near Nematic phase transition in unstrained $\text{Ba}(\text{Fe}_{1-x}\text{Co}_x)_2\text{As}_2$," 95, 165122, **Physical Review B** (2017)
- 39) P. Lingos, L. Mouchliadis, T. Li, A. Patz, L. Li, J. Yan, I. E. Perakis*, and J. Wang*, "Correlating Quasi-Electron Relaxation with Quantum Femtosecond Magnetism in the Order Parameter Dynamics of Insulating Manganites," **Physical Review B**, 95, 224432 (2017)
- 38) P. C. Lingos, J. Wang, and I. E. Perakis, "Manipulating Femtosecond Spin-Orbit Torques with Laser Pulse Sequences to Control Magnetic Memory States and Ringing," **Phys. Rev. B**, 91, 195203 (2015)
- 37) A. Patz, T. Li, X. Liu, J. K. Furdyna, I. E. Perakis, and J. Wang*, Ultrafast Probes of Nonequilibrium Hole spin Relaxation in Ferromagnetic Semiconductor GaMnAs , **Phys. Rev. B**, 91, 155108 (2015)
- 36) Liang Luo, Aaron Patz, Ioannis Chatzakis, and Jigang Wang*, "Directly Revealing Dark Excitonic Ground States of Selective Chirality Single-Walled Carbon Nanotubes via Ultrafast Terahertz Spectroscopy," **Physical Review Letters**, 114, 107402 (2015)
- 35) Tianqi Li, Aaron Patz, Leonidas Mouchliadis, Jiaqiang Yan, Thomas A. Lograsso, Ilias E. Perakis, Jigang Wang*, "Quantum Femtosecond Magnetism in a Strongly Correlated Manganese Oxide," **Ultrafast Magnetism I**, Springer Series in Physics Volume 159, 2015, pp 218-220
- 34) Liang Luo, Ioannis Chatzakis, Jigang Wang*, Nian Hai Shen, Thomas Koschny and Costas M. Soukoulis, "Broadband Terahertz Generation from Metamaterials," **Nature Communications**, 5, 3055 (2014).
- 33) A. Patz, T. Li, S. Ran, R. Fernandes, S. Bud'ko, J. Schmalian, P. Canfield and J. Wang*, "Ultrafast Observation of Critical Nematic Fluctuations and Giant Magnetoelastic Coupling in Iron Pnictides," **Nature Communications**, 5, 3229 (2014)
- 32) Jigang Wang*, Ilias E. Perakis, Tianqi Li, Aaron Patz, Jiaqiang Yan, Leonidas Mouchliadis, Thomas A. Lograsso, "Femtosecond Magneto-Optics: Quantum Spin Switching" **Optics & Photonics News (OPN)**, December, 56 (2013)
- 31) J. Zhang, T. Li, J. Wang* and J. Schmalian, "Post-transient relaxation in graphene after an intense laser pulse," **Euro. Phys. Journal.**, 222, 1263 (2013)
- 30) J. Zhang, J. Schmalian, T. Li and J. Wang*, "Transient Charge and Energy Balance in Graphene Induced by Ultrafast Photoexcitation," **Journal of Physics: Condensed Matter**, 25, 314201 (2013)
- 29) Ioannis Chatzakis, Philippe Tassin, Liang Luo, Nian-Hai Shen, Lei Zhang, Jigang Wang*, Thomas Koschny and C. M. Soukoulis, "One- and two-dimensional photo-imprinted diffraction gratings for manipulating terahertz waves," **Appl. Phys. Lett**, 103, 043101 (2013) (cover paper)

- 28) T. Li, A. Patz, L. Mouchliadis, J. Yan, T. A. Lograsso, I. E. Perakis, and J. Wang*, “Femtosecond switching of magnetism via strongly correlated spin–charge quantum excitations,” **Nature**, 496, 69 (2013)
- 27) Ioannis Chatzakis, Liang Luo, Jigang Wang*, Nian Hai Shen, Thomas Koscny and Costas M. Soukoulis, “Reversible modulation and ultrafast dynamics of terahertz resonances in strongly photoexcited metamaterials,” **Physical Review B**, 86, 125110 (2012)
- 26) T. Li, L. Luo, M. Hupalo, M. C. Tringides J. Zhang, J. Schmalian, and J. Wang*, “Femtosecond population inversion and stimulated emission of dense Dirac fermions in graphene,” **Physical Review Letters**, 108, 167401, (2012); *Editor’s suggestion*
- 25) A. Patz, T. Li, S. Ran, S. Bud’ko, P. Canfield and J. Wang*, “Photoinduced femtosecond relaxation of antiferromagnetic orders in the iron pnictides revealed by ultrafast laser ellipsometry,” **Ultrafast Phenomena XVIII**, **41**, 03011 (2012)
- 24) T. Li, A. Patz, J. Yan, T. A. Lograsso, I. E. Perakis and J. Wang*, “Photoinduced femtosecond formation of ferromagnetism in a strongly correlated antiferromagnetic manganite,” **Ultrafast Phenomena XVIII**, **41**, 34103004 (2012)
- 23) M. D. Kapetanakis, J. Wang, and I. E. Perakis*, “Femtosecond All–Optical Modulation of Collective Spin in the (Ga,Mn)As Ferromagnet,” **J. Optical. Society. America. B** 29, A95-A102 (2011)
- 22) M. D. Kapetanakis, P. C. Lingos, C. Piermarocchi, J. Wang, and I. E. Perakis*, “All-optical four-state magnetization reversal in (Ga,Mn)As ferromagnetic semiconductors,” **Applied Physics Letters**, 99, 091111 (2011)
- 21) Jigang Wang*, Matt W. Graham, Yingzhong Ma, Graham R. Fleming, and Robert A. Kaindl, “Ultrafast Spectroscopy of Midinfrared Internal Exciton Transitions in Separated Single-Walled Carbon Nanotubes,” **Physical Review Letters**, 104, 177401 (2010)
- 20) Tianqi Li, Liang Luo, Myron Hupalo, Michael C. Tringides and Jigang Wang*, “Femtosecond Generation of Extremely Dense Dirac Fermions in Graphene Monolayer,” **Ultrafast Phenomena XVII**, pp. 240-243, Oxford University Press (2010)
- 19) J. Wang*, M. Graham, Y. Z. Ma, G. R. Fleming and R. A. Kaindl “Ultrafast Mid-Infrared Intra-Exciton Response in Individualized Single-walled Carbon Nanotubes,” **Ultrafast Phenomena XVII**, pp. 236-239, Oxford University Press (2010)
- 18) M. D. Kapetanakis, I. E. Perakis*, K. J. Wickey, C. Piermarocchi, and J. Wang, “Femtosecond Coherent Control of Spins in (Ga,Mn)As Ferromagnetic Semiconductors Using Light,” **Physical Review Letters**, 103, 047404 (2009)
- 17) J. Wang*, I. Cotoros, D. S. Chemla, X. Liu, J. K. Furdyna, J. Chovan, and I.E. Perakis, “Memory Effects in Photoinduced Femtosecond Magnetization Rotation in Ferromagnetic GaMnAs,” **Applied Physics Letters**, 94, 021101 (2009)
- 16) K. M. Dani, I. A. Cotoros, J. Wang, J. Tignon, D. S. Chemla, E. G. Kavousanaki, and I. E. Perakis, “Observation of Inter-Landau Level Quantum Coherence in Semiconductor Quantum Wells,” **Physical Review B**, 78, 041301(R) (2008)
- 15) J. Wang, L. Cywinski, C. Sun, J. Kono, A. Oiwa, H. Munekata and L. J. Sham, “Femtosecond Demagnetization and Hot-Hole Relaxation in Ferromagnetic $\text{Ga}_{1-x}\text{Mn}_x\text{As}$,” **Physical Review B**, 77, 235308 (2008); 6 pages
- 14) J. Wang, I. Cotoros, X. Liu, J. K. Furdyna, and D. S. Chemla, “Ultrafast Photo-enhanced Ferromagnetism in GaMnAs,” **SPIE Proceedings**, 6892, 68920Q-1 (2008)
- 13) I. Cotoros, J. Wang, X. Liu, J. Chovan, J. K. Furdyna, I.E. Perakis and D. S. Chemla, “Memory Effects in Photo-induced Femtosecond Magnetization Rotation in a Ferromagnetic Semiconductor,” **Ultrafast Phenomena XVI**, Springer Series in Chemical Physics, 92, 212–214 (2008)
- 12) I. Cotoros, J. Wang, X. Liu, J. K. Furdyna and D. S. Chemla, “Ultrafast Photoinduced Ferromagnetic Order in a Magnetic Semiconductor Heterostructure,” **Ultrafast Phenomena XVI**, Springer Series in Chemical Physics, 92, 197–199 (2008)

- 11) J. Wang, I. Cotoros, K. M. Dani, X. Liu, J. K. Furdyna, and D. S. Chemla, "Ultrafast Enhancement of Ferromagnetism via Photoexcited Holes in GaMnAs", **Physical Review Letters**, 98, 217401 (2007);
- 10) K. M. Dani, I. Cotoros, J. Wang, J. Tignon, D. S. Chemla, E. G. Kavousanaki, and I. E. Perakis, "Dephasing of Inter-Landau Level Raman Coherences in GaAs Quantum Wells," **Ultrafast Phenomena XV**, Springer Series in Chemical Physics, 88, 692 (2007)
- 9) Jigang Wang, Chanjuan Sun, Yusuke Hashimoto, Junichiro Kono, Giti A. Khodaparast, Lukasz Cywinski, L. J. Sham, Gary D. Sanders, Christopher J. Stanton, and Hiro Munekata, "Ultrafast Magneto-Optics in Ferromagnetic III-V Semiconductors," **Journal of Physics: Condensed Matter** 18, R501–R530 (2006),
- 8) J. Wang, C. Sun, J. Kono, A. Oiwa, H. Munekata, L. Cywinski, and L. J. Sham, "Ultrafast Quenching of Ferromagnetism in InMnAs Induced by Intense Laser Irradiation," **Physical Review Letters**, 95, 167401 (2005)
- 7) J. Wang, Y. Hashimoto, J. Kono, A. Oiwa, H. Munekata, G. D. Sanders, and C. J. Stanton, "Propagating Coherent Acoustic Phonon Wave Packets in $\text{In}_x\text{Mn}_{1-x}\text{As}/\text{GaSb}$," **Physical Review B**, 72, 153311 (2005)
- 6) G. D. Sanders, C. J. Stanton, J. Wang, J. Kono, A. Oiwa and H. Munekata, "Theories of Carrier Dynamics and Time-resolved Reflectivity in $\text{In}_x\text{Mn}_{1-x}\text{As}/\text{GaSb}$ Heterostructures," **Physical Review B**, 72, 245302 (2005)
- 5) J. Wang, G. A. Khodaparast, J. Kono, A. Oiwa, and H. Munekata, "Ultrafast Optical and Magneto-Optical Studies of III-V Ferromagnetic Semiconductors," **Journal of Modern Optics**, 51, 2771–2780 (2004)
- 4) Ajit Srivastava, Rahul Srivastava, Jigang Wang, and Junichiro Kono, "Laser-Induced Above-Band-Gap Transparency in GaAs," **Physical Review Letters** 93, 157401 (2004)
- 3) J. Wang, J. Kono, A. Oiwa, H. Munekata, and C. J. Stanton, "Ultrafast Carrier Dynamics in Ferromagnetic InGaMnAs," **Superlattices and Microstructures**, 34, 563–566 (2003)
- 2) J. Wang, G. A. Khodaparast, J. Kono, T. Slupinski, A. Oiwa, and H. Munekata, "Ultrafast Softening in InMnAs," **Physica E**, 20, 412–418 (2004); Erratum, *Physica E*, 25, 681–682 (2005)
- 1) J. Wang, G. A. Khodaparast, J. Kono, T. Slupinski, A. Oiwa, and H. Munekata, "Ultrafast Optical Manipulation of Ferromagnetic Order in InMnAs/GaSb," **Journal of Superconductivity: Incorporating Novel Magnetism**, 16, 373–377 (2003)

Books, Chapters

- 1) J. Wang, "Ultrafast Magneto-Optical Spectroscopy," **Optical Techniques for Materials Characterization** (R. P. Prasankumar and A. J. Toni Taylor, Ed.), Taylor and Francis Group, Chapter 13 (70 pages) (2010).

INVITED CONFERENCE TALKS & SEMINARS

- 82) "Light-Matter Quantum Control by THz coherence and dynamics," The Ultrafast Dynamics and Metastability and Ultrafast Bandgap Photonics Symposium Conference, Crete, Greece May 2020
- 81) "Light-Matter Quantum Control by THz coherence," Michigan State University, 2020
- 80) "Ultrafast dynamics of topological materials," Brookhaven National Lab, 2020
- 79) "Light-Matter Quantum Control by THz coherence," APS March Meeting, Denver, CO, Mar 2020
- 78) "Terahertz quantum beats and nano-imaging of metal halide perovskites," the ACS Fall 2019 National Meeting & Exposition, San Diego, CA.
- 77) "THz quantum science at space and time limit" MRS spring meeting, April 20
- 76) "THz quantum science at space and time limit" Tulane University, Nov 2019
- 75) "THz quantum science at space and time limit" SPIE Photonic West International Coherence, San Francisco, California, Feb 2020

- 74) "Light-Matter Quantum Control by THz coherence and dynamics" The eighth international conference on Optical Terahertz Science and Technology (OTST 2019), the 11th Symposium on Ultrafast Surface Dynamics China, Jun 2019
- 73) "Light-Matter Quantum Control by THz coherence and dynamics," The Ultrafast Dynamics and Metastability and Ultrafast Bandgap Photonics Symposium Conference, Washington DC, April 2019
- 72) "Light-Matter Quantum Control by THz coherence and dynamics" The eighth international conference on Optical Terahertz Science and Technology (OTST 2019), New Mexico, March 2019
- 71) "Light-Matter Quantum Control by THz coherence and dynamics" symposium on "Nanoscale and molecular assemblies" the Fall 2019 ACS National Meeting, Oct 2019
- 70) "Light-Matter Quantum Control by THz coherence and dynamics" SPIE Photonic West International Coherence, San Francisco, California, Feb 2019
- 69) "Ultrafast spin dynamics in a magnetically doped topological insulator $\text{Cr}_x\text{Bi}_{2-x}\text{Te}_3$: the inverse Overhauser and spin-phonon relaxation," Oak Ridge National Laboratory, August 2018
- 68) "Ultrafast spin dynamics in a magnetically doped topological insulator $\text{Cr}_x\text{Bi}_{2-x}\text{Te}_3$: the inverse Overhauser and spin-phonon relaxation," The 2018 "Spintronics XI" conference, San Diego, CA, August 2018
- 67) The 2018 SPIE Optics and Photonics conference, San Diego, CA, August 2018
- 66) "Terahertz Light-Quantum-Tuning of a Metastable Emergent Phase Hidden by Superconductivity," The 2018 Conference on Quantum Electronics and Laser Conference (CLEO/IQEC), San Jose, California, Jun 2018
- 65) "Terahertz Light-Quantum-Tuning of a Metastable Emergent Phase Hidden by Superconductivity," APS March Meeting, LA, CA, Mar 2018
- 64) The SPIE DSS18 Ultrafast Bandgap Photonics Conference, Florida, April, 2018
- 63) The 2018 SPIE Optics and Photonics conference, San Diego, CA, August 2018
- 62) Department Colloquium, Physics, North Carolina State University, NC, Feb 2018
- 61) Colloquium, Center for Nanoscale Materials, Argonne National Laboratory Dec 2017
- 59) The 4th International Symposium on Microwave/Terahertz Science and Applications (MTSA 2017), Nov 22nd Japan
- 58) Materials Science and Engineering/Physics Department Seminar, University of Wisconsin Madison, WI, August 2017
- 57) International Conference on IRMMW-THz, Cancun, August 2017
- 56) "Quantum physics: one full circle", The 7th International Workshop on Quantum Energy, Haikou, China, November 2017
- 55) "Ultrafast imaging of microstructures and coherent transients in hybrid perovskite materials," the 2017 SPIE Optics and Photonics, San Diego, CA, August 2017
- 54) "Non-equilibrium Quantum Phase Discovery," Army Research Office Program Review meeting, Florida, Jun 2017
- 53) "Quantum physics: one full circle", International Center for Quantum Design of Function Materials, USTC, China July 10th 2017
- 52) "Broadband Terahertz Generation from Metamaterials and Their Hybrid Quantum Structures," SPIE Photonic West International Coherence on "Terahertz, RF, Millimeter, and Submillimeter-Wave Technology and Applications X," San Francisco, California, Feb 2017
- 51) "Non-Equilibrium Quantum Phenomena: Rydberg Bosons, Dirac Fermions and Beyond," Department Colloquium, Physics and Astronomy, Macalester College, MN, Oct 14th 2016
- 50) "Split ring resonator based THz emitter and photo-imprinted THz diffraction gratings," International Conference of Progress in Electromagnetics Research Symposium (PIERS 2016), Shanghai, China, 2016
- 49) "Characterization of Advanced Materials for Photodetectors Using Ultrafast Terahertz Technology," The 2016 EMN Meeting on Photodetectors, Cancun, Mexico, Jun 2016

- 48) "Ultrafast Exciton Dynamics in Hybrid Organic-Inorganic Perovskite materials," The 6th International Workshop on Quantum Energy, Xiangtang, China, October 2016
- 47) "Ultrafast nonlinear THz emission and electrodynamics in low dimensions," the 2016 SPIE Optics and Photonics, San Diego, CA, August 2016
- 46) "Non-equilibrium Phase Discovery: Quantum Magnetism and Beyond" Department Colloquium, Department of Physics, Northern Illinois University, Dekalb, IL, Sept 2016
- 45) "Ultrafast THz Charge Transport and Carrier Dynamics in Organic Solar Cells and Photovoltaics," The 5th International Workshop on Quantum Energy, Hangzhou, China, October 2015
- 44) "How Fast in Ultrafast: From Quantum Spins to Cooper Pairs," Department Colloquium, Department of Physics, Truman State University, Kirksville, Missouri, September 2015
- 43) "Non-equilibrium Phase Discovery: Quantum Magnetism and Beyond," Quantum Magnets 2015 workshop, Kolymbari, Greece, September 2015.
- 42) "Ultrafast nonlinear THz emission and electrodynamics in low dimensions," Ultrafast Nonlinear Spectroscopy conference in the 2015 SPIE Optics and Photonics, San Diego, CA, August 2015
- 41) "Non-equilibrium Phase Discovery: From Quantum Spins to Cooper Pairs," Department Colloquium, Department of Physics, Creighton University, Omaha, NE, April 2015
- 40) "Ultrabroadband and Ultrafast Electrodynamics in Low Dimensions: from Dark Excitons to Meta-Atoms," Department Colloquium, Department of Physics, University of South Florida, March 2015
- 39) "Non-equilibrium Quantum Phase Discovery," DoD workshop on Non-equilibrium Quantum Matter and Phase Transitions Created by Strongly-Correlated Ultrafast Excitations, Ames, IA, Dec 2014
- 38)+ "Quantum Non-equilibrium Phase Transition in Strongly Correlated Electrons at Femtosecond Timescales," APS March Meeting, Denver, CO, Mar 2014
- 37)+ "Quantum Femtosecond Magnetism in Strongly Correlated Electrons," Gordon Research Conference, Ultrafast Phenomena in Cooperative Systems, Santa Barbara, CA, Feb, 2014
- 36)+ "How Fast is Ultrafast?" Department Colloquium, Department of Physics, Minnesota state university, Mankato, March 2014
- 35)+ "Quantum Femtosecond Magnetism," Condensed matter physics colloquium, UIUC, Oct 2013
- 34)+ "Quantum Femtosecond Magnetism," Department Colloquium, Department of Physics, West Virginia University, Nov 2013
- 33)+ "Quantum Femtosecond Magnetism," 57th Mid-West Solid-State Physics Conference, Sept 2013
- 32)+ "Ultrafast Terahertz Probes of Dark Excitonic Ground States in Single-Walled Carbon Nanotubes," Crystal & Graphene Science Symposium, Waltham, MA, USA, Sept 8-9, 2013.
- 31)+ "Ultrafast Spin Dynamics in Ferromagnetic Semiconductors," Ultrafast Magnetism Conference 2013 (UMC 2013), Strasbourg, France in 2013, Oct 28th - Nov 1st
- 30)+ "Ultrafast Terahertz Probes of Dark Excitonic Ground States in Single-Walled Carbon Nanotubes," 2013 Conference Proceedings of Fundamental Optical Processes of Semiconductors, Kodiak Island, Alaska, USA August 12-16, 2013 (FOPS 2013)
- 29)+ "Quantum Femtosecond Magnetism," Department Colloquium, Department of Physics and Astronomy, Iowa State University, April 2013
- 28)+ "Ultrafast Order Parameter Dynamics and Critical Phenomena of Ising-Nematic Phase in Iron Pnictides," The 2013 Conference on Quantum Electronics and Laser Conference (CLEO/IQEC), San Jose, California, Jun 2013
- 27)+ "Femtosecond photoinduced magnetism and phase transitions via quantum spin hopping in strongly correlated electrons," 6th International Symposium on Ultrafast Phenomena and THz Wave (ISUPTW 2012) in the 5th International Photonics and Optoelectronics Meetings (POEM 2012), Wuhan, China, Nov, 2012.

- 26)⁺ “Ultrafast broadband probes of graphene and carbon nanotubes: from stimulated emission of electrons to dark excitons,” Crystal & Graphene Science Symposium, Waltham, MA, USA, Sept 2012.
- 25)⁺ “Ultrafast broadband probes of graphene and carbon nanotubes: from stimulated emission of electrons to dark excitons,” Condensed matter physics colloquium, Department of Physics, Boston University, Boston Sept 2012
- 24)⁺ “Physics of graphene”, The Physics, Atmospheric and Space Sciences Section sessions at the Iowa Academy of Science Annual Meeting in Waverly on Saturday, April 30, 2011.
- 23)⁺ “Ultrafast spectroscopy of carbon nanostructures: from excitons to Dirac fermions,” Gordon Research Conference, Ultrafast Phenomena in Cooperative Systems, Galveston, TX, Mar, 2010
- 22)⁺ “Ultrafast magnetism: coherent and cooperative phenomena, ”Condensed matter physics colloquium, Department of Physics, Michigan State University, Lansing, Michigan, Oct 2009
- 21)⁺ “Femtosecond spin reorientation in ferromagnetic GaMnAs,” SPIE Photonic West International Symposium on “Ultrafast Phenomena in Semiconductors and Nanostructure Materials”, San Jose, California, Jan 2009
- 20) “Spin manipulation in ferromagnetic semiconductors: ultrafast, non-thermal and cooperative,” The 2008 March Meeting of the American Physical Society, invited session on “Magnetism in Semiconductors: New Frontiers”, New Orleans, Louisiana, Mar 2008
- 19) “Spin manipulation in ferromagnetic semiconductors: ultrafast, non-thermal and cooperative,” The Physics Department colloquium, Department of Physics, Columbia University, New York, Feb 2008
- 18) “Spin manipulation in ferromagnetic semiconductors: ultrafast, non-thermal and cooperative,” The Physics Department colloquium, Department of Physics, Tufts University, Boston, MA, Feb 2008
- 17) “Ultrafast photo-enhanced ferromagnetism,” SPIE Photonic West International Symposium on “Ultrafast Phenomena in Semiconductors and Nanostructure Materials”, San Jose, California, Jan 2008
- 16) “Spin manipulation in ferromagnetic semiconductors: ultrafast, non-thermal and cooperative,” The Physics Department colloquium, Department of Physics, University of Pittsburg, Pittsburg, PA, Jan 2008
- 15) “Spin manipulation in ferromagnetic semiconductors: ultrafast, non-thermal and cooperative,” The Physics Department colloquium, School of Natural Sciences, University of California at Merced, Merced, CA, Jan 2008
- 14) “Spin manipulation in ferromagnetic semiconductors: ultrafast, non-thermal and cooperative,” The Physics Department colloquium, Department of Physics, Iowa State University, Ames, Iowa, Dec 2007
- 13) “Ultrafast spin dynamics in ferromagnetic GaMnAs,” Berkeley ultrafast science seminar, Lawrence Berkeley Laboratory and UC Berkeley, Berkeley, California, Nov 2007
- 12) “Spin manipulation in ferromagnetic semiconductors: ultrafast, non-thermal and cooperative,” The Condensed matter physics colloquium, Department of Physics, University of Notre Dame, Notre Dame, Indiana, Oct 2007
- 11) “Spin manipulation in ferromagnetic semiconductors: ultrafast, non-thermal and cooperative,” The Condensed matter physics colloquium, Center for Integrated Nanotechnologies, Los Alamos National Lab & Sandia National Lab, Los Alamos, New Mexico, Oct 2007
- 10) “Ultrafast enhancement of ferromagnetism in GaMnAs,” The 2007 Conference on Lasers and Electro-Optics/International Quantum Electronics Conference (CLEO/IQEC), Baltimore, MD, May 2007
- 9) “Ultrafast spin dynamics in ferromagnetic GaMnAs,” Ultrafast X-ray Beamline seminar, Advance Light Source, Lawrence Berkeley National Laboratory, Dec 2006
- 8) “Ultrafast demagnetization in ferromagnetic InMnAs,” SPIE Photonic West International Symposium on “Ultrafast Phenomena in Semiconductors and Nanostructure Materials IX”, San Jose, California, Jan 2005
- 7) “Ultrafast demagnetization in ferromagnetic InMnAs,” Ultrafast Science Seminar, Materials Sciences Division, LBNL, Berkeley, California, Nov 2004
- 6) “Ultrafast softening in InMnAs,” The 2004 Conference on Lasers and Electro-Optics/International Quantum Electronics Conference (CLEO/IQEC), San Francisco, California, May 2004

- 5) "Ultrafast softening in InMnAs," Condensed Matter Physics seminar, Institute of Industrial Science, University of Tokyo, Japan, Dec 2003
- 4) "Ultrafast softening in InMnAs," The 11th International Conference on Narrow Gap Semiconductors (NGS-11), Buffalo, New York, Jun 2003
- 3) "Ultrafast softening in InMnAs," The 28th International Conference on Infrared and Millimeter Waves (IRMMW-28), Ohtsu, Japan 2003
- 2) "Ultrafast softening in InMnAs," The 15th Annual Meeting of the IEEE Lasers & Electro-Optics Society, Glasgow, Scotland, Nov 2002
- 1) "Ultrafast spin manipulation in ferromagnetic semiconductors," The 2002 Annual Meeting of the Optical Society of America, Orlando, Florida 2002