Curriculum Vitae- Ezekiel Johnston-Halperin

Department of Physics, The Ohio State University
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November 14, 1974 Born: Española, NM

Education

March 2003 PhD, Physics, University of California, Santa Barbara, "Optical, Magnetic, and Electronic Control of Free Carrier Spin in Semiconductors"

April 2000 M.A., Physics, University of California, Santa Barbara

June 1996 B.S. *cum laude*, Physics, Case Western Reserve University

Professional Appointments

Assistant Professor: Chemical Physics Program, The Ohio State University (July 2007 – present).

Assistant Professor: Department of Physics, The Ohio State University (July 2006 – present).

Post-Doctoral Researcher: The California Institute of Technology, Division of Chemistry and Chemical Engineering (April 2003 – June 2006).
Research Supervisor: Professor James R. Heath

Graduate Student Researcher: The University of California at Santa Barbara, Department of Physics (September 1996-March 2003).
Thesis Advisor: Professor David D. Awschalom

Teaching Assistant at the University of California at Santa Barbara (Fall 1996).
Supervising Instructor: Dr. Roger Freedman

Research Assistant at Case Western Reserve University (July 1994 – July 1996).
Research Supervisor: Professor David E. Farrell

Publications

2 publications in *Science*, 2 in *Physical Review Letters*, and 1 in *Nature*, 2 with 100+ citations

28. "High-field magnetocrystalline anisotropic resistance effect in (Ga,Mn)As," D. Wu, P. Wei, E. Johnston-Halperin, D. D. Awschalom and J. Shi, *Phys. Rev. B* **77**, 125320 (2008).

27. "A 160 kBit molecular memory at 100 GBit/cm^2," J.E. Green, J.W. Choi, A. Boukai, Y. Bunimovich, E. Johnston-Halperin, E. DeIonno, Y. Luo, B.A. Sheriff, and J.R. Heath, *Nature* **445**, 414 (2007).

26. "Speirs Memorial Lecture – Molecular mechanics and molecular electronics," R. Beckman, K. Beverly, A. Boukai, Y. Bunimovich, J.W. Choi, E. DeIonno, J.E. Green, E. Johnston-Halperin, Y. Luo, B. Sheriff, J.F. Stoddart, and J.R. Heath, *Faraday Discussions* **131**, 9 (2006).

25. “Anisotropic Thermopower and Planar Nernst Effect in $Ga_{1-x}Mn_xAs$ Ferromagnetic Semiconductors,” Yong Pu, E. Johnston-Halperin, D. D. Awschalom, and Jing Shi, *Phys. Rev. Lett.* **97**, 036601 (2006).

24. “Circuit fabrication at 17 nm half-pitch by nanoimprint lithography ,” G.Y. Jung, E. Johnston-Halperin, W. Wu, Z. Yu, S.Y. Wang, Z. Li, J.E. Green, B.A. Sheriff, A. Boukai, Y. Bunimovich, J.R. Heath, and R.S. Williams, *Nanoletters* **6**, 351 (2006).

23. “Bridging dimensions: demultiplexing ultra-high density nanowire circuits,” R.A. Beckman, E. Johnston-Halperin, Y. Luo, J.E. Green, and J.R. Heath, *Science* **310**, 465 (2005).

22. “Concentration-independent local ferromagnetic Mn configuration in $Ga_{1-x}Mn_xAs$,” D. Wu, D.J. Keavney, R. Wu, E. Johnston-Halperin, D.D. Awschalom, and J. Shi, *Phys. Rev. B*, **71**, 153310 (2005).

21. “Magnetic properties of (Ga,Mn)As digital ferromagnetic heterostructures,” M. Diwekar, J.A. Borchers, K.V. O'Donovan, E. Johnston-Halperin, D.D. Awschalom, and J. Shi, Journal of Applied Physics, **95**(11): p. 6509-6511 (2004).

20. “Fabrication of conducting Si nanowire arrays,” R.A. Beckman, E. Johnston-Halperin, N.A. Melosh, Y. Luo, J.E. Green, and J.R. Heath, *J. Appl. Phys.*, **96**, 5921 (2004).

19. “Structural engineering of ferromagnetism in III-V digital ferromagnetic heterostructures,” J.A. Schuller, E. Johnston-Halperin, C.S. Gallinat, H. Knotz, A.C. Gossard, and D.D. Awschalom, *J. Appl. Phys.*, **95**, 4922 (2004).

18. “Element resolved spin configureation in ferromagnetic manganese-doped gallium arsenide,” D.J. Keavney, D. Wu, J.W. Freeland, E. Johnston-Halperin, D.D. Awschalom, and J. Shi, *Phys. Rev. Lett.*, **91**, 187203 (2003).

17. “Optical and electronic manipulation of spin coherence in semiconductors,” V.A. Sih, E. Johnston-Halperin, and D.D. Awschalom, *Proc. Of the IEEE*, **91**, 752 (2003).

16. “Theory of semiconductor magnetic bipolar transistors,” M. E. Flatté, Z. G. Yu, E. Johnston-Halperin, and D. D. Awschalom, *Appl. Phys. Lett.* **82**, 4740 (2003).

15. “Independent tuning of magnetic and electronic doping in (Ga,Mn)As based digital ferromagnetic heterostructures” E. Johnston-Halperin, J. A. Schuller, C. S. Gallinat, T. C. Kreutz, R. C. Myers, R. K. Kawakami, H. Knotz, A. C. Gossard, and D. D. Awschalom, *Phys. Rev. B* **68**, 165328 (2003).

14. “Highly enhanced Curie temperatures in low temperature annealed (Ga,Mn)As epilayers” K. C. Ku, S. J. Potashnik, R. F. Wang, M. J. Seong, E. Johnston-Halperin, R. C. Myers, S. H. Chun, A. Mascarenhas, A. C. Gossard, D. D. Awschalom, P. Schiffer, and N. Samarth, *Appl. Phys. Lett.* **82**, 2302 (2003).

13. “Optical, electrical and magnetic manipulation of spins in semiconductors,” D. K. Young, J.A. Gupta, E. Johnston-Halperin, R. Epstein, Y. Kato, and D.D. Awschalom, *Semi. Sci. Tech.* **17**, 275 (2002).

12. “Spin Injection from (Ga,Mn)As into InAs Quantum Dots,” Y. Chye, M. E. White, E. Johnston-Halperin, B. D. Gerardot, D. D. Awschalom, and P. M. Petroff, *Phys. Rev. B Rapid Comm.* **66**, 201301 (2002).

11. “Anisotropic Electrical Spin Injection in Ferromagnetic Semiconductor Heterostructures”, D.K. Young, Y. Ohno, E. Johnston-Halperin, H. Ohno, and D.D. Awschalom, *Appl. Phys. Lett.* **80**, 1598 (2002).

10. “Spin-Polarized Zener Tunneling in (Ga,Mn)As” E. Johnston-Halperin, D. Lofgreen, R.K. Kawakami, D.K. Young, L. Coldren, A.C. Gossard, and D.D. Awschalom, *Phys. Rev. B Rapid Comm.* **65,** 041306 (2002).

9. “Growth and magnetic properties of (Ga,Mn)As as digital ferromagnetic heterostructures,” R. K. Kawakami, E. Johnston-Halperin, L.F. Chen, M. Hanson, N. Guebels, J.M. Stephens, J.S. Speck, A.C. Gossard, and D.D. Awschalom, *Mat. Sci. and Eng. B* **88**, 209 (2002).

8. “Ferromagnetic Imprinting of Nuclear Spins in Semiconductors”, R. K. Kawakami, Y. Kato, M. Hanson, I. Malajovich, J. M. Stephens, E. Johnston-Halperin, G. Salis, A. C. Gossard, and D. D. Awschalom, *Science* **294**, 131 (2001).

7. “Spin spectroscopy of dark excitons in CdSe quantum dots to 60 T”, E. Johnston-Halperin, D. D. Awschalom, S. A. Crooker, Al. L. Efros, M. Rosen, X. Peng and A. P. Alivisatos, *Phys. Rev. B Rapid Comm.* **63**, 205309 (2001).

6. “Spin coherence and dephasing in GaN”, B. Beschoten, E. Johnston-Halperin, D. K. Young, M. Poggio, J. E. Grimaldi, S. Keller, S. P. DenBaars, U. K. Mishra, E. L. Hu, and D. D. Awschalom, *Phys. Rev. B Rapid Comm.* **63**, 121202 (2001).

5. “(Ga,Mn)As as a Digital Ferromagnetic Heterostructure”, R. K. Kawakami, E. Johnston-Halperin, L. F. Chen, M. Hanson, N. Guebels, J. S. Speck, A. C. Gossard and D. D. Awschalom, *Appl. Phys. Lett.* **77**, 2379 (2000).

4. “Stability of trions in strongly spin-polarized two-dimensional electron gases” S.A. Crooker, E. Johnston-Halperin, D.D. Awschalom, R. Knobel, and N. Samarth, *Phys. Rev. B Rapid Comm.* **61**, 16307 (2000).

3. “Angular dependence of metamagnetic transitions in $HoNi_2B_2C$” P. C. Canfield, S. L. Bud’ko, B. K. Cho, A. Lacerda, D. Farrell, E. Johnston-Halperin, V. A. Kalatsky, V. L. Pokrovsky *Phys. Rev. B* **55**, 970 (1997).

2. “Magnetization jumps and irreversibility in $Bi_2Sr_2CaCu_2O_8$” D.E. Farrell, E. Johnston-Halperin, L. Klein, P. Founier, A. Kapultnik, E.M. Frogan, A.I.M. Rae, T.W. Li, M.L. Trawick, R. Sasik, J.C. Garland *Physical Review B* **53**, 11807 (1996).

1. “Superconducting anisotropy of YNi_2B_2C” E. Johnston-Halperin, J. Fiedler, D. E. Farrell, Ming Xu, B. K. Cho, P. C. Canfield, D. K. Finnemore, D. C. Johnston *Physical Review B* **51**, 12852 (1995).

Invited Presentations

13. March 2007, Condensed Matter Seminar, Department of Physics, Case Western Reserve University, Cleveland, USA. Title: “From nano to micro: hierarchical ordering at the nanoscale”

12. March 2007, March Meeting of the American Physical Society, Denver, USA. Title: “From nano to micro: hierarchical ordering at the nanoscale”

11. January 2007, Department of Physics Colloquium, The University of Toledo, USA. Title: “Hierarchical ordering at the nanoscale”

Entries 10 - 4 were all part of my job search and carried the title: “The development of a 160 kBit molecular memory at 10^{11} Bits/cm^2 as a catalyst for interdisciplinary research”

10. February 2006, Department of Materials Science and Engineering Colloquium at the University of California at Los Angeles.

9. February 2006, Department of Materials Science and Engineering Seminar at the University of California at Berkeley.

8. February 2006, Department of Materials Science and Engineering Seminar at the Massachusetts Institute of Technology.

7. February 2006, Physics Dept. Colloquium at The University of Arizona.

4. February 2006, CME Seminar at the University of California at San Diego.

6. January 2006, Physics Dept. Colloquium at the University of Texas, Austin.

5. January 2006, CME Seminar at The Ohio State University.

4. December 2005, CME Seminar at The University of California at Riverside.

3. May 2005, *DARPA workshop on MEMS/NEMS Basic Science*, Santa Barbara, USA. Title: “Interconnects for High-Density NEMS”

2. March 2003, *Spring meeting of the Materials Research Society*, San Francisco, USA. Title: “Engineering Ferromagnetic Semiconductors”

1. March 2002, *IEEE Denver Section Annual Conference*, Denver, USA. Title: “Optical, Electrical, and Magnetic Manipulation of Spins in Semiconductors”

Contributed Presentations

12. September 2008, *Joint European Magnetic Symposia 2008*, Dublin, Ireland. Title: “Characterization of Spin-Torque Oscillators and Arrays” (Poster)

11. September 2008, *Gordon Research Conference on Magnetic Nanostructures*, Aussois, France. Title: “Evaluating Materials for Molecular Spintronics Applications” (Poster)

10. September 2008, *Gordon Research Conference on Magnetic Nanostructures*, Aussois, France. Title: “Characterization of Spin-Torque Oscillators and Arrays” (Poster)

9. March 2006, *March meeting of the American Physical Society*, Baltimore, USA. Title: “Ultra-dense nanowire arrays”

8. March 2005, *March meeting of the American Physical Society*, Los Angeles, USA. Title: “Si Nanowire FET arrays”

7. March 2004, *March meeting of the American Physical Society*, Montreal, Canada. Title: "Fabrication and Characterization of Nanowire Arrays for Molecular Electronics and Chemical Sensing"

6. March 2003, *March meeting of the American Physical Society,* Austin, USA. Title: "Independent Electronic and Magnetic Doping of Digital Ferromagnetic Semiconductors"

5. July 2002, *2nd International Conference on Physics and Application of Spin Related Phenomena in Semiconductors*, Würzbug, Germany. Title: "Spin-engineering Ferromagnetic Semiconductor Heterostructures and Devices"

4. March 2002, *March meeting of the American Physical Society,* Indianapolis, USA. Title: "Spin Polarized Zener Tunneling in (Ga,Mn)As"

3. March 2001, *March meeting of the American physical society*, Seattle, USA. Title: "Spin Coherence and Dephasing in GaN"

2. November 2000, *Fall meeting of the Materials Research Society*, Boston, USA. Title: "Spin Coherence and Dephasing in GaN"

1. March 2000, *March meeting of the American physical society*; Minneapolis, USA. Title: "Spin Spectroscopy of CdSe Quantum Dots in High Magnetic Field"

Patents

"Bipolar Spin Transistors and the Application of Same," *pending*.

Current Students

Sarah Parks – 6th year graduate student in the Department of Physics, Ohio State University.

Lei Fang – 5th year graduate student in the Department of Physics, Ohio State University.

Ke Li – 3rd year graduate student in the Department of Physics, Ohio State University.

Dongkyun Ko – 5th year graduate student in the Department of Physics, Ohio State University.

Joshua Emerick – Undergraduate student in Engineering Physics, Ohio State University; supported by Grilly Undergraduate Research Scholarship.

Cole Robinette – Undergraduate student in Physics, Ohio State University.

Raman Talwar - Undergraduate student in Engineering Physics, Ohio State University.

Current and Past Funding

NSF DMR-0820414: "MRSEC: Center for Emergent Materials;" PI: Prof. Nitin Padture, Materials Science and Engineering; 19 additional Co-PIs; Amount: $10,800,000; Duration: 9/1/2008 – 8/31/2014.

IMR Interdisciplinary Materials Research Grant IMR-G00017: “Solving the ‘Contact Problem’ of Molecular Electronics via Atomic Layer Deposition;” Co-PIs: Prof. Malcolm Chisholm, Chemistry; Prof. Jonathan Pelz, Physics; Amount: $45,000; Duration: 7/1/2008 – 6/30/2009.

Institute for Materials Research Facilities Seed Grant (OSU internal) – “Nanoscale Patterning of Magnetic Nanowires,” $2,500, February 2008 to August 2008.

NSF Small Grant for Exploratory Research (SGER) - “Sublithographic Patterning of Nanoscale Spintronic Devices,” $75,000, May 2007 to May 2008.

Institute for Materials Research Facilities Seed Grant (OSU internal) – “Nanoscale Patterning of Magnetic Nanowires,” $2,500, February 2007 to August 2007.

New Faculty Startup Funds (OSU internal) - $1,000,000, unlimited duration.

Service

September 2008 – Present, Co-Leader IRG-1 “Towards Heterogeneous, Spin-Preserving Networks” of the Center for Emergent Materials MRSEC, Ohio State University, USA.

September 2008 – Present, Co-Chair of the Seed Funding Board of the Center for Emergent Materials MRSEC, Ohio State University, USA.

September 2008 – Present, Member of the Executive Committee of the Center for Emergent Materials MRSEC, Ohio State University, USA.

July 2008 – Present, Member, Institute for Materials Research Faculty Advisory Committee, Ohio State University, USA.

September 2008 – June 2009, Member of the Graduate Studies Committee, Department of Physics, Ohio State University, USA.

September 2007 – June 2008, Member of the Graduate Studies Committee, Department of Physics, Ohio State University, USA.

September 2007 – June 2008, Member of the Colloquium Committee, Department of Physics, Ohio State University, USA.

March 2007, Chair of session P3 at the APS March Meeting, Denver, USA

January 2007, Chair of session EC at the 10th annual MMM conference, Baltimore, USA.

December 2006 – present, Head of the Nanowire Focus subgroup of ENCOMM, Ohio State University, USA.

September 2006 – June 2007, Member of the Graduate Studies Committee, Department of Physics, Ohio State University, USA.