Brian Akira Collins

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Department of Physics and Astronomy
Washington State University
Pullman, WA 99164

BrianAkiraCollins@gmail.com
919-619-7847 (Cell)
301-975-6783 (Office)

Education:

- Ph.D. in Physics, University of North Carolina, Chapel Hill, NC (August 2009)
- M.S. in Physics, University of North Carolina, Chapel Hill, NC (December 2005)
- B.A. in Physics, minor in music, magna cum laude, Gustavus Adolphus College, St. Peter, MN (May 2003)

Professional Employment & Experience:

- Assistant Professor (2014 – present)
  Department of Physics and Astronomy, Washington State University
- NRC Postdoctoral Fellow (2012 – 2014)
  Adviser: Dr. Dean Delongchamp, Materials Science and Engineering Division
  National Institute of Standards and Technology, Gaithersburg
  Development of polarized resonant x-ray scattering and microscopy on organic materials and devices
- Postdoctoral Associate (2009 – 2012)
  Adviser: Dr. Harald Ade, Department of Physics, North Carolina State University
  X-ray spectromicroscopy & resonant scattering on organic materials and organic device fabrication & characterization
- Graduate Research Assistant (2005-2009)
  Adviser: Dr. Frank Tsui, Dept. of Physics and Astronomy, University of North Carolina, Chapel Hill, NC
  Thesis: Synchrotron X-ray studies of structural and chemical ordering in group IV-based magnetic epitaxial films
  Teaching Assistant (2003-2005)
  Department of Physics and Astronomy, University of North Carolina, Chapel Hill, NC
- NSF Research Experience for Undergraduates (2002)
  Adviser: Dr. Paul Crowell, Department of Physics, University of Minnesota, Minneapolis, MN
  Spin transport in ferromagnet-semiconductor heterostructures measured with ultrafast polarized spectroscopy
- NSF Research Experience for Undergraduates (2001)
  Adviser: Dr. Enrique Barrera, Department of Physics, Rice University, Houston, TX
  Thermo-environmental fabrication and analysis of single-walled carbon nanotubes

Fellowships and Recognition:

- Berkeley National Laboratory and Advanced Light Source Science Highlights
  - March 2013: The importance of domain size and purity in high-efficiency organic solar cells
  - October 2012: Polarized X-rays Reveal Molecular Alignment in Printed Electronics
  - April 2011: New Morphological Paradigm Uncovered in Organic Solar Cells
- National Research Council RAP Fellowship at NIST, Gaithersburg, MD (2012-2014)
- University of North Carolina Graduate School Dissertation Completion Fellowship (2008-2009)
- Outstanding Paper Award, 24th North American Conference on Molecular Beam Epitaxy, (2006)
- National School on Neutron and X-ray Scattering, Training Fellowship, Argonne National Laboratory, IL (Aug. 2006)
- University of North Carolina Board of Governors Fellowship (2003-2004)
- Julian A. Crawford Memorial Prize in Physics, Gustavus Adolphus College (2002-2003)
- Partners In Scholarship (Tuition award), Gustavus Adolphus College (1999-2003)

Memberships and Service:

- User Executive Committee, Advanced Light Source at Berkeley National Lab (starting 2014).
- American Physical Society (2006 – present)
  - Abstract Sorter 2013 & 2014 March Meeting
  - Chair *Polymers for Energy Storage and Conversion – Photovoltaics*, 2014 March Meeting
  - Chair *Organic Electronics and Photonics – Transport*, 2014 March Meeting
  - Chair *Organic Electronics and Photonics - Morphology and Structure II*, 2013 March Meeting
- Materials Research Society (2009 – present)
- Organic Devices Journal Club, North Carolina State University, Organizer (2009 – 2012)
- Administrative Board of the Library, UNC Graduate Student Representative (2007 – 2009)
- Graduate Student Association Grievances Officer, UNC Physics (2007 – 2009)
- Graduate Student Association K-12 Physics Outreach Team, UNC Physics (2007 – 2009)
- Graduate Student Recruitment Organizer & Liaison, UNC Physics (2003 – 2005)
- Phi Beta Kappa Honor Society (2002 – present)
- Society of Physics Students, Gustavus Chapter

Teaching & Mentoring:

Mentored student project under the Summer Undergraduate Research Fellowship program at NIST (2013)

Mini-term class at the North Carolina School of Science and Mathematics – magnet high school (2011)

- Instruction and mentoring in organic photovoltaic device physics and laboratory techniques
- Developed an organic solar cell lab for the Environmental Chemistry class curriculum

Private tutor for high school and undergraduate physics students (2003 – 2009)

- College credit obtained by students through the Advanced Placement exam

Teaching Assistant for undergraduate courses at University of North Carolina (2003 – 2005)

- PHYS 116: Mechanics Recitation and Laboratory (Calculus based)
- PHYS 105: E&M and Modern Laboratory (Non-calculus)
- PHYS 104: Mechanics Laboratory (Non-calculus)

Laboratory Assistant/Grader for undergraduate physics courses at Gustavus Adolphus College (2002-2003)

Successful Beamtime Proposals:

- E. Gann, B. A. Collins, H. Yan, H. Ade, "Development and use of Grazing Incidence X-ray Scattering to Determine Crystallinity and Molecular Alignment in Novel Organic Thin Film Devices" (ALS-04131 for beamline 7.3.3) Jan. 2011 – Dec. 2012
- B. A. Collins, R. J. Kline, D. M. Delongchamp, "Probing noncrystalline molecular ordering in organic electronics with polarized resonant scattering" (ALS-05599 for beamlines 7.3.3, 11.0.1.2, and 11.0.2) Jan. 2013 – Dec. 2014

Invited Research Talks:

1. Washington State University Physics Colloquium, Pullman WA, Feb. 13, 2014.
2. Vermont University Physics/Materials Science Colloquium, Burlington, VT, Feb. 10, 2014.
3. University of New Hampshire Physics/Materials Science Colloquium, Durham, NH, January 29th, 2014.
4. ***Plenary Speaker:*** "X-ray measurements of nano-to-mesoscale structure informing the optoelectronic processes in organic devices." Advanced Light Source User Meeting, Berkeley, CA, October 8th 2013.

5. "A model to explain anisotropic resonant X-ray scattering from isotropic organic systems." Resonant Soft X-ray Scattering for Mesoscale Science Workshop, ALS User Meeting, Berkeley, CA, October 9th 2013.
6. "New types of ordering in functional organic materials revealed with resonant scattering." Neutron and Nano User Meeting, Oak Ridge National Laboratory, TN, August 15th, 2013.
7. "New insights into organic devices revealed using resonant x-ray scattering." Canadian Light Source User Meeting, Saskatoon, Saskatchewan, CA, May 2, 2013.
8. "Measurement of hierarchical structures in organic photovoltaics using resonant x-rays." Materials Research Society Fall Meeting, Boston, MA, November 28th, 2012.
9. "Problems measuring morphology and ordering in organic electronics and how coherent soft X-rays could solve them." Coherent Scattering and Microscopy (COSMIC) Imaging Workshop, Advanced Light Source User Meeting, Berkeley, CA October 10, 2012.
10. "Miscibility in OPVs: Roll in Morphology and Device Operation." Soft X-Ray Characterization of Organic Devices and Energy Materials Workshop, Advanced Light Source User Meeting, Berkeley, CA, October 5, 2011.
11. ***Plenary Speaker***: "Unique Contrast Mechanisms Using Resonant X-Ray Scattering: The Key to Nanoscale Insight in Organic Devices." Advanced Light Source User Meeting, Berkeley, CA, October 4, 2011.
12. "Organic Devices: An application in need of new tools." Coherent Scattering and Microscopy (COSMIC) Workshop, Lawrence Berkeley National Laboratory, CA, June 7, 2011.

Contributed Talks:

13. "Correlated molecular orientation in all-polymer solar cells and its role in free charge generation." To be given at the American Physical Society March Meeting, Denver, CO, March, 2014.
14. "Exploring novel scattering contrast mechanisms of resonant x-rays in organic matter." Low-Q Seminar, NIST Center for Neutron Research, September 4th, 2013.
15. "Control of molecular orientation at donor/acceptor interfaces in bulk heterojunction organic solar cells." Materials Research Society Spring Meeting, San Francisco, CA, April 3, 2013.
16. "The impact of miscibility on OPV performance and stability." American Physical Society March Meeting, Baltimore, MD, March 21, 2013.
17. "Orientational pattering in organic solar cells revealed with polarized resonant scattering." 2012 Conference on Synchrotron Radiation in in Polymer Science, San Francisco, CA. March 30th – April 2nd, 2012.
18. "Correlation of Channel Mobility in OTFTs with Domain Cluster Size Directly Measured using P-SoXS." Materials Research Society Fall Meeting, Boston, MA, November 28, 2011.
19. "Phase purity in organic solar cells." American Physical Society March Meeting, Dallas, TX, March 23, 2011.
20. "Miscibility in polymer solar cells: Do we need a new paradigm describing device function?" Materials Research Society Fall Meeting, Boston, MA, December 1, 2010.
21. "Local structure of Mn-Co codoped Ge epitaxial films of dilute magnetic semiconductors." American Physical Society March Meeting, Pittsburgh, PA, March 19, 2009.
22. "Structure and Chemical Ordering of Heusler Alloys using X-Ray Scattering Techniques." Advanced Photon Source User Science Seminar, Argonne National Laboratory, Argonne, IL, November 7, 2008.

23. "Structure and chemical ordering in epitaxial films of $Co_xMn_yGe_{1-x-y}$." American Physical Society March Meeting, New Orleans, LA, March 13, 2008.

24. "Effects of Complementary Doping of Transition Metals into Ge Epitaxial Films." American Physical Society March Meeting, Denver, CO, March 8, 2007.

25. "Evolution of Chemical Ordering and Magnetism in Heusler Alloys $(Co_2Mn)_{1-x}Ge_{1+x}$.", North American Molecular Beam Epitaxy Conference, Duke University, Durham, NC, October 10, 2006.

26. "Structural and Magnetic Phase Diagrams of Co and Mn Doped Ge (100) Epitaxial Films." American Physical Society March Meeting, Baltimore, MD, March 14, 2006.

27. "Structural and Magnetic Properties of Magnetic Semiconductors." Advanced Photon Source User Science Seminar, Argonne National Laboratory, Argonne, IL, June 28, 2005.

Book Chapter:

1. B. A. Collins, F. A. Bokel, D. M. Delongchamp, "Organic Photovoltaic Morphology" in *Organic Photovoltaic Devices*, Christoph Brabec Ed., STM-Books (Wiley) 2014.

Peer Reviewed Publications:

1. M. Schubert, B. A. Collins, H. Mangold, I. A. Howard, W. Schindler, K. Vandewal, S. Rloand, J. Behrends, F. Kraffert, R. Steyrleuthner, Z. Chen, K Fostiropouulos, R. Bittl, A. Salleo, A. Facchetti, F. Laquai, H. Ade, D. Neher, "Correlated Donor/Acceptor Crystal Orientation and Fast Charge-Transfer State Recombination Controls Photocurrent Generation in All-Polymer Solar Cells." *Adv. Func. Mater.* DOI: 10.1002/adfm.201304216 – Accepted as VIP.

2. R. Steyrleuthner, R. Di Pietro, B. A. Collins, F. Polzer, S. Himmelberger, H. Kirmse, M. Schubert, Z. Chen, A. Salleo, H. Ade, A. Facchetti and D. Neher, "The role of regioregularity and crystallinity on electron transport anisotropy in a high mobility n-type copolymer." *J. Am. Chem. Soc.* **136**, 4245 (2014).

3. J. R. Tumbleston, B. A. Collins, L. Yang, A. C. Stuart, E. Gann, W. Ma, W. You, H. Ade, "The influence of molecular orientation on organic bulk heterojunction solar cells." *Nature Photonics*, **8**, 385 (2014).

4. J. R. Tumbleston, A. D. Gadisa, Y. Liu, B. A. Collins, E. T. Samulski, R. Lopez, H. Ade, "Modifications in morphology resulting from nanoimprinting bulk heterojunction blends for light trapping organic solar cell designs." *ACS Applied Materials and Interfaces*, **5**, 8225 (2013).

5. J. A. Bartelt, Z. M. Beiley, E. T. Hoke, W. R. Mateker, J. D. Douglas, B. A. Collins, J. R. Tumbleston, K. R. Graham, A. Amassian, H. Ade, J. M. J. Fréchet, M. F. Toney, M. D. McGehee "The importance of fullerene percolation in the mixed regions of polymer-fullerene bulk heterojunction solar cells." *Adv. Energy Mater.* **3**, 364 (2013).

6. J. E. Cochran, E. Amir, K. Sivanandan, S.-Y., Ku, J. H. Seo, B. A. Collins, J. R. Tumbleston, M. F. Toney, H. Ade, C. J. Hawker, M. L. Chabinyc "Synthesis, solid-state, and charge-transport properties of conjugated polythiophene-*S,S*-dioxides." *J. Poly. Sci. B*, **51**, 48 (2013).

7. B. A. Collins, Z. Li, J. R. Tumbleston, E. Gann, C. R. McNeill, H. Ade, "Absolute measurement of domain composition and nanoscale size distribution explains performance in PTB7:$PC_{71}BM$ solar cells." *Adv. Energy Mater.*, **3**, 65, (2013). **– Feature Article**.

8. B. A. Collins, H. Ade, "Quantitative compositional analysis of organic thin films using transmission NEXAFS spectroscopy in an x-ray microscope." *J. Electron Spectrosc.*, **85**, 119 (2012).

9. E. Gann, A. Young, B. A. Collins, H. Yan, J. Nasiatka, H. A. Padmore, H. Ade, A. Hexemer, C. Wang, "Soft x-ray scattering facility at the Advanced Light Source with real-time data processing and analysis." *Rev. Sci. Instrum.*, **83**, 045110 (2012).

10. B. A. Collins, J. Cochran, H. Yan, E. Gann, C. Hub, R. Fink, C. Wang, T. Schuettfort, C. R. McNeill, M. L. Chabinyc, H. Ade, "Polarized x-ray scattering reveals noncrystalline orientational ordering in organic films." *Nat. Mater.*, **11**, 536 (2012). [Selected for *Nature Materials* "News and Views"]

11. X. He, B. A. Collins, B. Watts, H. Ade, C. R. McNeill, "Studying polymer/fullerene interdiffusion and miscibility in laterally-patterned films with x-ray spectromiscroscopy." *Small*, **8**, 1920 (2012).

12. H. Yan, B. A. Collins, E. Gann, C. Wang, H. Ade, C. R. McNeill, "Correlating the efficiency and nanomorphology of polymer blend solar cells utilizing resonant soft x-ray scattering." *ACS Nano*, **6**, 677 (2012).

13. ***Invited***: B. A. Collins, J. R. Tumbleston, H. Ade, "Miscibility, crystallinity, and phase development in P3HT:PCBM solar cells: Towards an enlightened understanding of device morphology and stability." *J. Phys. Chem. Lett.*, **2**, 3135 (2011).

14. B. A. Collins, L. Zhe,C. R. McNeill, H, Ade, "Fullerene-dependent miscibility in the silole-containing copolymer PSBTBT-08." *Macromolecules*, **44**, 9747 (2011).

15. L. He, B. A. Collins, F. Tsui, Y. S. Chu, "Epitaxial growth of Co(x)Mn(y)Si(z) (111) thin films in the compositional range around the Heusler alloy Co(2)MnSi." *J. Vac. Sci. Technol. B* **29**, 03C124 (2011). **– Feature Article**.

16. B. A. Collins, E. Gann, L. Guignard, X. He, C. R. McNeill, H. Ade, "Molecular Miscibility of Polymer-Fullerene Blends." *J. Phys. Chem. Lett.* **1**, 3160 (2010).

17. P. K. Muduli, W. C. Rice, L. He, B. A. Collins, Y. S. Chu, F. Tsui, "Study of magnetic anisotropy and magnetization reversal using the quadratic magnetooptical effect in epitaxial $Co_xMn_yGe_z$ (111) films." *J. Phys Cond. Matter* **21**, 296005 (2009).

18. B. A. Collins, Y.S. Chu, L. He, Y. Zhong, and F. Tsui, "Dopant stability and strain states in Co and Mn doped Ge (001) epitaxial films." *Phys. Rev. B*, **77**, 193301 (2008).

19. F. Tsui, B. A. Collins, L. He, A. Mellnik, Y. Zhong, S. Vogt, Y.S. Chu, "Combinatorial synthesis and characterization of a ternary epitaxial film of Co and Mn doped Ge(001)." *Appl. Surf. Sci.* **254**, 709 (2007).

20. Yuncheng Zhong, Yong S. Chu, Brian A. Collins, Frank Tsui., "High-resolution X-ray diffraction studies of combinatorial epitaxial Ge(001) thin-films on Ge(001) substrates." *Appl. Surf. Sci.* **254**, 714 (2007)

21. Brian A. Collins, Yuncheng Zhong, Yong Chu, Liang He, Frank Tsui. "Anomalous x-ray diffraction study of the Heusler Alloy Co_2MnGe." *J. Vac. Sci. Technol. B* **25**, 999 (2007).

22. Liang He, Brian Collins, Frank Tsui. "Epitaxial Growth of $(FeCo)_xGe_{1-x}$(001)." *J. Vac. Sci. Technol. B* **25**, 1217 (2007).

23. E. V. Barrera, L. P. F. Chibante, B. Collins, F. Rodriquez-Marcias, M. Shofner, J. D. Kim, and F. D. S. Marquis. "Recycling Nanotubes from Polymer Nanocomposites." *Powder Materials Current Research and Industrial Practices*,267-282 (2001).