Dr. David C. Coffey

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Education

- **Ph.D. in Physics**, May 2007, University of Washington, Seattle, WA
  Dissertation Title: Characterizing the Local Optoelectronic Performance of Organic Solar Cells with Scanning Probe Microscopy
- **M.S. in Physics,** January 2003, University of Washington, Seattle, WA
- **B.S. in Mathematics. B.S. in Physics**, May 2001, University of the South, Sewanee, TN
  Summa cum laude with honors

Professional Experience

Assistant Professor; Warren Wilson College; Swannanoa, NC, July 2012- present

- Taught undergraduate courses including general physics I, general physics II, inorganic chemistry, materials science, the science and food and cooking, quantum mechanics and astronomy
- Collaborated with researchers at the National Renewable Energy Laboratory and the University of Washington on several research studies and journal articles (see publications section)
- Wrote book chapter on nanotechnology fabrication (see publications section, 2015)
- Mentored multiple students each year on undergraduate research projects, including projects associated with excitonic solar cells, graphene film patterning, and microbial fuel cells. Students have been awarded North Carolina Academy of Science (NCAS) Yarbrough grants three times and presented at the local NCAS meeting three times for this work
- Managed students in building a steady-state, photo-induced absorption measurement apparatus
- Presented photovoltaic research seminars at local society meetings including Sigma Xi and IEEE (see talks/posters section)
- Taught Natural Science Research and Advanced Natural Science Research, the courses that facilitate undergraduate natural science research projects
- Elected as one of the six faculty representatives of the Warren Wilson College forum, its shared governance body (2013-present)
- Chair of Warren Wilson College's forum policy committee (2014-present). Managed committee meetings for writing policy, gathering community feedback, and shepherding policy through the governance process

Visiting Researching; National Renewable Energy Laboratory; Golden, CO, Summer of 2014

- Awarded grant for this research through the Department of Energy Visiting Faculty Program
- Devised research methods to characterize charge creation and energy transfer in excitonic solar cells
- Mentored graduate students in characterizing excitonic solar cells

Research Faculty; University of Colorado; Boulder, CO, Jan. 2012- May 2012

- In collaboration with the National Renewable Energy Laboratory, devised, fabricated, and characterized fluorescence properties of fullerene-polymer solar cells
- Mentored graduate students in their research project

Postdoctoral Researcher; National Renewable Energy Laboratory; Golden, CO, Dec. 2008- Dec 2011

- Devised, fabricated, and characterized novel polymer and small-molecule solar cells
- Employed Time-Resolved Microwave Conductivity (TRMC) to study fundamental charge creation and energy transfer processes
- Primary author for two winning proposals for Laboratory Directed Research and Development Grants ($500k and $1M awarded)
- Initiated research collaborations with Colorado State University and the University of Colorado

Senior Scientist; Nano-Terra, Inc. (a Harvard-based startup); Cambridge, MA, June 2007- Sept. 2008

- Scientific project manager through two phases of project in partnership with Japanese printing company, leading to the successful fabrication of organic transistors with soft-lithographic printing and demonstration of potential manufacturing scale-up
- Originated inking and printing procedures of flexible electronics, designed and built prototype printing machines in collaboration with engineering team, and assessed resulting devices
- Authored three patent applications (see references below)
- Co-led company's whitepaper and grant writing efforts. Lead author of two officially encouraged whitepapers and two awarded DARPA grants (~$1M awarded)
- Supervised two Boston University undergraduate students in full-time, semester-long internships

Research Assistant; Ginger Laboratory: University of Washington- Chemistry, Seattle, WA, Nov. 2003- May 2007

- Designed new methods of coupling optical spectroscopy with scanning probe microscopy (SPM) to study nanostructured solar cells. Led to a 10× improvement in characterization resolution over previous techniques
- Devised a new method to guide the self assembly of polymer blend films with 100 nm resolution by patterning surface chemistry with Dip-Pen nanolithography
- Planned/built/purchased laboratory equipment, established protocols, and led both graduate and undergraduate students (first graduate student in this laboratory)
- Authored several articles and delivered over a dozen talks at conference meetings/workshops, requiring the clear and concise presentation of complex scientific data (see details below)
- Mentored two undergraduate students in research laboratory
- Taught introductory physics labs, 2 weekly lab sections

Research Assistant, University of Washington- Physics, Seattle, WA, Sept. 2002- Oct 2003

- Fabricated carbon nanotube and Se-nanowire devices with CVD, optical lithography, and e-beam lithography
- Performed low-temperature, electronic spectroscopy

Research Assistant, Fermilab, E835, Batavia, IL, summer 2000

- Wrote a beamline analysis program and monitored data runs for Charmonium spectroscopy project

Research Assistant, Gunton Laboratory, Lehigh University, Bethlehem, PA, summer 1999
- Programmed Monte Carlo simulations of supercooled gases

Honors and Awards
- Have been elected as one of the six faculty representatives of the Warren Wilson College forum, its shared governance body (2013-2017)
- Awarded a 'Commendation in Service' to the college from Warren Wilson College (2016)
- Awarded grant to participate in the Department of Energy's Visiting Faculty Program at the National Renewable Energy Laboratory (2014)
- Awarded 1M Laboratory Directed Research and Development Grant at NREL (2011)
- Awarded 500k Laboratory Directed Research and Development Grant at NREL (2009)
- MRS Fall Meeting Graduate Student Award Silver Medalist, 2006
- Global School for Advanced Studies Scholar, Advanced Solar Cells session, Taiwan, 2006
- Co-leader of winning fellowship team at Global School for Advanced Studies, 2006
- Poster prize nomination at Material Research Society Fall Meeting, 2005
- NSF, IGERT Nanotechnology Fellowship, awarded for graduate education and research in nanotechnology at the University of Washington, competitive renewal, 2002-2005
- Achievement Reward for College Scientists (ARCS) scholarship, 2001-2004
- Kenneth Young Memorial Scholarship, awarded for graduate education and research at the University of Washington, 2001-2002
- Research Experience for Undergraduate Grant, Fermilab, 2000
- Member of Phi Beta Kappa since 2000
- Research Experience for Undergraduate Grant, Lehigh University, 1999
- Graduated summa cum laude with honors from the University of the South, TN, 2001
- Chancellor's Scholarship to the University of the South, 1997-2001

Publications
Academic Publications (in reverse chronological order)
- Larson, B.W.; Reid, O.G.; Coffey, D.C.; Avdoshenko, S.M.; Alexey, A.P.; Boltalina, O.V.; Strauss, S.H.; Kopidakis, N.; Rubmles, G. "Inter-Fullerene Electronic Coupling Controls the Efficiency of Photoinduced Charge Generation in Organic Bulk Heterojunctions." Advanced Energy Materials, DOI: 10.1002/aenm.201601427, (2016)
- Coffey, D.C; Wei, J. "Template Guided Structuration of Polymer Films." *Polymer Surface in Motion*. Ed. Rodriguez-Hernandez, J., and Drummond, E.; Switzerland: Springer, (2015)
- Cox, P.A.; Glaz, M.S.; Harrison, J.S.; Peurifoy, S.R.; Coffey, D.C.; Ginger, D.S. "Imaging Charge Transfer State Excitations in Polymer/Fullerene Solar Cells with Time-Resolved Electrostatic Force Microscopy," The Journal of Physical Chemistry Letters, 8(15), 2852-2858 (2015)
- Callahan, R.; Clark, N.; Coffey, D.C.; Chen, D.; Walba, D.; Rumbles, G. "Charge Generation Measured for Fullerene – Helical Nanofilament Liquid Crystal Heterojunctions," ACS Applied Materials & Interfaces, 6 (7), 4823-30 (2014)

- Coffey, D. C.; Larson, B. W.; Hains, A. W.; Whitaker, J. B.; Kopidakis, N.; Boltalina, O. V.; Strauss, S. H.; Rumbles, G. "Optimal Driving Force for Converting Excitons into Free Carriers in Excitonic Solar Cells," Journal of Physical Chemistry C. 116 (16), 8916-8923 (2012)
- Coffey, D.C.; Ferguson, A.J.; Kopidakis, N.; Rumbles, G., "Photovoltaic Charge Generation in Organic Semiconductors Based on Long-Range Energy Transfer," ACS Nano, 4 (9), 5437-5445 (2010)
- Reid, O.R.; Rayermann, G.E.; Coffey, D.C.; Ginger, D.S., "Imaging Local Trap Formation in Conjugated Polymer Solar Cells: A Comparison of Time-Resolved Electrostatic Force Microscopy and Scanning Kelvin Probe Imaging," Journal of Physical Chemistry, 144 (48), 20672-20677 (2010)
- Coffey, D.C.; Kopidakis, N.; Ferguson, A.; Laird, D.; Sheina, E.; Rumbles, G., "Transient Microwave Conductivity Studies of Poly(3-alkyl thiophene)s and Blends with PCBM," OSA Technical Digest (CD), LMA3 (2010)
- Rumbles, G.; Kopidakis, N.; Ferguson, A.; Coffey, D.; Blackburn, J.; Heben, M., "Charge Transfer at Conjugated Polymer:Fullerene Interfaces," Proceedings of the Thirty-First DOE Solar Photochemistry Research Meeting, 99-103 (2009)
- Halter, M.; Liao, Y.; Plocinik, R.M.; Coffey, D.C.; Bhattacharjee, S.; Mazur, U.; Simpson, G.J.; Robinson, B.H.; Keller, S.L., "Molecular self-assembly of mixed high-beta zwitterionic and neutral ground state NLO chromophores," Chemistry of Materials, 20 (5), 1778-1787 (2008)
- Pingree, L. S. C.; Rodovsky, D. B.; Coffey, D. C.; Bartholomew, G. P.; and Ginger, D. S., "Scanning Kelvin Probe Imaging of the Potential Profiles in Fixed and Dynamic Planar LECs," Journal of the American Chemical Society, 129, 15903-15910 (2007).
- Coffey, D.C.; Reid, O.R.; Rodovsky, D.B.; Bartholomew, G.P.; Ginger, D.S, "Mapping Local Photocurrents in Polymer/Fullerene Solar Cells with Photoconductive Atomic Force Microscopy," Nanoletters, 7 (3), 738-744 (2007)
- Wei, J.H.; Coffey, D.C.; Ginger, D.S., "Nucleating Pattern Formation in Spin-Coated Polymer Blend Films with Nanoscale Surface Templates," Journal of Physical Chemistry B, 110 (48), 24324-24330 (2006)
- Coffey, D.C.; Ginger, D.S., "Time-resolved electrostatic force microscopy of polymer solar cells," Nature Materials, 5, 735-740 (2006)
- Coffey, D.C.; Ginger, D.S., "Patterning Phase separation in Polymer Films with Dip-Pen Nanolithography," Journal of the American Chemical Society, 127 (13), 4564 (2005)

Patents and Patent Applications

- Coffey, D.C.; Mayers, B.T.; McLellan, J.M., "Anti-reflection coatings comprising ordered layers of nanowires and methods," U.S. Patent 08574710 .
- Mayers, B.T.; McLellan, J.M., Chauhan, K.; Saadi, W.; Dickey, K.; Agarwal, S.; Coffey, D.C.; Stewart, K.R., "Structured Smudge-Resistant Coatings and Methods of Making and Using the Same," U.S. Patent Application 12/189,485
- Coffey, D.C.; Agarwal, S.; Dickey, K.; Mayers, B.T.; Carbeck, J., "Polymer composition for preparing electronic devices by microcontact printing processes and products prepared by the processes," U.S. Patent Application 12/052,329

Research Highlighted in Common Press

- Coffey, D.C.; Ginger, D.S., "Mapping efficiency variations in plastic solar cells," SPIE newsroom, February (2007)—highlighting 2006 Nature Materials paper
- Rugani, L., "AFM measures photocurrent distribution in solar cells," Photonics.com, April (2007)—highlighting 2007 Nanoletters paper
- Nikbin, D., "Microscopy sheds light on organic solar cells," Optics.org, August (2006) — highlighting 2006 Nature Materials paper
- McGehee, M.D.; Topinka, M.A., "Solar Cells: Pictures from the blended zone," Nature Materials, 5, 675-676 (2006)—news and view article highlighting 2006 Nature Materials paper

Talks/Posters

- IEEE Power and Energy Society meeting, University of North Carolina Asheville, March 24th, 2015 (seminar)
- Sigma Xi meeting, Warren Wilson College, Feb. 10th 2015 (seminar)
- National Renewable Energy Laboratory, Golden Colorado, VFP Seminar, 2014 (seminar)
- National Renewable Energy Laboratory, Golden Colorado, TRMC, 2014 (seminar)
- Material Research Society Fall Meeting, Boston, Nov. 29th, 2011 (seminar)
- Chemical Sciences Seminar Series, NREL- Golden Colorado, Aug. 3, 2011 (seminar)
- Chemical Sciences Seminar Series, NREL- Golden Colorado, Aug. 18, 2010 (seminar)
- Gordon Research Conference on Electronic Processes in Organic Materials, Mount Holyoke, July 25-July 30, 2010 (poster)
- Material Research Society Fall Meeting, Boston, Nov. 30-Dec. 4, 2009 (poster)
- Center for Materials and Devices for Information Technology Research (CMDITR) seminar, Seattle, Dec. 8, 2006 (talk)
- Material Research Society Fall Meeting, Graduate Student Award Talk, Boston, Nov. 27-Dec. 1, 2006 (talk)
- Material Research Society Fall Meeting, Boston, Nov. 27-Dec. 1, 2006 (poster)
- Global School for Advanced Studies (GSAS) session on advanced solar cells, Hsinchu and Taipei, Taiwan, Sept. 19-29, 2006 (talk)
- Gordon Research Conference on Electronic Processes in Organic Materials, Mount Holyoke, July 30- Aug. 4, 2006 (poster)
- Center for Materials and Devices for Information Technology Research (CMDITR) annual retreat, Feb. 2006 (talk)
- Material Research Society Fall Meeting, Boston, Nov. 28- Dec. 2, 2005 (talk)
- Material Research Society Fall Meeting, Boston, Nov. 28- Dec. 2, 2005 (poster)
- Nanoscale Science and Technology Workshop, Seattle, September 2005 (talk)
- Material Research Society Fall Meeting, San Francisco, March 28-April 1, 2005 (poster)
- Gordon Research Conference on Electronic Processes in Organic Materials, Mount Holyoke, July 25-30, 2004 (poster)

Professional Affiliations

- Material Research Society (MRS)
- American Physical Society (APS)
- Sigma Pi Sigma- physics honor society
- Phi Beta Kappa