

**Cullen R. Buie, Ph.D.**

*Associate Professor*

Esther and Harold E. Edgerton Career Development Professor

Department of Mechanical Engineering

Massachusetts Institute of Technology

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**Massachusetts  
Institute of  
Technology**

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**EDUCATION**

**Stanford University**

2009

**Doctor of Philosophy, Mechanical Engineering**

Dissertation: “Application of Electroosmotic Pumps to Low Temperature Fuel Cells”

Ph.D. Advisor: Juan G. Santiago

2005

**Master of Science, Mechanical Engineering**

**The Ohio State University**

2003

**Bachelor of Science, Mechanical Engineering, *magna cum laude***

Undergraduate Honors Thesis: “Modeling, Analysis, and Application of NiTi Shape Memory Alloy Wire”

**RESEARCH APPOINTMENTS**

2009 – present

**Massachusetts Institute of Technology, Cambridge, MA**

**Department of Mechanical Engineering**

2015 – present

*Associate Professor (without tenure)*

2014 – present

*Esther and Harold E. Edgerton Career Development Professor*

2010 – 2013

*Mitsui Career Development Professor*

2010 – 2015

*Assistant Professor*

2008 – 2009

**University of California-Berkeley, Berkeley CA**

**Professor Liwei Lin, PI**

*University of California President’s Postdoctoral Fellow*

2003 – 2008

**Stanford Microfluidics Laboratory, Stanford, CA**

**Professor Juan Santiago, PI**

*Graduate Research Assistant*

Summer 2006

**Lawrence Livermore National Laboratory, Livermore, CA**

*Summer Research Scholar*

2001 – 2003

**Intelligent Structures and Systems Laboratory, Columbus, OH**

**Professor Gregory Washington, PI**

*Undergraduate Research Assistant*

**JOURNAL PUBLICATIONS**

Joung, Y.S.; Ramirez, R.; Bailey, E.; Adenekan, R.; Buie, C.R.; “Conductive Hydrogel Films Produced by Freestanding Electrophoretic Deposition and Polymerization at the Interface of Immiscible Liquids” (*submitted*).

- Moran, J.L.\*; Garcia, P.A.\*; Dingari, N.N.; and C.R. Buie, "Numerical Study of the Effect of Soft Layer Properties on Bacterial Electroporation," (*submitted*).
- Wang, Q.; Dingari, N.N.; and C.R. Buie, "Particle Trajectories under the Influence of Nonlinear Electrokinetic Effects at Insulating Microchannel Constrictions," (*submitted*).
- Zhang, P., Wang, Q., Jones III, A.-A. D., Lin, L., and C. R. Buie, "Cell Envelope Polarizability Correlates with Bacterial Extracellular Electron Transport", (*submitted*).
- Joung, Y.S.; Ge, Z.; Buie, C.R., "Soil-to-Air Transfer of Bacteria by Raindrops," *Nature Communications* (*accepted*).
- Garcia, P.A.; Ge, Z.; Kelley, L.E.; Holcomb, S.J. and C.R. Buie, "Hydrodynamically Controlled Electric Fields for High Efficiency Bacterial Flow-through Transformation," *Lab Chip*, (*accepted*).
- Suss, M. E.; Conforti, K.; Gilson, L.; Buie, C. R.; and M.Z. Bazant, "Membraneless Flow Battery Leveraging Flow-through Heterogeneous Porous Media for Improved Power Density and Reduced Crossover," *RSC Advances*, 2016, 6, (102), 100209-100213.
- Schor, A.R. and C.R. Buie, "Rapid fabrication of three-dimensional structures for dielectrophoretic sorting of lipid-containing organisms," *Journal of Micromechanics and Microengineering*, 2016, 26, (10), 105010.
- Figliuzzi, B.; Chan, W.H.R.; Moran, J.L. and C.R. Buie, "Nonlinear electrophoresis in the presence of dielectric decrement," *Physical Review E*, 2016, 94, (2), 023115.
- Garcia, P.A.\*, Ge, Z.\*, Moran, J.L.\*, and C. R. Buie, "Microfluidic Screening of Electric Fields for Electroporation," *Scientific Reports*, 2016, 6, 21238.
- Ge, Z.; Girguis, P. R.; and C.R. Buie, "Nanoporous Microscale Microbial Incubators," *Lab Chip*, 2016.
- Joung, Y. S.; and C.R. Buie, "Antiwetting Fabric Produced by a Combination of Layer-by-Layer Assembly and Electrophoretic Deposition of Hydrophobic Nanoparticles," *ACS Applied Materials & Interfaces* 2015, 7, (36), 20100-20110.
- Flores, J. Q.; Joung, Y. S.; Kinsinger, N. M.; Lu, X.; Buie, C. R.; and S.L. Walker, "Antimicrobial Behavior of Novel Surfaces Generated by Electrophoretic Deposition and Breakdown Anodization," *Colloids and Surfaces B: Biointerfaces*, 2015, 134, 204-212.
- Joung, Y.S., and C.R. Buie, "Aerosol Generation by Raindrop Impact on Soil," *Nature Communications*, 2015, 6.
- Braff, W.A., Bazant, M.Z., and C.R. Buie, "Inertial effects on the generation of co-laminar flows," *Journal of Fluid Mechanics*, 2015, 767, 85-94.
- Figliuzzi, B., Chan, W. H. R., Moran, J. L., and Buie, C. R., "Nonlinear electrophoresis of ideally polarizable particles," *Physics of Fluids*, 2014, 26, 102002-1:102002-21.
- Dingari, N.N., and C.R. Buie, "A theoretical investigation of bacteria polarizability under direct current electric fields," *Langmuir*, 2014, 30, (15), 4375-4384.

- Joung, Y.S., Figliuzzi, B.M., and C.R. Buie, "Design of Capillary Flows with Functionally Graded Porous Films Fabricated by Anodization Instability," *Journal of Colloid and Interface Science*, 2014, 423, (0), 143-150.
- Joung, Y.S., Buie, C.R., "Scaling laws for drop impingement on porous films and papers," *Physical Review E*, 2014, 89, (1), 013015-1:013015-9.
- Braff, W. A., Willner, D., Hugenholtz, P., Rabaey, K., Buie, C. R., "Dielectrophoresis-Based Discrimination of Bacteria at the Strain Level Based on Their Surface Properties," *PLoS One*, 2013, 8, (10), e76751.
- Braff, W. A., Buie, C. R., Bazant, M. Z., "Boundary Layer Analysis of Membraneless Electrochemical Cells," *Journal of the Electrochemical Society*, 2013, 160, (11), A2056-A2063.
- Figliuzzi, B., Buie, C. R., "Rise in Optimized Capillary Channels," *Journal of Fluid Mechanics*, 2013, 731, 142-161.
- Braff, W. A., Bazant, M. Z., Buie, C. R., "Membrane-Less Hydrogen Bromine Flow Battery," *Nature Communications*, 2013, 4.
- Chu, K.-H., Joung, Y.S., Enright, R., Buie, C.R., Wang, E.N., "Hierarchically structured surfaces for boiling critical heat flux enhancement," *Applied Physics Letters*, 2013, 102, p.151602.
- Joung, Y.S., Buie, C.R., "A Hybrid Method Employing Breakdown Anodization and Electrophoretic Deposition for Superhydrophilic Surfaces," *The Journal of Physical Chemistry: B*, 2013, 117, p.1714.
- Braff, W.A., Pignier, A., and Buie, C.R., "High sensitivity three-dimensional insulator-based dielectrophoresis," *Lab Chip*, 2012, 12, p.1327.
- Inoue, S., Parra, E.A., Higa, A., Jiang, Y., Wang, P., Buie, C.R., Coates, J.D., Lin, L., "Structural optimization of contact electrodes in microbial fuel cells for current density enhancements," *Sensors and Actuators A: Physical*, 2012, 177, p.30.
- Joung, Y.S. and C.R. Buie, "Electrophoretic Deposition of Unstable Colloidal Suspensions for Superhydrophobic Surfaces," *Langmuir*, 2011, 27, p. 4156.
- Buie, C. R. and J.G. Santiago, "Two Phase Hydrodynamics in a Miniature Direct Methanol Fuel Cell," *International Journal of Heat and Mass Transfer*, 2009, 52, p. 5158.
- Litster, S., Buie, C. R., and J.G. Santiago, "Engineering Model for Coupling Wicks and Electroosmotic Pumps with Proton Exchange Membrane Fuel Cells for Active Water Management," *Electrochimica Acta*, 2009, 54, p. 6223.
- Buie, C. R.; Kim, D.; Litster, S.; and J.G. Santiago, "An Electroosmotic Fuel Pump for Direct Methanol Fuel Cells," *Electrochemical and Solid-State Letters*, 2007, 10, p. B196.
- Litster, S., Buie, C. R., Fabian, T., Eaton, J. K., and J.G. Santiago, "Active Water Management for PEM Fuel Cells," *Journal of the Electrochemical Society*, 2007, 154, p. B1049.

Buie, C.R., Posner, J.D., Fabian, T., Cha, S.W., Kim, D., Prinz, F.B., Eaton, J.K., and J.G. Santiago, "Water Management in Proton Exchange Membrane Fuel Cells using Integrated Electroosmotic Pumping," *Journal of Power Sources*, 2006, 161, p.191.

## **REFEREED CONFERENCE PUBLICATIONS**

Ge, Z. and C.R. Buie "Combining Soft Lithography and Photo-Polymerization for Engineered Micro-Environment," published in the Proceedings of the Hilton Head Workshop 2016: A Solid-State Sensors, Actuators and Microsystems Workshop, June 5-9, 2016.

Garcia, P.A., Ge, Z., Moran, J.L. and C.R. Buie "Rapid Optimization of Bacterial Electroporation Conditions," published in the Proceedings of the 18th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS 2014), October 26-30, 2014.

Ge, Z., Girguis, P.R. and C.R. Buie "Multi-Species Co-Culture Platform for Physical Segregation and Chemical Communication," published in the Proceedings of the 18th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS 2014), October 26-30, 2014.

Joung, Y.S. and C.R. Buie "Porous Titania Thin Film Microfluidic Devices for Medical Diagnostics," published in the Proceedings of the 18th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS 2014), October 26-30, 2014.

Wang, Q. and C.R. Buie "High Constriction Ratio Continuous Insulator Based Dielectrophoretic Particle Sorting," published in the Proceedings of the 18th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS 2014), October 26-30, 2014.

Wang, Q., Dingari, N.N. and C.R. Buie "Nonlinear Electrokinetic Effects on Particle Motion Near a Microchannel Constriction," published in the Proceedings of the 18th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS 2014), October 26-30, 2014.

Jones III, A.-A.D. and C.R. Buie "A Microfluidic Platform for Evaluating the Anode Substrates for Microbial Fuel Cells," published in the Proceedings of the International Mechanical Engineering Conference and Exposition, Houston, TX, IMECE2012-87781, November 9-15, 2012.

Schor, A.R. and C.R. Buie "Non-Invasive Sorting of Lipid Producing Microalgae with Dielectrophoresis Using Microelectrodes," published in the Proceedings of the International Mechanical Engineering Conference and Exposition, Houston, TX, IMECE2012-88317, November 9-15, 2012.

Joung, Y.S. and C.R. Buie, "Hybrid Electrophoretic Deposition with Anodization Process for Superhydrophilic Surfaces to Enhance Critical Heat Flux," to be published in the Proceedings of the 4th International Conference on Electrophoretic Deposition, Puerto Vallarta, MX, October 2-7, 2011.

Palmer, T.R. and C.R. Buie, "Fundamentals of Pulsed and Direct Current Electrophoretic Infiltration Kinetics," to be published in the Proceedings of the 4th International Conference on Electrophoretic Deposition, Puerto Vallarta, MX, October 2-7, 2011.

Braff, W.A. and C.R. Buie, "Novel Hydrogen Bromine Fuel Cell for High Power Density Applications," to be published in the Proceedings of the 2010 Fall Electrochemical Society Meeting, Las Vegas, NV, October 10-15, 2010.

- Blaesi, A. and C.R. Buie, "Characterization of Pt and Pt-Alloy Catalysts for the Oxidation of Glucose," to be published in the Proceedings of the 2010 Fall Electrochemical Society Meeting, Las Vegas, NV, October 10-15, 2010.
- Parra, E.A., Higa, A., Buie, C.R., Coates, J.D. and L. Lin, "Real-Time Biocatalyst Loading and Electron Transfer via Microfabricated Transparent Electrode," published in the Proceedings of the 23<sup>rd</sup> IEEE Conference on Micro Electro Mechanical Systems, Hong Kong, January 24-28, 2010.
- Buie, C.R., Parra, E. A., Sochol, R.D., Coates, J. D. and L. Lin, "Characterization of Bacteria for Microbial Fuel Cell Applications Using Dielectrophoresis," published in the Proceedings of The 13<sup>th</sup> International Conference on Miniaturized Systems for Chemistry and Life Sciences, Jeju, Korea, November 1-5, 2009.
- Buie, C.R., and Santiago, J.G., "Model and Experimental Study of Hydrodynamic Coupling between a Fuel Pump and a Direct Methanol Fuel Cell," published in the Proceedings of the 214<sup>th</sup> Meeting of the Electrochemical Society, Honolulu, HI, October 12 – 17, 2008.
- Buie, C.R., Litster, S., and J.G. Santiago, "Physics of Pumping Methanol/Water Solutions for Fuel Cell Applications," published in the Proceedings of the ASME International Mechanical Engineering Conference and Exposition, Seattle, WA, IMECE2007-42579, November 11-15, 2007. (Best Student Paper Award)
- Buie, C.R., Buckley, P., Hamilton, J., Ness, K.D., Rose, K.A., "Droplet-based Segregation and Extraction of Concentrated Samples," published in the Proceedings of the 10<sup>th</sup> Annual NSTI Nanotech Meeting, Santa Clara, CA, May 20-24, 2007.
- Buie, C.R., Litster, S.E., Kim, D., Santiago, J.G., "Free Convection Direct Methanol Fuel Cells Powered by Electroosmotic Pumps," published in the Proceedings of the 210<sup>th</sup> Meeting of the Electrochemical Society, Cancun, MX, October 28 – November 3, 2006.
- Kim, D, Buie, C.R., Santiago, J.G., "Towards Electroosmotic Flow-Driven Air Pumps for Miniaturized PEM Fuel Cells," published in the Proceedings of the 210<sup>th</sup> Meeting of the Electrochemical Society, Cancun, MX, October 28 – November 3, 2006.
- Buie, C.R., Banin, Y., Tang, C., Santiago, J.G., Prinz, F.B., Pruitt, B.L., "A Microfabricated Direct Methanol Fuel Cell with Integrated Electroosmotic Pump," published in the Proceedings of the 19<sup>th</sup> IEEE Conference on Micro Electro Mechanical Systems, Istanbul, Turkey, January 22-26, 2006.
- Buie, C.R., Posner, J.D., Fabian, T., Cha, S.W., Prinz, F.B., Eaton, J.K. and J.G. Santiago, "Active Water Management for Proton Exchange Membrane Fuel Cells Using an Integrated Electroosmotic Pump," published in the Proceedings of the International Mechanical Engineering Conference and Exposition, Orlando, FL, IMECE2005-79728, November 5-11, 2005. (Best Student Paper Award)
- Buie, C.R., Posner, J.D., Fabian, T., Cha, S.W., Prinz, F.B., Eaton, J.K. and J.G. Santiago, "Water Removal from Proton Exchange Membrane Fuel Cells via Electroosmotic Pumping," published in the Proceedings of the 208<sup>th</sup> Meeting of the Electrochemical Society, Los Angeles, CA, October 16-21, 2005.

## CONFERENCE PRESENTATIONS

Garcia, P.A., Ge, Z., Moran, J.L., and C.R. Buie "Microfluidic Electroporation Techniques to Accelerate Discovery in Synthetic Biology," Presented at Synthetic Biology: Engineering, Evolution, and Design (SEED 2016), July 18-21, 2016.

Buie, C.R., "Understanding and Exploiting Bacterial Surface Polarizability," Presented at Dielectrophoresis 2014 (Institute of Physics), London, UK, July 13-17, 2014.

Buie, C.R., "Spreading, Splashing, and Sparkling: Drop Impingement Phenomena on Porous Media," Presented at the 57th New England Complex Fluids Workshop, Billerica, MA, June 27, 2014. **(Invited)**

Buie, C.R., "Theory and Applications of Bacterial Polarization," Presented at the 2014 ACS Colloid & Surface Science Symposium, Philadelphia, PA, June 22-25, 2014. **(Invited)**

Joung, Y.S., and C.R. Buie, "Porous Thin Film Microfluidics Devices," Presented at the 6th International Conference on Porous Media, Milwaukee, WI, May 27-30, 2014. **(Invited)**

Joung, Y.S., Ramirez, R., and C.R. Buie, "Conductive Hydrogel Films Produced by Electrophoretic Deposition at the Interface of Immiscible Liquids," presented at the ASME 2014 3rd Global Congress on Nanoengineering for Medicine and Biology, San Francisco, CA, February 2-5, 2014.

Buie, C.R., "Electrophoretic Deposition for Environmentally Friendly Superhydrophobic Fabrics," presented at the International Symposium for Green Manufacturing and Applications, Honolulu, HI, June 25-29, 2013. **(Invited)**

Buie, C.R., "Discrimination of Bacterial Pathogens with High Sensitivity Dielectrophoresis," presented at the 29th International Symposium for Microscale Bioseparations, Charlottesville, VA, March 10-14, 2013. **(Invited)**

Joung, Y.S. and C.R. Buie, "Drop Impingement on Highly Wetting Porous Thin Films: Theoretical Justification for the Washburn-Reynolds Number," presented at the APS 65th Annual Division of Fluid Dynamics Meeting, San Diego, CA, November 18-20, 2012.

C.R. Buie, "Aggregation of Biofilm Forming Bacteria Induced by Insulator Based Dielectrophoresis," presented at the American Electrophoresis Society Meeting, Pittsburgh, PA, October 28-November 2, 2012.

C.R. Buie, "Dielectric Phenotyping of Electrochemically Active Bacteria," presented at the International Society for Microbial Ecology North American Regional Meeting, Cornell, NY, October 8-10, 2012.

C.R. Buie, "Linear sweep dielectrophoresis for cell surface characterization," presented at the International Symposium, Exhibit & Workshop on Electro- and Liquid Phase-Separation Techniques, Baltimore, MD, September 30-October 3, 2012. **(Invited)**

Joung, Y.S. and C.R. Buie, "Drop Impingement on Highly Wetting Micro/Nano Porous Surfaces," presented at the APS 64th Annual Division of Fluid Dynamics Meeting, Baltimore, MD, November 20-22, 2011.

- Braff, W.A., Wilner, D., Hugenholtz, P., Rabaey, K., and C.R. Buie, "High Sensitivity Insulator Based Dielectrophoretic Phenotyping of Bacteria," presented at the American Electrophoresis Society Meeting, Minneapolis, MN, October 16-20, 2011.
- C.R. Buie, "Alternative Energy: A New Frontier for Microfluidics," presented at the American Physical Society March Meeting, Dallas, TX, March 21-25, 2011. **(Invited)**
- Braff, W.A. and C.R. Buie, "DC-Biased AC Dielectrophoresis for Electrical Characterization of Bacteria," presented at the 13<sup>th</sup> International Symposium on Microbial Ecology, Seattle, WA, August 22-27, 2010.
- Joung, Y.S. and C.R. Buie, "Electrophoretic Deposition of Unstable Colloidal Suspensions for Superhydrophobic Surfaces," presented at the 84<sup>th</sup> ACS Colloid and Surface Science Symposium, Akron, OH, June 20-23, 2010.
- Buie, C.R., Litster, S.E., and J.G. Santiago, "In Situ Visualization of Liquid Water Removal in an Operating Proton Exchange Membrane Fuel Cell," presented at the 5<sup>th</sup> International ASME Fuel Cell Science, Engineering, and Technology Conference, New York, NY, June 18-20, 2007.
- Buie, C.R., Kim, D., Litster, S.E., and J.G. Santiago, "Electroosmotic Pumps for Fuel Delivery to Direct Methanol Fuel Cells," presented at the Thermal and Fluid Sciences Affiliates Conference, Stanford, CA, February 7-9, 2007.
- Buie, C.R., Kim, D., Litster, S., and J.G. Santiago, "Electroosmotic Pumps for Fuel Delivery to Direct Methanol Fuel Cells," 2006 AIChE Annual Meeting, San Francisco, CA, November 12-17, 2006.
- Litster, S., Buie, C.R., Fabian, T., Posner, J.D., and J.G. Santiago, "Water Management in a 25 cm<sup>2</sup> PEM Fuel Cell with Electroosmotic Pump," 2006 AIChE Annual Meeting, San Francisco, CA, November 12-17, 2006.
- Cha, S. W.; Fabian, T.; Posner, J.; Prinz, F. B.; Buie, C.; Eaton, J. K.; Kim, D. J.; and J.G. Santiago, "Direct water removal in gas diffusion layer of proton exchange membrane fuel cells by a flexible electroosmotic pump," Proceedings of the 4th International ASME Conference on Fuel Cell Science, Engineering and Technology, 2006.
- Buie, C.R., Posner, J.D., Fabian, T., Cha, S.W., Prinz, F.B., Eaton, J.K. and J.G. Santiago, "Flooding Mitigation in Proton Exchange Membrane Fuel Cells Using Electroosmotic Pumps," 32<sup>nd</sup> Annual National Society of Black Engineers Convention, Pittsburgh, PA, March 29-April 2, 2006. (Best Paper Award)
- Buie, C.R., Posner, J.D., Fabian, T., Cha, S.W., Prinz, F.B., Eaton, J.K. and J.G. Santiago, "Active Water Management for Proton Exchange Membrane Fuel Cells Using an Integrated Electroosmotic Pump," presented at the Thermal and Fluid Sciences Affiliates Conference, Stanford, CA, February 1-3, 2006.
- Buie, C.R., Banin, Y., Tang, C., Santiago, J.G., Prinz, F.B., Pruitt, B.L., "A Microfabricated Direct Methanol Fuel Cell with Integrated Electroosmotic Pump," presented at the Stanford Opportunity Job Fair Technical Poster Session, Stanford, CA, January 27, 2006. (Best Poster Award Winner)
- Buie, C.R., Posner, J.D., Fabian, T., Cha, S.W., Prinz, F.B., Eaton, J.K. and J.G. Santiago, "Active Water Management for Proton Exchange Membrane Fuel Cells Using an Integrated Electroosmotic

Pump,” presented at the Seoul National University/Stanford University Joint Meeting, Stanford, CA, June 21-22, 2005.

## **INTELLECTUAL PROPERTY**

C.R. Buie and Y.S. Joung, Electrophoretic-Deposited Surfaces, MIT (USPTO Patent Filed February 2012).

T. Fabian, S. Litster, J.G. Santiago, C.R. Buie, J. Sasahara, and T. Kubota, Heat and Water Management Device and Method in Fuel Cells, The Board of Trustees of the Leland Stanford Junior University and Honda Giken Kogyo Kabushiki Kaisha (USPTO application filed 2007).

T. Fabian, S. Litster, J.G. Santiago, C.R. Buie, H. Tsuru, J. Sasahara, and T. Kubota, Fuel Cell Water Management, The Board of Trustees of the Leland Stanford Junior University and Honda Giken Kogyo Kabushiki Kaisha (USPTO application filed 2007).

J. Santiago, J. Posner, F. B. Prinz, T. Fabian, J. Eaton, S.-W. Cha, C. Buie, D. Kim, H. Tsuru, J. Sasahara, T. Kubota and Y. Saito, Fuel cell with electroosmotic pump, The Board of Trustees of the Leland Stanford Junior University and Honda Giken Kogyo Kabushiki Kaisha, US 2006/0029851.

## **INVITED PRESENTATIONS**

2016	September	Synthetic Genomics, Inc.
2016	August	The Ohio State University, Dept. of Microbiology
2016	July	Lawrence Berkeley National Laboratory, Joint Genome Institute
2016	June	Bioanalytical Sensors (Gordon Research Conference)
2016	March	University of California, Berkeley, Department of Mechanical Engineering
2016	March	Stanford University, Department of Mechanical Engineering
2016	February	California Institute of Technology, Medical Engineering Seminar
2016	February	Stanford University, Fluid Mechanics Seminar
2015	August	Lawrence Livermore National Laboratory
2015	June	Physics and Chemistry of Microfluidics (Gordon Research Conference)
2015	May	3M, Advanced Materials Laboratory
2015	April	University of California, Santa Barbara, Center for Bioengineering
2015	February	DuPont Central Research & Development
2014	November	University of Wyoming, School of Energy Resources
2014	September	University of Pennsylvania, Department of Mechanical Engineering
2014	August	Harvard University, Squishy Physics Seminar Series
2014	May	University of California, Los Angeles, Department of Mechanical Engineering
2014	May	California Institute of Technology, Department of Mechanical Engineering
2014	April	University of California, Irvine, Department of Biomedical Engineering
2014	February	The Ohio State University, Department of Mechanical Engineering
2013	November	Stanford University, Department of Mechanical Engineering
2013	November	University of California, Berkeley, Berkeley Nanosciences and Nanoengineering Institute
2013	September	Princeton University, Department of Mechanical Engineering
2012	December	Northeastern University, Department of Chemical Engineering
2012	October	DuPont Central Research & Development, Horizon Seminar Series
2011	November	The University of Texas at Austin, Department of Mechanical Engineering
2011	September	Harvard University, Prof. Gilmore Research Group Seminar
2011	September	Duke University, Department of Mechanical Engineering
2011	August	Harvard University, Prof. Wessels Research Group Seminar



2011	July	Naval Research Laboratory, Center for Bio/Molecular Science and Engineering
2011	April	The University of Queensland, Advanced Water Management Center
2010	October	Georgia Institute of Technology, Mechanical Engineering
2010	June	Lawrence Livermore National Laboratory
2008	December	University of California, Berkeley, Prof. Newman Research Group Seminar
2008	December	University of California, Berkeley, Berkeley Sensor and Actuator Center
2008	March	Princeton University, Mechanical and Aerospace Engineering
2008	March	Cornell University, Mechanical and Aerospace Engineering
2008	March	Massachusetts Institute of Technology, Mechanical Engineering
2008	February	University of Illinois, Urbana-Champaign, Mechanical Science and Engineering
2008	February	University of California, Berkeley, Berkeley Nanosciences and Nanoengineering Institute
2008	February	Carnegie Mellon University, Department of Mechanical Engineering
2008	January	University of Michigan, Department of Mechanical Engineering
2007	October	Auburn University, Department of Mechanical Engineering
2007	October	University of Michigan, Department of Mechanical Engineering
2007	October	The Ohio State University, Department of Mechanical Engineering
2007	July	Argonne National Laboratory, Fuel Cell Technology Department
2007	May	The Ohio State University, Department of Mechanical Engineering

## ADVISEES

### MIT

Summer 2014	Eric Bailey, B.S. Materials Science and Engineering, University of Maryland (CMSE Summer Research Program)
2013 – present	Paulo Garcia, Ph.D. Biomedical Engineering, Virginia Tech
2013 – 2016	Jeffrey Moran, Ph.D. Mechanical Engineering, University of Washington
2013 – present	Laura Gilson, M.S. Mechanical Engineering, MIT
2013 – present	Kameron Conforti, B.S. Chemical Engineering, University of Delaware (co-advised with M.Z. Bazant)
Summer 2013	Robert Ramirez, B.S. Computer Science, Columbia University (CMSE Summer Research Program)
Summer 2013	Edward Guzman, B.S. Mech & Aer. Eng., California State University (MIT Summer Research Program)
2012 – 2013	Bruno Figliuzzi, Ph.D. MINES ParisTech (Currently on the faculty at MINES ParisTech)
2012 – present	Naga Neehar Dingari, M.Tech. Mechanical Engineering, IIT - Kharagpur
2012 – present	Qianru Wang, B.S. Mechanical Engineering, Shanghai Jiao Tong University
2011 – 2013	Soon Ju Choi, B.S. Mech & Aer. Eng., Seoul National University
2011 – present	Zhifei Ge, B.S. Mechanical Engineering, Shanghai Jiao Tong University
2010 – present	Andrew Jones III, B.S. Mechanical Engineering, MIT
2010 – 2016	Alisha Schor, Ph.D. Mechanical Engineering, MIT (Currently at Mathworks)
2009 – 2014	William Braff, Ph.D. Mechanical Engineering, MIT (Currently at Exponent, Inc.)
2009 – 2015	Youngsoo Joung, Ph.D. Mechanical Engineering, MIT
2009 – 2011	Timothy Palmer, M.S. Mechanical Engineering, MIT
Summer 2010	Alexei Bordas, B.S. Mechanical Engineering, University of Miami (MIT Summer Research Program)
2009 – 2010	Aron Blaesi, M.S. Mech. Eng., ETH - Zurich

### UC Berkeley Summer 2009

Kristina Roe, B.S. Chem. Eng., University of Michigan (2010)

Stanford University

Summer 2008

Viktor Shkolnikov, B.S. Mech. Eng., Stanford University (2009)

## TEACHING EXPERIENCE

### **Massachusetts Institute of Technology, Department of Mechanical Engineering**

Fall 2015 2.05 – Thermodynamics, Lecturer  
Spring 2015 2.006 – Thermal Fluids Engineering II, Lecturer  
Fall 2014 2.05 - Thermodynamics, Lecturer  
Fall 2013 2.05 - Thermodynamics, Lecturer (First time offered at MIT)  
Spring 2013 2.006 - Thermal Fluids Engineering II, Lecturer  
Fall 2012 2.25 - Advanced Fluid Mechanics, Recitation Instructor  
Spring 2012 2.006 - Thermal Fluids Engineering II, Lecturer  
Spring 2011 2.005 - Thermal Fluids Engineering I, Lecturer  
Fall 2010 2.005 - Thermal Fluids Engineering I, Recitation Instructor  
Spring 2010 2.671 - Measurement and Instrumentation, Laboratory Instructor

### **Stanford University, Department of Mechanical Engineering**

Fall 2007 Experimental Methods in Fluid Mechanics – Laboratory Assistant  
Spring 2007 Fuel Cell Science and Technology – Course Assistant  
Spring 2006 Microelectromechanical Systems Laboratory – Laboratory Assistant

## PROFESSIONAL EXPERIENCE

Summer 2002 **The Dow Chemical Company, Midland, MI**  
**Commercial Development Intern**  
Researched potential markets for Industrial Grade Syndiotactic Polystyrene and presented proposed solutions to the global business team.

Summer 2001 **The Procter and Gamble Company, Cincinnati, OH**  
**Technical Engineering Intern**  
Conducted four projects in the areas of quality and manufacturing which resulted in \$500k in realized savings and \$300k in potential savings for the company across several businesses.

Summer 2000 **The Polaroid Corporation, Waltham, MA**  
**Equipment Engineering Intern**  
Performed five projects, which resulted in reductions of downtime on four different production machines and a savings of \$60k per year on one production machine.

## AWARDS AND HONORS

2016 The Root 100 Most Influential African Americans (#86)  
2016 Presidential Early Career Award for Scientists and Engineers  
2014 Esther and Harold E. Edgerton Career Development Professor  
2013 Stanford Distinguished Alumni Scholar  
2013 DARPA Young Faculty Award  
2013 DuPont Young Professor Award  
2012 NSF Career Award  
2010 Mitsui Career Development Chair  
2010 NSF Minority Faculty Development Workshop, Best Poster Award

2008	University of California, President's Postdoctoral Fellowship
2007	American Society of Mechanical Engineers Graduate Teaching Fellow
2007	Ford Foundation Dissertation Fellowship
2006	Link Foundation Energy Fellowship Recipient (Declined Award)
2005	Link Foundation Energy Fellowship, Honorable Mention
2003	National Science Foundation Graduate Research Fellowship
2002	Rhodes Scholarship State Finalist (Ohio)
2002	Barry M. Goldwater Scholarship
2002	Elected to The Honor Society of Phi Kappa Phi
2002	Elected to The Honor Society of Tau Beta Pi
2000	Dow Chemical Company Emerging Scholar
1999	National Achievement Scholarship Semi-Finalist
<u>Stanford University</u>	
2007	James W. Lyons Award for Student Service
2007	Stanford Black Community Services Center 2007 Graduate Student of the Year
2006	Stanford Black Community Services Center 2006 Graduate Student of the Year
<u>The Ohio State University</u>	
2003	Outstanding Senior Award
2003	Kaplan Humanitarian Award
2003	Board of Trustees Student Recognition Award
2002	Denman Undergraduate Research Forum, Top Junior Award
2002	Denman Undergraduate Research Forum, Second Place in Engineering Sciences
2002	Homecoming Court
2002	Emerging Leaders Citation
2002	Minority Engineering Program Eminent Scholar Award
2001 – 2002	African American Scholarship (Homecoming) Pageant King
2001	Denman Undergraduate Research Forum, Top Sophomore Award
2001	African American Student Services Distinguished Academic Achievement Award
1999	Office of Minority Affairs Excellence Scholarship
<u>The National Society of Black Engineers (NSBE)</u>	
2004	Stanford University, chapter member of the year
2004	NSBE Fellow Award
2002	The Ohio State University, chapter member of the year
2000 – 2002	Torchbearer Award
2000	NSBE Fellow Award
2000 – 2001	Region IV Oratorical Contest Champion

## **LEADERSHIP AND SERVICE EXPERIENCE**

2016 – present	DOE Joint Genome Institute, External User Meeting Planning Committee
2015 – 2016	Hilton Head 2016 Technical Program Committee
2015 – present	Gordon Research Conference on the Physics and Chemistry of Microfluidics, Vice-Chair (2017), Co-Chair (2019)
2015	ASME International Conference on Nanochannels, Microchannels and Minichannels, Session Organizer
2014 - 2015	Transducers 2015 Program Committee
2014	ASME Fuel Cell Science and Engineering Conference, Session Organizer
2013 - present	Academic and Research Leadership Network, Steering Committee
2012 - 2015	American Electrophoresis Society, Executive Board, 2014 Meeting Co-Chair
2011 - present	Associate Head of House, MIT-Maseeh Hall
2011 - 2013	MIT School of Engineering Ad-Hoc Diversity Committee

2011 Mechanical Engineering Strategic Planning Committee  
 2010 - 2015 Mechanical Engineering Graduate Admissions Committee  
 2010 - 2011 4<sup>th</sup> International Conference on Electrophoretic Deposition, Organizing Committee  
 2008 Keynote Speaker, 8<sup>th</sup> Annual Man to Man Conference, Columbus OH  
 2008 Graduate Student Speaker, Stanford Black Graduation Celebration  
 2007 – 2008 Associated Students of Stanford University (ASSU) Executive Cabinet  
 2006 – 2008 Stanford Alumni Association Board of Directors (student representative)  
 2005 – 2007 Stanford Graduate Student Council Engineering Representative  
 2005 – 2007 Stanford Graduate Student Council Diversity Committee Co-Chair  
 2004 – 2005 Vice President of the Stanford Black Graduate Student Association  
 2004 Stanford Summer Engineering Academy, Resident Fellow  
 2003 The Ohio State University PREFACE program, Resident Fellow  
 2002 – 2003 President of The National Society of Black Engineers (NSBE) @ OSU  
 2002 – 2003 Founding Member of The Association of Black Leaders for Entrepreneurship  
 2002 – 2003 Member of The Academy of African American Male Leadership  
 2002 – 2003 Afrikan Student Union (ASU) Organizing Committee  
 2002 African American Heritage Festival Weekday Events Planning Committee  
 2001 – 2003 Office of Minority Affairs (OMA) Peer mentor  
 2000 – 2003 The Ohio State University Honors Ambassadors  
 2001 – 2002 Young David’s Ministry Steering Committee, New Salem Missionary Baptist Church  
 2000 – 2001 Membership Chair for NSBE @ OSU  
 2000 – 2002 Academic Excellence Chair for Lambda Psi Engineering Honorary