

Christopher R. Dennison

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Education

- Ph.D. **Drexel University, Philadelphia PA** September 2010 – Present
Mechanical Engineering
Advisor: Dr. E. C. Kumbur
- M.Sc. **Drexel University, Philadelphia PA** June 2010
Mechanical Engineering
Concentrations in Advanced Thermodynamics & Nonlinear Control Theory
- B.Sc. **Drexel University, Philadelphia PA** June 2010
Mechanical Engineering
Senior Design: Performance Characterization of PEM Fuel Cells For Automotive Applications

Areas of Interest

Electrochemical Systems for Alternative Energy; Microstructure Characterization and Modeling; Multiphase Transport

Honors and Awards

- National Science Foundation IGERT Fellowship, 2010 – 2012
- Best Collaboration, 4th International Forum on Multidisciplinary Education and Research for Energy Science, 2011
- Drexel University Dean's Fellowship, 2010 – 2011
- Best Presentation, 3rd International Forum on Multidisciplinary Education and Research for Energy Science, 2010
- Graduation with Distinction, Drexel University Pennoni Honors College, June 2010
- Award for Outstanding Contributions to Drexel ASME, 2010
- Kappa Theta Epsilon National Co-op Honors Society, Theta Chapter, 2009
- Pi Tau Sigma International Mechanical Engineering Honors Society, Xi Chapter, 2008
- Eugene Pohl Award, 2006
- Drexel University Deans Scholarship, 2005 - 2010

Publications

Journal Papers

K.W. Knehr, Ertan Agar, C. R. Dennison, A. R. Kalidindi, and E. C. Kumbur, "Macroscopic Model of a Vanadium Redox Flow Battery Incorporating the Crossover of Vanadium Ions and Negatively Charged Species Through the Membrane," 2011, *Electrochimica Acta*. (in progress)

G. Qiu, Abhijit S. Joshi, C. R. Dennison, K.W. Knehr, E. C. Kumbur, and Ying Sun., "3-D Pore-Scale Resolved Model for Coupled Ion/Charge/Fluid Transport in a Vanadium Redox Battery Using X-Ray Tomography and the Lattice Boltzmann Method," 2011, *Electrochimica Acta*, ISSN 0013-4686, 10.1016/j.electacta.2011.12.06.

Book Chapters

Wargo, A. E., Dennison, C. R., and Kumbur, E. C., 2010 "Durability Aspects of Polymer Electrolyte Fuel Cells: Status and Targets" In: Mench, M. M., Kumbur, E. C., and Veziroglu, T. N. editors. *Modern Topics in Polymer Electrolyte Fuel Cell Degradation*, Oxford: Elsevier: 2011.

Abstracts, Presentations and Posters

Dennison, C. R., Kalidindi, A. R., Biel-Gobel, J. J., Commons, W., Agar, E. A., Knehr, K. W., Kumbur, E. C., "Ionic Transport and Kinetic Processes in Vanadium Redox Flow Batteries", The 4th International Forum on Multidisciplinary Education and Research for Energy Science, December 17–21, 2011, Honolulu, Hawaii (Abstract+Presentation).

Knehr, K. W., Agar, Ertan, Dennison, C. R., Kalidindi, A. R., Kumbur, E. C., "Modeling Species Crossover and Related Effects on the Performance of a Vanadium Redox Flow Battery", The 4th International Forum on Multidisciplinary Education and Research for Energy Science, December 17–21, 2011, Honolulu, Hawaii (Abstract).

Dennison, C. R., Knehr, K. W., Agar, Ertan, and Kumbur E. C., "Component and Performance Analysis of Vanadium Redox Flow Batteries: Experimental and Modeling Studies," *AIChE Annual Meeting*, October 16 – 21, 2011, Minneapolis, MN (Abstract).

Agar, Ertan, Knehr, K. W., Dennison, C. R., and Kumbur, E. C., "Investigation of the Performance of Vanadium Redox Flow Batteries: A Macroscopic Modeling Approach," *220th ECS Meeting and Electrochemical Energy Summit*, October 9 - 14, 2011, Boston, MA (Abstract).

Commons, W., Dennison, C. R., Kumbur, E. C., "Performance Characterization of Vanadium Redox Flow Batteries," *Drexel University REU Program Poster Session*, August 11, 2011, Philadelphia, PA (Poster).

Dennison, C. R., Knehr, K. W., Kumbur, E. C., “Characterization of Electrode and Cell Potential in Vanadium Redox Flow Batteries,” *5th International Conference on Energy Sustainability*, August 7-10, 2011, Washington D.C. (Abstract+Presentation).

Knehr, K. W., Dennison, C. R., Kumbur, E. C., “Open Circuit Voltage and Electrode Transport Characteristics in Vanadium Redox Flow Batteries,” *Pennsylvania Regional Nanotechnology Conference*, May 31, 2011, Philadelphia, PA (Poster+Presentation) .

Knehr, K. W., Dennison, C. R., Kumbur, E. C., “Open Circuit Voltage and Electrode Transport Characteristics in Vanadium Redox Flow Batteries,” *Drexel University Research Day*, April 8, 2011, Philadelphia, PA (Poster).

Dennison, C. R., Knehr, K. W., Kumbur, E. C., “Open Circuit Voltage and Effects of Electrode Compression in Vanadium Redox Flow Batteries,” *The 3rd International Forum on Multidisciplinary Education and Research for Energy Science*, December 9–14, 2010, Ishigaki Island, Okinawa, Japan (Abstract+Presentation).

Teaching Materials

Dennison, C. R., adapted from Farouk, B., “Experiment 4: Performance Analysis of a Steam Turbine Power Plant”, In: *MEM 311: Thermal and Fluid Science Laboratory Laboratory*, Drexel University, 2010.

Industry Experience

Merck & Co.

Manufacturing Engineer - Viral Vaccines

West Point, PA

March 2009 – September 2009

Assisted with start-up of a new vaccine production area within a union work environment. Developed protocol to test parameters of thermal waste inactivation system. Developed qualification protocols for new equipment. Identified process critical instruments and calibration thresholds. Developed periodic maintenance plans and issued corrective maintenance work orders. Worked closely with mechanics to troubleshoot equipment issues. Utilized cGMP practices in daily work.

Sunoco, Inc.

Fixed Equipment Reliability Engineer – Light Gas Plant

Marcus Hook, PA

October 2007 - March 2008

Acted as reliability engineer for Area Business Team. Produced piping packages for construction and turn-around activities. Worked closely with maintenance foreman and union mechanics during shut-down maintenance opportunities. Surveyed emergency relief equipment and recommended improvements as needed. Presented yearly initiatives to facility management.

Bechtel Power Corporation

Responsible Engineer

Frederick, MD

September 2006 - March 2007

Acted as the responsible engineer on a pipe replacement project. Investigated applicable design codes for pipe replacement. Performed pipeline sizing calculations in support of pipe replacement. Produced layout schematics for pipe replacement.

Ijamsville Services, Ltd. - The PC/MD

Computer Repair and Sales Associate

Ijamsville, MD

September, 2004 - March, 2007

Identified and troubleshot hardware, software and network issues. Sold computer parts and systems. Worked closely with customers and designed customer relation materials.

Teaching Experience

Mechanical Engineering and Mechanics, Drexel University

Philadelphia, PA

Graduate Advisor – “Microbial Fuel Cell-Powered Electroosmotic Pump”

September 2010 – June 2011

Advised a team of four B.S. students, in conjunction with faculty advisors. Provided technical guidance for fuel cell design and manufacture. Evaluated team performance and deliverables throughout the nine month project, and provided timely feedback.

Teaching Assistant – Thermal Systems Analysis

June 2010 – September 2010

Evaluated student performance on all course deliverables. Interacted directly with students to present new concepts and supplement lecture content. Provided timely, relevant feedback on student progress.

Teaching Assistant – Thermal Fluid Science Lab

March 2010 – June 2010

Guided students through experiments highlighting fundamental thermal-fluid phenomena. Developed student’s technical writing and data analysis skills. Evaluated student performance on all course deliverables. Revised laboratory manual to implement improvements and clarifications.

Volunteering and Mentorship

First Robotics, Atomic Robotics 4-H Club

Philadelphia, PA

Adult Mentor

November, 2011 – Present

Guide high school students in the design and fabrication of a robot to compete in regional and national competitions. Teach students about the fundamental principles governing the various sub-systems of the robot. Generate student interest in STEM disciplines and careers.

NSF Research Experience for Undergraduates (REU)

Philadelphia, PA

Graduate Mentor

June - August, 2011

Mentored a visiting undergraduate student in testing methods and experimental design for electrochemical systems. Guided the student through the design, optimization, and manufacturing of experimental components and apparatuses, as well as the development of an analytical tool for the rapid analysis of redox flow battery charge/discharge data.

Girl Scouts of America, Camp Low Country

Cordesville, SC

Alternative Spring Break Volunteer

April, 2010

Spent spring vacation improving facilities at a regional summer camp for girls. Demolished and reconstructed aging structures. Painted and screened in cabins. Prepared the facilities for the upcoming season.

Pennoni Honors College, Drexel University

Philadelphia, PA

Freshmen Mentor

September, 2008 – June, 2009

Mentored four incoming freshmen in engineering majors. Answered questions and gave advice to ease the transition to college life.

Mechanical Engineering and Mechanics, Drexel University

Philadelphia, PA

High School Mentor

June, 2008 – September, 2008

Mentored two local high school students in conjunction with a faculty advisor. Provided technical guidance in the design and optimization of the frame for an electric/human-powered hybrid vehicle.

Philabundance & Pi Tau Sigma

Philadelphia, PA

Food Drive Coordinator

April, 2008 – June, 2008

Organized a food drive on campus to help feed local homeless. Designed and distributed flyers, setup drop-off locations around campus, and coordinated activities with Philabundance. Successfully collected a sizeable donation of food.

Activities

- Pennoni Honors College Student Mentor
- Pi Tau Sigma - Xi Chapter, Mechanical Engineering Honors Society
- Kappa Theta Epsilon – Theta Chapter, National Co-op Honor Society
- American Society of Mechanical Engineers (ASME)
- International Association for Hydrogen Energy (IAHE)