

Alex Benjamin
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Education

Drexel University
Bachelor and Master of Science in Mechanical Engineering
Minor in Mathematics

Philadelphia, PA
Anticipated Graduation: June, 2015
Cumulative GPA: 3.99

Honors and Awards

A.J. Drexel Scholarship, Drexel University (2010-2015)
Drexel University's Honor Roll, Drexel University (2010-Present)
Chemistry Excellence Award, American Chemical Society (2010)

Drexel University's Dean's List, Drexel University (2010- Present)
Joe Martin Scholarship (2012-Present)
Mathematics Excellence Award, AMC (2010)

Relevant Coursework

Fundamentals of CAD Design
Heat Transfer
Mechanics of Materials I,II
Engineering Reliability

Engineering Mechanics - Statics, Dynamics
Fluid Dynamics I
Applied Engineering Analytical Methods I,II,III
Mechanical Behavior of Materials

Basic Fluid Mechanics
Thermodynamic Analysis I,II
Introduction to Controls I

Engineering Design Project

Drexel University

Cannula for Microtissue Hydrodissection

Philadelphia, PA
March 2011- June 2011

- Researched novel cannula designs for dissecting a delicate membrane of the human lens capsule from the underlying nuclear material.
- Developed three-dimensional CAD models of the optimized/original cannula configurations.
- Modeled, analyzed, and compared fluid-flow through the optimized and original cannula designs using advanced fluid-flow simulators.
- Designed and tested an optimized prototype for evaluation in surgery.

Work Experience

Electrochemical Systems Laboratory

Undergraduate Researcher - Vanadium Redox Flow Batteries

Philadelphia, PA
September 2012 - Present

- Characterized and quantified the trade-off between species crossover and conductivity by varying the thickness of proton exchange membranes used in VRFBs.
- Analyzed the capacity loss and efficiencies of VRFBs (with PEMs of different thicknesses) using finite element and finite difference models developed in COMSOL.
- Analyzed and quantified crossover mitigation in proton exchange membranes using asymmetric current densities during the charge/discharge cycles.

Merck and Co.

Pharmaceutical Packaging Technology and Development Engineer

West Point, PA
September 2011 - April 2012

- Executed planned activities to evaluate the stability and marketing sustainability of new products in both solid and liquid dosage forms.
- Determined and analyzed moisture absorption isotherms of various drug products and developed and executed tests to characterize and quantify the rate of moisture permeation through potential packaging configurations.
- Utilized mathematical models, based on systems of differential equations, in conjunction with the principles of mass-balance to simulate the behavior of pharmaceutical products in packaging configurations.

Drexel University's Math Department

Independent Researcher

Philadelphia, PA
June 2011-Present

- Developed and implemented a unique 2D and 3D mesh management package in MATLAB based on the principles of discrete differential geometry.
- Created and tested functions for mesh refinement, manipulation, and modification with boundary management and extraction.
- Configured and optimized functions for the computation of differential fields, mesh relaxations, and rigid transformations of meshes.
- Applied the principles of meshing and discrete differential geometry to study dynamic and static problems in engineering, specifically those relating to fluid films.

Drexel University's Quantum Device Laboratory

Mechanical Engineer

Philadelphia, PA
June 2011 - August 2011

- Analyzed and designed ultra-low-temperature and low-noise dip testers, operational amplifiers, and waveform generators to test macroscopic, graphene and MgB₂-based qubits.
- Configured and optimized the electromechanical components of the lab including dilution refrigerators and data acquisition systems to resolve the quantum mechanical behavior of superconducting Josephson Junctions.

Skills

Microsoft Windows (2000-7), Mac OS, Microsoft Office (Word, Excel,PowerPoint, and Outlook), Maple, AutoCAD, CreoElements/Pro, Adobe Illustrator, AccuCADD, Pro/DESKTOP, MATLAB, SolidWorks, LabVIEW,COMSOL,HTML.
Foreign Languages: Hindi and Marathi

Activities

Pi Tau Sigma (2013-Present), American Society of Mechanical Engineers (2010-Present), American Chemical Society (2010-Present), Society of

Physics Students (2010-Present), Honors Student Advisory Committee (2010-Present), National Forensic League (2009-Present).

Publications

Benjamin, A., Benjamin, R., and Grinfeld, P., 2012, " Minimal Surface With a Cavity of a Given Perimeter," Journal of Geometry and Symmetry in Physics, vol. 28, pp 59-66.

Agar, E. , Benjamin A., Dennison, C. R., Chen, D., Hickner, M. A., and Kumbur, E. C., 2013, "Reducing capacity fade in vanadium redox flow batteries by altering charging and discharging currents," Journal of Power Sources, in press.

Benjamin A., Agar, E., Dennison, C. R., and Kumbur, E. C., 2013, "On the quantification of coulombic efficiency for vanadium redox flow batteries: cutoff voltages vs. state-of-charge limits," Electrochemistry Communications, vol 35, pp. 42-44.

Conferences

Benjamin, A., Benjamin, R., and Grinfeld, P., 2013, "Minimal Surface With a Cavity of a Given Perimeter," 2013 NCUR Proceedings, April 10-15, LaCrosse, Wisconsin.

Agar, E., Benjamin, A., Dennison, C. R., Chen, D., Hickner, M. A., and Kumbur, E. C., 2013, "Mitigating capacity fade in vanadium redox flow batteries using asymmetric currents during cycling," 224th Electrochemical Society Meeting, San Francisco , Oct 27-Nov 1.

Benjamin, A., Agar, E., Dennison, C. R., and Kumbur, E. C., 2013, "On the determination of coulombic efficiency for vanadium redox flow batteries: cutoff voltage vs. state of charge limits," 224th Electrochemical Society Meeting, San Francisco , Oct 27-Nov 1.

Agar, E., *Benjamin, A., Knehr, K.W., Dennison, C. R., and Kumbur, E. C., 2013, "Prediction and mitigation of capacity fade in vanadium redox flow batteries," AIChE Massive Energy Storage for the Broader Use of Renewable Energy Sources, Newport Beach, CA June 23-26. (invited)