

Tayloria N. G. Adams, Ph.D.

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EDUCATION

Michigan Technological University, Houghton, MI
Ph.D. in Chemical Engineering (Dec 2014)
M.S. in Chemical Engineering (Dec 2010)

Virginia Commonwealth University, Richmond, VA
B.S. in Chemical & Life Science Engineering (May 2009)
B.S. in Applied Mathematics (May 2009)

CURRENT WORK EXPERIENCE

University of California-Irvine, Neurology Department
Postdoctoral Fellow, Advisor Dr. Lisa Flanagan

Irvine, CA
Aug 2015-Present

Project Description: Neural stem and progenitor cells (NSPCs) have potential to treat neurodegenerative diseases since they provide neuroprotection and differentiate into astrocytes, neurons, and oligodendrocytes. NSPC cultures are heterogeneous containing progenitor cells with distinct differentiation properties and little is known about which progenitors are best for neural repair. Dielectrophoresis (DEP), a technique used to separate cells based on their dielectric properties, is implemented to examine NSPCs.

- Design and fabricate continuous flow microdevices containing high cell trapping capacity to characterize the dielectric behavior of human and mouse neural stem and progenitor cells (NSPCs).
- Quantify human and mouse NSPC's membrane capacitance, permittivity, and conductivity.
- Determine the cell surface molecules for human and mouse NSPCs that contribute to membrane capacitance.

PATENT RESEARCH

Michigan Technological University, Chemical Engineering Department
Researcher

Houghton, MI
July 2014 – Sept 2014

Project Description: This is an extension of dissertation research project 2. To strengthen the provisional patent filed for blood typing, dielectrophoretic technology was used to further characterize red blood cells DEP behavior using the frequency modification method.

- Established the optimal upper limit polarization parameter to accurately evaluate the DEP behavior of red blood cells.
- Verified that the upper limit polarization parameter predict red blood cell DEP behavior independent of A+, A-, B+ and O+ blood type.
- Full patent: Minerick, A., Collins, J., Leonard, K., and Adams, T., System for handheld device for identifying e.g. virus based on dielectrophoretic responses, has controller for determining distribution of particles relative to microelectrode array at frequency levels between low and high frequencies, Patent No. WO2015051372-A1, April 2015.

RESEARCH

PhD Research: Utilizing Dielectrophoresis to Determine the Physiological Attributes of Human Mesenchymal Stem Cells, Michigan Technological University, *Advisor Dr. Adrienne Minerick*, Jan 2011 - Dec 2014

Project 1 Description: Dielectrophoresis technology was the scientific focus of this project with an application in using human mesenchymal stem cells (hMSCs) for type 1 diabetes treatment. DEP polarizes particles to induce cell movement in suspensions, and hMSCs are a unique set of cells that maintain and repair tissues through differentiation, self-renewal, and protein secretion. This research utilized DEP in microfluidic devices to characterize hMSCs dielectric behavior.

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- Designed and fabricated a microdevice with quadrupole electrodes to adequately exploit hMSCs electrical properties in a batch system.
- Developed a protocol to coat hMSCs with elastin-like polypeptide polyethyleneimine polymer and test the resulting DEP behavior.
- Established a spatial analysis technique to translate hMSCs experimental DEP behavior to a DEP spectra.
- Quantified hMSCs membrane capacitance and permittivity, establishing its uniqueness from other cell systems.
- Determined that hMSCs are biocompatible with elastin-like polypeptide polyethyleneimine polymer using trypan blue cell viability assay.

Project 2 Description: DEP technology was used to characterize the polarization kinetics of polystyrene beads (model system) and red blood cells. Dielectric relaxation, the time taken for a particle to respond to an external force, is a key phenomenon to be accounted for in DEP experiments. The application for this work is rapid blood typing in microfluidic devices.

- Developed and optimized a new frequency modification method for DEP data collection.
- Quantified the dielectric relaxation for red blood cells and polystyrene beads.
- Established optimal lower limit polarization parameters to accurately evaluate the DEP behavior of red blood cells and polystyrene beads.
- Patent was filed on this work: Leonard, K., Minerick, A., and Adams, T.N.G., Frequency Sweep Rate Dependence on the Dielectrophoretic Response of Polystyrene Beads and Red Blood Cells, U.S. Provisional Patent Application No. 61/887,178, filed October 2013.

MS Research: Conductivity Modeling of Carbon/Liquid Crystal Polymer Composites for Fuel Cell Bipolar Plates, Michigan Technological University, *Advisor Dr. Julie King*, Aug 2009 - Dec 2010

Project Description: The scientific focus of this research was in the development of mathematical models to accurately predict the thermal conductivity of carbon filled polymer composites. Adding conductive carbon fillers to thermoplastic polymers increases the composites electrical and thermal conductivity at rates proportional to the filler amount, ideal for bipolar plates in fuel cells.

- Determined that synthetic graphite particles caused the largest increase in the in-plane thermal conductivity for the thermoplastic polymer composite.
- Developed a mathematical model using the average field approximation with ellipsoidal inclusions to accurately predict the in-plane thermal conductivity of synthetic graphite and carbon black thermoplastic polymer composites.
- Developed a mathematical model using an assemblage of coated ellipsoids to accurately predict the in-plane thermal conductivity of the carbon fiber thermoplastic polymer composite.

PUBLICATIONS

- (1) Adams, T.N.G., Turner, P., Zhao, F., Janorkar, A., and Minerick, A.R., Characterizing the Dielectric Properties of Human Mesenchymal Stem Cells and the Effects of Charged Elastin-like Polypeptide Copolymer Treatment, *Biomicrofluidics*, 8, 054109, 2014.
- (2) Adams, T.N.G., Leonard, K.M., and Minerick, A.R., Frequency Sweep Rate Dependence on the Dielectrophoretic Response of Polystyrene Beads and Red Blood Cells, *Biomicrofluidics*, 7, 064114, 2013.
- (3) Adams, T., Yang, C., Gress, J., Wimmer, N., and Minerick, A.R., A Tunable Microfluidic Device for Drug Delivery, *Advances in Microfluidics*, InTech Open Science, 2012.
- (4) Adams, T.N.G., Olson, T., King, J., and Keith, J., In-Plane Thermal Conductivity Modeling of Carbon Filled Liquid Crystal Polymer Based Resins, *Journal of Polymer Composites*, 32, 147-157, 2011.

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TECHNICAL SKILLS

Device Microfabrication (Soft Lithography, EVG 620 Aligner, Electron Beam Thin Film Deposition, Dark Room Fabrication), Cell Culture, Cell Viability Assays (LDH and MTT), Immunochemistry, and Genotyping

AWARDS

National Science Foundation Postdoctoral Research Fellowship in Biology	2016
UCI Chancellor's ADVANCE Postdoctoral Fellowship	2016
AES/BioMicrofluidics Art in Science Competition (Video Awarded 1 st place)	2016
Future Faculty Program Participant, Virginia Tech University	2015
Doctoral Finishing Fellowship, Michigan Technological University	2013
Biotech Research Center Travel Awards, Michigan Technological University	2012
Anderson Research Scholarship, Michigan Technological University	2012
Biotech Research Center Merit Award, Michigan Technological University	2012
Biotech Research Center Travel Awards, Michigan Technological University	2011
King-Chavez-Parks Future Faculty Fellowship, Michigan Technological University	2009-2013
Graduate School Dean's Fellowship, Michigan Technological University	2011-2012
Society of Woman Engineers Baltimore-Washington Section Scholarship	2011-2012
National GEM Consortium Fellowship	2009-2010

POSTER & CONFERENCE PRESENTATIONS

Optimizing Human Neural Stem Cell Sorting with Dielectrophoresis, Massachusetts Institute of Technology, Dielectrophoresis 2016, July 2016.

Optimizing Label-free Human Neural Stem Cell Sorting, University of California Irvine, Translational Research Day, June 2016.

Optimizing Neural Stem Cell Sorting with Dielectrophoresis, University of California Irvine, American Institute of Chemical Engineers and American Electrophoresis Society, Nov 2015 (*Poster Awarded 2nd place*).

Future Faculty Tutoring: An innovative way to create a community and provide academic support for underrepresented minority students, Michigan Technological University, National Conference on Race and Ethnicity in American Higher Education, May 2015.

Frequency Sweep Rate Dependence on the Dielectrophoretic Response of Polystyrene Beads and Red Blood Cells, Michigan Technological University, American Institute of Chemical Engineers and American Electrophoresis Society, Nov 2014 (*Poster Awarded 2nd place*).

Characterizing the Dielectric Properties of Human Mesenchymal Stem Cells and the Effects of Charged Elastin-like Polypeptide Copolymer Treatment, Michigan Technological University, American Institute of Chemical Engineers and American Electrophoresis Society, Nov 2014.

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Dielectrophoresis and its Connection to Biosensors for Wearable Microfluidic Devices: Exercise Assessments and Disease Detection, Michigan Technological University, American Institute of Chemical Engineers Meet the Faculty Candidate Session, Nov 2014.

Voices from the Field, GEM Grad Lab, Northwestern University, Oct 2014.

Dielectrophoretic Response Quantification of ELP-PEI Modified Human Mesenchymal Stem Cells, Michigan Technological University, 2nd Annual Chemical Engineering Graduate Research Forum, Jan 2014.

Kidz Corner, Pre-college Initiative, National Society of Black Engineers 39th National Convention, Mar 2013.

Voices from the Field, GEM Grad Lab, National Society of Black Engineers 39th National Convention, Mar 2013.

Sweep Rate Dependence on the Negative Dielectrophoretic Behavior of Polystyrene Beads, Michigan Technological University, 1st Annual Chemical Engineering Graduate Research Forum, Jan 2013.

Dielectric Behavior of Human Mesenchymal Stem Cells, Michigan Technological University, American Institute of Chemical Engineers and American Electrophoresis Society, Oct 2012.

Voices from the Field, GEM Grad Lab, Michigan Technological University, Sept 2012.

How I chose my research topic, Transfer Scholars Research, Michigan Technological University, Aug 2012.

Dielectrophoresis: Exploring the Dielectric Behavior of Human Mesenchymal Stem Cells for Cell Sorting, Michigan Technological University, GEM Consortium Conference, Aug 2012.

Characterizing the Dielectric Behavior of Human Mesenchymal Stem Cells for Cellular Sorting, Michigan Technological University, Biotechnology Research Center Research Forum, Mar 2012.

Characterizing the Dielectric Behavior of Human Mesenchymal Stem Cells, American Institute of Chemical Engineers and American Electrophoresis Society, Nov 2011.

PAST WORK EXPERIENCE

Michigan Technological University, Center for Diversity and Inclusion
Outreach Coordinator

Houghton, MI
Sept 2014-June 2015

- Developed and performed assessments on academic and professional development programs and services for underrepresented undergraduate students.
- Mentored students in the Fall Academic Research Program by helping them develop research proposals for the Summer Undergraduate Research Fellowship.
- Managed and assessed the Future Faculty Tutoring Initiative (underrepresented graduate students tutor underrepresented undergraduate students).
- Monitored underrepresented minorities academic progress (GPA tracking).
- Coordinated professional development seminars to assist students in career fair preparation.
- Supported students with cultural heritage event planning.

Michigan Technological University, Center for Diversity and Inclusion
Academic and Professional Outreach Coordinator

Houghton, MI
Jan 2014-May 2014

- Implemented and managed the Future Faculty Tutoring Initiative.
- Coordinated professional seminars for undergraduates on career fair preparation.
- Organized MiCUP meetings, program designed to support cohort of Michigan Tech students that transferred from community colleges.

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**Michigan Technological University
Chemical Engineering Department
Teaching Assistant**

**Houghton, MI
Jan 2012-Apr 2012**

- Provided assistance to students taking the Fundamentals of Chemical Engineering II course.
- Held weekly office hours, graded homework assignments and exams, and developed UniSim tutorial.
- Coordinated semester project modeling VLE curves using the Antoine Equation, UNIQUAC Model, and SRK Model.

**Michigan Technological University
Chemical Engineering Department
Teaching Assistant**

**Houghton, MI
Jan 2011-Apr 2011**

- Provided assistance to students in the Chemical Engineering Thermodynamics course.
- Held weekly office hours and reviewed concepts taught in class and solved homework problems.

**Lexmark International
Chemical Engineer Intern**

**Lexington, KY
May 2010-Aug 2010**

- Developed a test plan to study the critical viscoelastic properties of polyurethane to determine which properties impact the cleaning unit of a color-laser printer.
- Tested the tensile strength, Young's Modulus, hardness, resilience, and surface tension of polyurethane.

**Lexmark International
Hardware Engineer Intern**

**Lexington, KY
May 2009-Aug 2009**

- Conducted product development tests and analysis on high-end color-laser printers to determine if different components within the color-laser printer system would improve print quality.
- Utilized statistical analysis skills to determine the statistical significance that printer components had on print quality.

**Honeywell International
Monomer Tech Coop**

**Colonial Heights, VA
May 2006-Dec 2008**

- Directed experiments to obtain physical properties and quality of fertilizers.
- Performed safety analysis by conducting heat transfer studies on fertilizer.
- Applied chemical engineering principles of thermodynamics to develop testing for recrystallization of fertilizer-water systems.

PROFESSIONAL ORGANIZATIONS

American Electrophoresis Society, Member Meeting Planner 2017 Meeting Session Co-chair 2016	2011-present
Society of Women Engineers, Member Editorial Board 2015-present	2009-present
American Institute of Chemical Engineers, Member President 2008-2009	2006-present
National Society of Black Engineers, Member Treasurer 2011-2012, 2005-2006 President 2010-2011, 2007-2008 Pre-College Initiative Co-Chair 2009-2010 Senator 2009-2010 Secretary 2008-2009 Programs Chair 2006-2007 Community Service Chair 2004-2005	2004-present

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SERVICE

Instructor, Girls Inc. Science Program, University of California Irvine	2016
Science Demonstration Volunteer, 36 th Annual Orange County Black History Parade and Cultural Faire in Anaheim, University of California Irvine	2016
Lab Demonstration, Stem Cell Research Center Open House, University of California Irvine	2016
STEM Graduate Panelist, Student Outreach and Retention Center, University of California Irvine	2015
Computing and Engineering Success Workshop, led tour of Dr. Lisa Flanagan's lab at the University of California Irvine's Sue & Bill Gross Stem Cell Research Center	2015
Broadening Participation in Engineering Panel Reviewer, National Science Foundation	2015
Dr. Martin Luther King Service Day Reading Volunteer, Michigan Technological University	2015
Cultural Competency Training, Michigan Technological University	2014
Safe Place Ally Training, Michigan Technological University	2014
Center for Diversity and Inclusion Tutor, Michigan Technological University	2014
Jell-O Microfluidics Desktop Experimental Module Graduate Student Volunteer, Michigan Technological University	2012
Academic Quality Improvement Program Committee, Michigan Technological University Brand Awareness, Graduate Student Representative	2011
A Walk For Education, Virginia Commonwealth University, National Society of Black Engineers, City Captain	2009