

Education

Massachusetts Institute of Technology, Cambridge, MA (2016-present)

Ph.D. Candidate, Chemical Engineering, *Brushett Research Group*, degree expected 2022 (**GPA: 4.9/5.0**)

Thesis Title: Combining Physical Modeling and Inference to Extend the Capabilities of Analytical Electrochemistry

Minor: Inference and Machine Learning *Certificates*: Kaufman Teaching Certificate, received 2021

Masters of Science in Chemical Engineering Practice, received 2018 (**GPA: 4.9/5.0**)

Rice University, Houston, TX (2012-2016)

Bachelors of Science in Chemical Engineering, *Magna Cum Laude*, received 2016 (**GPA: 4.04/4.33**)

Research and Professional Experience

Massachusetts Institute of Technology, Chemical Engineering; Cambridge, MA

Graduate Research Assistant, Brushett Research Group; January 2017-present

Identifying analytes in solutions using voltammetry, physical modeling, and Bayesian inference (*manuscript accepted*)

- Utilize binary hypothesis testing and Bayes' Information Criterion to infer the presence of compounds in solutions
- Validate the methodology on in-house experimental data of a solution containing multiple redox-active phenothiazines

Automated analysis of analyte solutions using closed-form models of microelectrode voltammograms (*manuscript in prep*)

- Derive analytical expressions for microelectrode voltammograms in oblate spheroidal coordinates
- Accurately estimate the state-of-charge and state-of-health of analyte solutions using non-linear least squares regression

An earth-abundant and mechanically rechargeable redox mediated primary flow battery (*manuscript in prep*)

- Probe complex mediated processes using *in situ* (microelectrode voltammetry) and *ex situ* (NMR, XRD) techniques
- Actively collaborate within and outside the Brushett Group

Emirates Global Aluminium (EGA); Dubai, United Arab Emirates

Technical Consulting Intern, MIT Practice School; October 2017-December 2017

- Estimated greenhouse gas emissions from plant processes. EGA presented this work at the 37th Conference and Exhibition of The International Committee for Study of Bauxite, Alumina, and Aluminium (ICSOBA) in Krasnoyarsk, Russia

Royal Dutch Shell; Houston, TX

Technical Consulting Intern, MIT Practice School; August 2017-October 2017

- Evaluated approaches for integration of renewables into common processes (e.g., electrification)

University of Alabama at Birmingham, Physics; NSF Research Experience for Undergraduates, Birmingham, AL

Research Intern, Camata Research Group; Summer 2015

- Studied solid oxide fuel cells and vanadium oxide for miniaturization in consumer products using electrochemical impedance spectroscopy and pulsed laser deposition. Results were presented at the 2016 MRS[®] Spring Meeting and Exhibit

Rutgers University, Chemical Engineering; NSF Research Experience for Undergraduates, Piscataway, NJ

Research Intern, Neimark Research Group, Summer 2014

- Conducted Monte Carlo simulations of water adsorption onto nano-scale carbon structures

Awards and Honors

- MathWorks Engineering Fellowship (2021-2022)—competitive funding award granted within MIT's School of Engineering
- Teaching Development Fellowship (2021-2022)—selective award given by MIT's Teaching + Learning Lab
- Electrochemical Society Student Slam Trivia Winner (2021)—16 total participants; topic was "Grid Energy Storage System"
- Electrochemical Society Travel Grant (2021)—competitive, given by the Physical and Analytical Electrochemistry Division
- Dow Travel Award (2019)—competitive grant awarded within MIT's Chemical Engineering department
- MIT Presidential Fellow (2016-2017)
- Phi Beta Kappa Honor Society (inducted 2016)
- Tau Beta Pi Engineering Honor Society (inducted 2015)
- American Chemical Society Scholar (2013-2016)
- McMurtry Residential College Outstanding Senior Award (2016)
- T.W. Moore Scholarship (2015)—awarded to the top six rising seniors by GPA in the Rice Chemical Engineering major
- Princeton Engineering Graduate Symposium (2015)—travel award from Princeton
- L.J. Walsh Scholarship (2015)
- Houston Gas Processors Association Scholarship (2015)
- Fluor Daniel Engineering Scholarship (2015)
- 2013-2014 Donald F. Othmer Sophomore Academic Excellence Award (2014)
- Rice Trustee Brown Scholarship (2012-2016)

Scholarly Publications

- A. M. Fenton Jr., B. J. Neyhouse, K. M. Tenny, Y. M. Chiang, F. R. Brushett, *Extending and Automating Quantitative Microelectrode Voltammetry through an Oblate Spheroidal Coordinate Framework*, in prep
- A. M. Fenton Jr., R. K. Jha, B. J. Neyhouse, A. P. Kaur, D. A. Dailey, S. A. Odom, F. R. Brushett, *On the Challenges of Materials and Electrochemical Characterization of Concentrated Electrolytes for Redox Flow Batteries*, in prep
- A. M. Fenton Jr.,* Y. Ashraf Gandomi,* C. T. Mallia, B. J. Neyhouse, M. A. Kpeglo, W. E. Exson, F. R. Brushett, *An earth abundant and mechanically rechargeable redox mediated primary flow battery*, in prep (*=co-lead authorship)
- Y. Ashraf Gandomi, I. Krasnikova, N. Akhmetov, N. Ovsyannikov, M. Pogosova, N. Matteucci, C. Mallia, B. Neyhouse, A. Fenton, F. R. Brushett, K. Stevenson, *Synthesis and characterization of lithium-conducting composite polymer-ceramic membranes for use in nonaqueous redox flow batteries*, submitted
Preprint: <https://doi.org/10.33774/chemrxiv-2021-dp7c3>
- A. Mistry, A. Verma, S. Sripad, ..., A. Fenton Jr., ..., D. Howey, S. DeCaluwe, S. Roberts, V. Viswanathan, *A Minimal Information Set to Enable Verifiable Theoretical Battery Research*, accepted, ACS Energy Letters
- A. M. Fenton Jr., F. R. Brushett, *Using voltammetry augmented with physics-based modeling and Bayesian hypothesis testing to identify analytes in electrolyte solutions*, accepted, Journal of Electroanalytical Chemistry
Preprint: <https://doi.org/10.33774/chemrxiv-2021-nfp3b-v3>
- B. J. Neyhouse, A. M. Fenton Jr., F. R. Brushett, *Too Much of a Good Thing? Assessing Performance Tradeoffs of Two-Electron Compounds for Redox Flow Batteries*, Journal of The Electrochemical Society, **168**(5), 050501, 2021
- J. A. Kowalski, A. M. Fenton Jr., B. J. Neyhouse, F. R. Brushett, *A Method for Evaluating Soluble Redox Couple Stability Using Microelectrode Voltammetry*, Journal of The Electrochemical Society, **167**(16), 160513, 2020
- M. A. Jawi, E. A. Obaidli, R. Natesan, S. Pollé, M. Mahmoud, K. Williams, A. Fenton, and A. Wu, *Carbon Monoxide Emissions from Electrolysis Process in EGA Smelters*, 37th Conference and Exhibition of ICSOBA, 2019

Invited Talks

- A. M. Fenton Jr., F. R. Brushett, *Using voltammetry augmented with physics-based modeling and Bayesian hypothesis testing to identify analytes in electrolyte solutions*, Battery Modeling Webinar Series (BMWS), Cambridge, MA (virtual). Date TBD

Technical Presentations

- A. Fenton Jr., *Leveraging Statistical Inference and Physical Modeling to Augment Electrochemical Analysis of Charge Storage Materials*, Meet the Candidates Poster Session, 2021 AIChE Annual Meeting, Boston, MA. November 2021
- A. Fenton Jr., B. J. Neyhouse, K. M. Tenny, F. R. Brushett, *Electrochemical Analysis of Redox Electrolytes Using Microelectrode Voltammetry Modeling*, 2021 AIChE Annual Meeting, Boston, MA. November 2021
- A. Fenton Jr., F. R. Brushett, *Chemical Identification in Multicomponent Electrolytes Using Voltammetry, Physics-Based Modeling, and Bayesian Inference*, 2021 AIChE Annual Meeting, Boston, MA. November 2021
- A. M. Fenton, Jr., B. J. Neyhouse, K. M. Tenny, Y. M. Chiang, F. R. Brushett, *Analytical and Numerical Modeling of Microelectrode Voltammetry in Oblate Spheroidal Coordinates*, 239th Electrochemical Society Meeting, Chicago, IL (virtual). May-June 2021
- A. M. Fenton Jr., F. R. Brushett, *Using voltammetry augmented with physics-based modeling and Bayesian hypothesis testing to estimate electrolyte composition*, BMWS 3-Minute Thesis Day, Cambridge, MA (virtual). April 2021
- A. Fenton Jr., F. Brushett, *Combining Experiment, Physics-Based Modeling and Bayesian Inference to Enhance Voltammetric Characterization*, 2020 Virtual MRS[®] Spring/Fall Meeting and Exhibit, Boston, MA (virtual). November-December 2020
- A. Fenton Jr., F. Brushett, *Automating Electroactive Compound Identification to Simplify Electrolyte Decay Analysis in Energy Storage Devices*, 2020 MIT A+B Applied Energy Symposium, Cambridge, MA (virtual). August 2020
- A. M. Fenton Jr., F. Brushett, *Combining Cyclic Square Wave Voltammetry Experiment and Modeling to Quantify Unknown Electron Transfer Mechanisms for Applications in Relevant Electrochemical Systems*, 236th Electrochemical Society Meeting, Atlanta, GA. October 2019
- A. M. Fenton Jr., F. R. Brushett, *Predicting Unknown Electron Transfer Mechanisms for Applications in Electrochemical Systems*, 2nd Annual Boston Academic Researchers Symposium, July 2019. Medford, MA
- A. M. Fenton, K. K. Dillon, N. W. El-Bermani, A. L. Genau, R. P. Camata, *Thermal Stress Effects in Vanadium Oxide/YSZ Composite Anodes for Built-In Energy Storage in Thin Film YSZ Fuel Cell Structures*, 2016 MRS[®] Spring Meeting and Exhibit, Phoenix, AZ. March 2016

Service and Leadership Experience

Senior Graduate Student, Massachusetts Institute of Technology, Cambridge, MA

Brushett Research Group, present

- Mentor younger graduate students in various capacities (e.g., research design, troubleshooting, providing critical feedback)
- Organize and execute meetings, both within the group and with outside collaborators
- Contribute to a culture of caring and support to help group members grow as scholars and individuals

ChemE Application Mentorship Program Mentor, Massachusetts Institute of Technology, Cambridge, MA

Department of Chemical Engineering, September 2020-November 2020

- Aided an undergraduate student of an underrepresented group with his MIT ChemE graduate school application
- Critically revised various application materials and offered advice over synchronous video calls

Vice-President of Residential Life, Massachusetts Institute of Technology, Cambridge, MA

Sidney Pacific Graduate Residence Executive Council, May 2018-May 2019

- Managed and oversaw 14 officers in charge of organizing events for Sidney Pacific residents
- Wrote successful proposals to MIT-wide funding sources (e.g., Graduate Student Council) for large events (300+ people)

NetPals Program Mentor, Cambridge School Volunteers, Inc., Cambridge, MA

Massachusetts Institute of Technology, January 2018-May 2018

- Coached and provided scientific guidance to a seventh-grade Cambridge public school student for his class project

Teaching and Mentorship Experience

Teaching Development Fellow, Cambridge, MA

Chemical Engineering Fellow, MIT Teaching + Learning Lab; September 2021-present

- Develop programs to support ChemE graduate students and to promote pedagogy within the department
- Collaborate with department leaders to discuss student needs and to design content to address them
- Engage with Fellows from other departments to exchange and to refine ideas

Telluride Science Research Center Summer School on Electrochemical Energy Storage, Telluride, CO (virtual)

Teaching Assistant, June 2021

- Designed content with Prof. Fikile Brushett and instructed a practicum on redox flow batteries in a larger school on applied electrochemical systems for *ca.* 40 students. The practicum specifically received praise in a free-response feedback survey

Kaufman Teaching Certificate Program, Cambridge, MA

Participant, MIT Teaching + Learning Lab; certificate received January 2021

- Studied proven practices and philosophies in instruction to develop teaching skills
- Designed modules for an electrochemistry class (e.g., constructing a syllabus, formulating exam questions)
- Constructed and taught a short demo lesson on electrochemistry thermodynamics to fellow participants

Teaching Assistant (Graduate Chemical Reactor Engineering), Cambridge, MA

MIT, Department of Chemical Engineering; January 2020-May 2020

- Ranked highly by first-year graduate students (mean: 5.8 out of 7, standard deviation: 1.04)
- Developed content for recitations and drafted both problem sets and exams
- Responded to the COVID-19 pandemic by helping transition the class to an accessible and exclusively online format

Graduate Student Mentor, Cambridge, MA

MIT, Brushett Research Group; November 2020-present

- Guide a younger graduate student to become familiar with a field of study
- Teach electrochemistry and chemical engineering fundamentals
- Counsel in experimental and research design as the student grows in independence and in critical thinking

Undergraduate Research Opportunities Program Mentor, Cambridge, MA

MIT, Brushett Research Group; June 2019-October 2020

- Communicated research goals and concepts to 2 undergraduate students who performed foundational work for a manuscript in preparation
- Crafted successful funding proposals within MIT
- Pivoted ongoing experimental research to a remote modeling project in response to the COVID-19 pandemic

Academic Fellow, Rice University, Houston, TX

McMurtry Residential College, 2014-2016

- Tutored students in organic chemistry, both individually and in larger groups