

Leonard W. Sprague Jr.

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Objective Statement Pursuing the endless search for unanswered questions to explore, across all disciplines that aim to improve our world (examples: sustainable and renewable resources, catalyst design, high specificity surface chemistry, and molecular modeling/simulation of these systems)

Education

Brown University, Providence, RI

Ph.D. Track in *Chemistry*

Start Date: July 2016

Expected Graduation: May 2021

Bridgewater State University, Bridgewater, MA

B.S. in *Chemistry* with *Environmental* and *Professional* concentrations

Minor in *Aviation Science: Flight Training*

Period: September 2011 – May 2016

Overall GPA: 3.911 - Program GPA: 3.97

Awards, Honors & Travel Grants

William R. Potter Grant, Brown University Chemistry Department

Graduate Travel Grant '17, Brown University Graduate School

GSC Travel Grant '17, Brown University Graduate Student Council

Achieved **Deans List Status** for 10 consecutive semesters, Bridgewater State University

Norris-Richards Summer Grant, North-Eastern Section of the ACS

American Institute of Chemists Award in Chemistry, American Institute of Chemists

T. Leonard Kelly Award in Chemistry, Bridgewater State University

Dr. George A. Weygand Scholarship, Bridgewater State University

Dr. Henry '58 and Rosemary Daley Chemistry Scholarship, Bridgewater State University

Adrian Tinsley Program Summer 2013 Research Grant, Bridgewater State University

Paul '68 and Barbara Killgoar Annual Fund Scholarship, Bridgewater State University

Abigail Adams Scholarship, Bridgewater Raynham Regional High School, 2011

CollegeBoard Advanced Placement Programs, AP Scholar with Honors Award, 2011

Courses

Organic Chemistry, Advanced Organic Chemistry, Inorganic Chemistry, Advanced Inorganic Chemistry, Biochemistry I, Physical Chemistry I & II, Computers in Chemistry, Ecology, Single Variable Calculus II, Physics I & II (Calculus Based), Advanced Environmental Chemistry, Quantum Mechanics, Statistical Mechanics, Topics in Bioinorganic Chemistry

Laboratory Skills

General

Proficiency with titration techniques, “bench top” organic chemistry techniques, chromatography and staining techniques, “bench top” biochemistry techniques

Analytical Techniques

MP/CP/BP Determination, Infrared Spectroscopy, Thin-Layer Chromatography, $^1\text{H}/^{13}\text{C}$ Nuclear Magnetic Resonance Spectroscopy, Ultraviolet-visible Spectroscopy, (“Flash”) Column Chromatography, Gas Chromatography Mass Spectrometry

Research Experience

Computational Chemistry Research: “*CdSe-CdS Core-shell Nanoparticle Semi-empirical Simulation*”, Brown University, Mentor: Dr. Brenda Rubenstein, Summer 2017 – Fall 2017

- Benchmarking Gaussian09 molecular modeling software in the PM3 and PM6 semi-empirical methods on a variety of Cd, S, and Se molecules
- Simulating CdS tetrahedron nanoparticle for understanding surface chemistry and assembly, using Gaussian09. Size of system ranges from tens to several hundreds of atoms.

Experimental Chemistry Research: “*Molecular Informatics with Ugi Reaction Products*”

Brown University, Mentor: Dr. Brenda Rubenstein, Advisor in Lab: Dr. Jason Sello, Summer 2017

- Ugi reaction synthesis obtaining 36 compounds as a trial run to illustrate the ability to read/write information into a molecular solution for DARPA
- Purification was done using “Flash” Column Chromatography, followed by using TLC plates to identify different fractions (using both Cerium Ammonium Molybdate (CAM) or Potassium Permanganate stains)
- Rotary Evaporator was used to remove excess solvent, and products were re-dissolved for NMR and GC/MS spectrum analysis.

Computational Chemistry Research: “*Ising Model and Quantum Monte Carlo Techniques*”

Brown University, Mentor: Dr. Brenda Rubenstein, Summer 2016 – Fall 2016

- Began work on Python coding of Ising model for six weeks over the summer prior to graduate school start
- Afterwards, focus was shifted to QMC variants and recognition of patterns for optimization purposes (Python, Fortran, and C languages in use)

Experimental Chemistry Research: “*Applying 1H NMR spectroscopy to develop a kinetic model for the transesterification of glycerol fatty acid triesters*”, Bridgewater State University, Mentor:

Dr. Edward Brush, Summer 2015 – present

- Applied for and received \$3000 for summer research from the Northeastern Section of the American Chemical Society (NESACS)
- Kinetics research on biodiesel transesterification using NMR spectroscopy, in order to identify the rate determining step and various other details. Information will help to narrow options for improving reaction efficiency.

Experimental Chemistry Research: “*Southeastern Massachusetts Student Network for Biodiesel Research and Education*”, Bridgewater State University, Mentor: Dr. Edward Brush, Summer

2014 – Fall 2015

- EPA P3 research grant, Phase I \$15000, approved: 1) to create an affordable bench top biodiesel reactor that may be used with many synthesis techniques, 2) to build a network of biodiesel researchers through distribution of this reactor to community colleges and high schools in the area

Experimental Chemistry Research: “*Applying Green Chemistry Principles to Biodiesel Synthesis from Waste Vegetable Oil*”, Bridgewater State University, Mentor: Dr. Edward Brush, Spring 2014 - Fall 2014

- Researching old and new techniques regarding biodiesel synthesis to assess their efficiency based on Green chemistry principles

Mathematics Research: “*The Archbishop: New Paths, Creating New Opportunities*”,

Bridgewater State University, Mentor: Dr. Ward Heilman, Spring 2013 – Summer 2014

- Applied for and received a \$4000 summer research grant from the Adrian Tinsley Program to conduct 10 weeks of research
- Worked on the creation of a new problem in Hamiltonian Path and Cycle Theory

Presentations

“Simulating Transition Metals and Transition Metal Oxides: Importance and Methodologies”, Oral Presentation, Brown University Chemistry Department’s Physical Chemistry Tea Session, October 12th 2017

“Applying 1H NMR spectroscopy to develop a kinetic model for the transesterification of glycerol fatty acid triesters”, Poster Presentation, Northeastern Student Chemistry Research Conference and Career Symposium, April 16th 2016

“Applying 1H NMR spectroscopy to develop a kinetic model for the transesterification of glycerol fatty acid triesters”, Poster Presentation, American Chemical Society Conference, March 14th 2016

“Applying 1H NMR spectroscopy to develop a kinetic model for the transesterification of glycerol fatty acid triesters”, Poster Presentation, Bridgewater State Summer Symposium, August 7th 2015

“Southeastern Massachusetts Student Network for Biodiesel Research and Education”, Poster & Oral Presentation (Group), EPA P3 Expo, April 11th 2015

“Southeastern Massachusetts Student Network for Biodiesel Research and Education”, Poster Presentation (Solo), American Chemical Society Conference, March 23rd 2015

“Southeastern Massachusetts Student Network for Biodiesel Research and Education”, Oral Presentation (Group), BSU Chemistry Department Seminar, February 20th 2015

“Applying Green Chemistry Principles to Biodiesel Synthesis from Waste Vegetable Oil”, Poster Presentation, Bridgewater State Undergraduate Summer Symposium, August 8th 2014

“The Archbishop: New Paths, Creating New Opportunities”, Poster Presentation, National Conference on Undergraduate Research (NCUR), April 3rd 2014

“The Archbishop: New Paths, Creating New Opportunities”, Oral Presentation, Mathematics Association of America (MAA) Northeastern Sectional Meeting, November 22nd 2013

“The Archbishop: New Paths, Creating New Opportunities”, Poster Presentation, Bridgewater State Undergraduate Summer Symposium, August 9th 2013

Publications

“Applying 1H NMR spectroscopy to develop a kinetic model for the transesterification of glycerol fatty acid triesters” (2016), *The Nucleus*, Northeastern Section of the American Chemical Society, accepted and published.

“The Archbishop’s Odyssey” (2014), *The Undergraduate Review*, Bridgewater State University, Journal of Undergraduate Research, accepted and published.

Teaching Experience

General Chemistry TA, Brown University, CHEM 0330, Fall 2016 – Present

- Instructor of general chemistry labs. Responsibilities include: supervision and instruction of students in executing proper experimental technique, assessment of experimental preparation, grading of lab reports and lecture examinations.

Martial Arts Instructor, South Shore Martial Arts Center, 2009 – Summer 2016

- Instructor of Martial Arts to children (ages 4-13) and adults (13 and up). Teaching self-defense, self-discipline, self-respect, self-control, and how to have a healthy attitude.

Writing Studio Senior Consultant and Fellow, English, Bridgewater State University, Spring 2012 –Spring 2016

- Senior Consultant: working with a client (undergraduate to graduate level students) to help improve their written works, from essays to business or grant proposals, and their ability as a writer. As a Senior Consultant, responsibilities also include leading and managing events, employee meetings, and problems that arise on a case-by-case basis between consultants and clients.
- Fellow: teaching assistant for targeted, introductory level English courses, wherein meetings of 30 minutes in length are held with each student once a week over the semester to mentor and reinforce their abilities as a writer. Class essays and projects are discussed and worked on, along with any other academic works they wish to discuss that are writing related.

Organic Chemistry PAL, Chemistry, Bridgewater State University, Spring 2015 – Spring 2016

- Lab assistant and tutor for organic chemistry I & II. Attended labs and demonstrated proper “bench top” techniques, while also holding office hours to address questions from lecture or lab.

Academic Tutor, Physics, Spring 2016

- One on one tutoring sessions covering introductory physics material. Once a week meetings, one and a half hours in length.

Academic Tutor, Mathematics, Fall 2011 - Summer 2014

- One on one tutoring sessions covering an array of mathematical topics from fundamentals to Calculus II. Meetings twice a week, minimum one hour in length to effectively cover topic of discussion.

Academic Tutor, Chemistry, Spring 2015 – Fall 2015

- One on one tutoring sessions covering topics in physical chemistry and inorganic chemistry. Meetings twice a week, minimum one hour in length to effectively cover topic of discussion.

STREAMS Consultant, English and Gen. Sciences, Bridgewater State University, Summer 2014

- Consulted incoming freshman (majoring in science and mathematics) in properly orchestrating argumentative and informative essays within and outside of their focus.

Workshops

Telluride School on Stochastic Approaches to Electronic Structure Calculation

Telluride Science Research Center (TSRC), Summer 2017

- Week long course covering various stochastic approaches to calculating electronic structure, with hands on practice using Variational, Diffusion, and Quantum Monte Carlo techniques.
- Speakers/Faculty whom assisted in presentating topics or designing practical activities included: Shiwei Zhang, Cyrus Umrigar, Brenda Rubenstein, Lucas Wagner, Bryan Clarke, Luke Shulenburg, Claudia Filippi, David Ceperly, James Shephard

Computer Skills

ChemBioOffice: ChemBioDraw, ChemBio3D, ChemBioFinder

Microsoft Office: Word, Excel, PowerPoint, 365, OneNote

Autodesk Software: Inventor, 3ds Max, Revit Architecture, Sketchbook Pro

Programming Languages: Python (P), Matlab (P)

Modeling Programs: Gaussian (89, 03, 09), Q-chem, Spartan, CASINO

(if applicable: N – Novice, P – Proficient, A – Advanced)

University Committees

Brown University

-*Member, Graduate Student Leadership Committee (GSLC)*, 2017 – present

-*Asst. Organizer, Incoming Graduates Visitation Weekend*, 2017 – present

Bridgewater State University

-*Member, Departmental Honors Program*, 2011 – 2016

-*Master of Ceremonies/Panel Member, College of Science and Mathematics Orientation*, 2015

Membership in Societies

-*Member, American Chemical Society*, 2014 – present

-*Member, Chemistry Club*, 2014 - Present

-*Member, Flying Bears: Flight Team*, 2011- 2014

Volunteer Experience

Judge, Times^2 Academy Science Fair, Feb. 8th 2018

Waiter, Heritage Circle Senior's Thanksgiving Dinner, 2009

Clean Up Crew, TJ² "Green Day" Clean-up Events, 2007 – 2011

Assistant, "Green" Workshops, 2014 - 2016

Special Topics

5th Kyu, Aikido Kokikai, Spring 2017 – Present

- Training in Aikido under Otto Liebman-Sensei, 6th Dan
- Kokikai lineage of Maruyama-Sensei

1st Degree Black Belt, South Shore Martial Arts Center (SSMAC), 1999 – Present

- Sixteen years of training in Ed Parker's Kenpo Karate
- Lead Instructor, 2011 – 2016

Private Pilot, Bridgewater State Part 141 Flight Program, 2011 – 2012

- Federal Aviation Administration (FAA) qualified Private Pilot for single engine land airplanes.

Engineer, FIRST Robotics Team (FRC), Member: 2007 - 2011, Captain: 2009-2011

- Design and fabrication of a robot built to most effectively solve a problem (or "game") created by the organization FIRST (For Inspiration and Recognition of Science and Technology). Ideas are tested through competitions around the globe.