

# Brandon Allen

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## EDUCATION

### YALE UNIVERSITY | DOCTORATE OF PHILOSOPHY IN CHEMISTRY

Began: August 2019 | New Haven, CT

### MONMOUTH COLLEGE | BACHELOR OF ARTS IN CHEMISTRY (ACS-CERTIFIED) AND PHYSICS

May 2019 | Monmouth, IL

(Summa Cum Laude)

### MCHENRY COUNTY COLLEGE | ASSOCIATES OF APPLIED SCIENCE

May 2016 | Crystal Lake, IL

(High Honors)

## RESEARCH EXPERIENCE

### MONMOUTH COLLEGE CHEMISTRY DEPARTMENT RESEARCH ASSISTANT

Dr. Audra Sostarecz and Dr. Bradley E. Sturgeon | Fall 2018 - May 2019

- Developed Python software for web-based isotropic Electron Paramagnetic Resonance (EPR) signal simulation.
- Glass blew reaction vessels used for generation of free radical species under vacuum line, characterized with Bruker EPR Spectrometer.
- Utilized home-built Brewster Angle Microscope (BAM) for visualization of Insulin Aggregates (in collaboration with another student) and Langmuir Films composed of various lipids (DPPC, DOPC, DPPE, DOPE) at the air-water interface.
- Independently wrote and tested LabVIEW VIs for the quantitative analysis of BAM images to determine Langmuir film thickness and surface density.
- Worked with student on the design and construction of a fluorescence microscope to be mounted directly onto Langmuir trough for visualization of Langmuir films. Developed Python software for instrument control and image processing.

### RICHARD "DOC" KIEFT SUMMER RESEARCH PROGRAM RESEARCH ASSISTANT

Monmouth College Chemistry Department

Dr. Audra Sostarecz and Dr. Bradley E. Sturgeon | May 2018 - August 2018

- Imaged systems of DPPC and DPPC/Cholesterol mixtures using BAM and developed image processing software in LabVIEW.
- Worked with a home-built BAM to improve instrument performance and image quality. Built laser modules to investigate the effect of wavelength and power of lasers on instrument performance.
- Designed and 3D-printed various components for integration into home-built BAM including a polarizer mount and a camera adjustment attachment (linear actuator) driven by an Arduino microcontroller. Developed LabVIEW VI for communication with Arduino.
- Improved Python codes for the optimization of processing procedure and presentation of Langmuir Trough data. Worked with another student to construct a Graphical User Interface for program and constructed executable version of it for distribution to other research group members.
- Developed a website to host the data processing programs. Deployed website to Chemistry Department server so that users can process data through website on personal computers.
- Presented Research to Chemistry and Physics Department faculty as well as other program participants.

### MONMOUTH COLLEGE CHEMISTRY DEPARTMENT RESEARCH ASSISTANT

Dr. Audra Sostarecz and Dr. Bradley E. Sturgeon | Fall 2017 - Spring 2018

- Improved Design of BAM by testing different microscope objectives/camera optical set-ups. Completed software for automated camera acquisition and general image processing.
- Investigated the percolation threshold in domain formation of Langmuir Films composed of varied mole ratios of DPPC and cholesterol. Wrote LabVIEW software for quantifying formation/size of lipid domains in these DPPC/Cholesterol systems.
- Added algorithms to Python data processing program for the automated calculation of the limiting molecular area and compression modulus in Langmuir trough data.
- Investigated the effect of cholesterol concentration in Langmuir monolayers composed of DPPE and DOPC.

### RICHARD "DOC" KIEFT SUMMER RESEARCH PROGRAM RESEARCH ASSISTANT

Monmouth College Chemistry Department

Dr. Audra Sostarecz and Dr. Bradley E. Sturgeon | May 2017 - August 2017

- Designed and constructed a low-cost Brewster Angle Microscope to be mounted directly on a Langmuir Trough for real-time visualization of Langmuir films while simultaneously collecting compression analysis data.

- Designed LabVIEW software for camera acquisition and manual control of support arms of instrument.
- Imaged systems of DPPC, DOPC, Cholesterol, and binary mixtures with home-built BAM and AFM.
- Developed multiple Python programs to optimize processing of data collected with Langmuir Trough.
- Presented results to Chemistry and Physics Department faculty as well as other program participants.

## **MONMOUTH COLLEGE CHEMISTRY DEPARTMENT RESEARCH ASSISTANT**

Dr. Audra Sostarecz | Fall 2016 - Spring 2017

- Learned principles and theory of Langmuir Monolayer research.
- Studied Langmuir monolayers of DPPC, DOPC, DPPE and other phospholipids with Langmuir Trough with the goal of studying the effects of oxidatively-modified lipids on membrane fluidity.
- Wrote a formal project proposal to model oxidative stress in brain cells using photooxidation and lipids found in the brain.
- Imaged Langmuir-Blodgett films of DPPC, DPPE, and DOPC with Atomic Force Microscopy (NanoMagnetics ezAFM).

## **PUBLICATIONS AND PRESENTATIONS**

### **PUBLICATION**

- Beaumont, V. A.; Reiss, K.; Qu, Z.; Allen, B.; Batista, V. S.; Loria, J. P. Allosteric Impact of the Variable Insert Loop in Vaccinia H1-Related (VHR) Phosphatase. *Biochemistry* 2020, 59 (20), 1896–1908. <https://doi.org/10.1021/acs.biochem.0c00245>.

### **CONFERENCE PROCEEDINGS**

- Allen, Brandon, Seth Croslow, and Audra Sostarecz. "Development of Microscopy Systems for the Visualization of Langmuir Monolayer Films." In *Abstracts of Papers of The American Chemical Society*, Vol. 257. 1155 16TH ST, NW, Washington, DC 20036 USA: AMER CHEMICAL SOC, 2019.
- Saulcy, Kathryn, Seth Croslow, Brandon Allen, Debbie Crans, and Audra Sostarecz. "Investigating Insulin Monomer and Hexamer Formation with Langmuir Monolayers, Brewster Angle Microscopy, and Fluorescence Microscopy." In *Abstracts of Papers of The American Chemical Society*, Vol. 257. 1155 16TH ST, NW, Washington, DC 20036 USA: American Chemical Society, 2019.
- Allen BC, Sturgeon BE, Sostarecz AG. Brewster Angle Microscopy and Langmuir Monolayer Films: Construction of an Instrument and Basic Software Development for Visualization of Lipid Domains and Lipid Raft Formation. In *FASEB JOURNAL* 2018 Apr 1 (Vol. 32, No. 1). 9650 Rockville Pike, Bethesda, MD 20814-3998 USA: Federation American Society of Experimental Biology.

### **PRESENTATIONS**

- The Development of Microscope Systems for Visualization of Langmuir Films (April 2019 - American Chemical Society National Meeting in Orlando as part of the Basic Research in Colloids, Surfactants and Interfaces Session)
- A Comparative Study Between Simulated and Experimental Electron Paramagnetic Resonance Data (Poster Presentation - April 2019 - Monmouth College Scholar's Day Event)
- Development of Microscope Systems for the Visualization of Langmuir Films (Poster Presentation - April 2019 - Monmouth College Scholar's Day Event)
- The Electron: A Preamble to Understanding EPR Spectroscopy (Spring 2019 - Science Seminar at Monmouth College)
- Utilization of a Ceramic 3D Printer (August 2018 - Summer Opportunity for Intellectual Activities Colloquium)
- Revisiting Langmuir Films with a Home-Built Brewster Angle Microscope (July 2018 - Richard "Doc" Kieft Summer Research Program at Monmouth College)
- Construction of a Brewster Angle Microscope for the Visualization of Lipid Domains in Langmuir Monolayer Films (April 2018 - American Society of Biochemistry and Molecular Biology Annual Meeting in San Diego - Spotlight Session as part of the Lipid Domains and Lipid Rafts Session)
- Brewster Angle Microscopy and Langmuir Monolayer Films for Visualization of Lipid Domains and Lipid Raft Formation (Poster Presentation - April 2018 - American Society of Biochemistry and Molecular Biology Annual Meeting in San Diego, CA)
- Design and Construction of a Brewster Angle Microscope for the Visualization of Thin Films (Guest Speaker - April 2018 - First Annual Science Symposium at Monmouth College)

- Application of a Fabricated Brewster Angle Microscope to the Visualization of Langmuir Monolayers (November 2017 - IL-IA Local ACS Section Undergraduate Research Conference at St. Ambrose)
- The Chemistry Archives (August 2017 - Summer Opportunity for Intellectual Activities Colloquium)
- Langmuir Monolayers and Brewster Angle Microscopy: Construction of an Instrument and Basic Software Development (July 2017 - Richard "Doc" Kieft Summer Research Program at Monmouth College)

## **HONORS/AWARDS**

### **MONMOUTH COLLEGE**

- Dean's List: Fall 2016, Spring 2017, Fall 2017, Spring 2018, Fall 2018, Spring 2019
- Excellence in Chemistry - Awarded to Senior Student for Outstanding Work in the Chemistry Department at Monmouth College (2019)
- Excellence in Physics - Awarded to Senior Student for Outstanding Work in the Physics Department at Monmouth College (2019)
- ACS Division of Physical Chemistry: Undergraduate Excellence in Physical Chemistry (2018)
- Robert Minter Prize for Excellence in Mathematics, Physics, and Chemistry (2018)
- Robert H. Bucholz Scholarship at Monmouth College (2017-2019)
- Cliff-Struthers Hamilton Scholarship at Monmouth College (2017-2019)
- Kenneth M. & Katherine B. Irey Scholarship at Monmouth College (2017-2019)

### **MCHENRY COUNTY COLLEGE**

- President's List: Spring 2014, Fall 2014, Spring 2015, Fall 2015, Spring 2016
- Member of Phi Theta Kappa International Honors Society

## **TEACHING AND SERVICE**

- Analytical Chemistry Supplemental Instructor (Fall 2018 - Spring 2019)
- President of Monmouth College Student Chapter of the American Chemical Society (2017 - 2019)  
Received Excellence in Green Chemistry and Commendable Chapter Awards (2018)
- Roaster/Technician for the Monmouth College Coffee Project (Fall 2016 - May 2019)
- Academic Success Resident Assistant (Spring 2017 - May 2019)
- Monmouth College Boy Scouts of America Merit Badge Clinic - Nuclear Science Instructor (2018, 2019)
- Summer Opportunity for Intellectual Activities (SOfIA) Mentor - Utilization of a Ceramic 3D Printer (2018) and The Chemistry Archives (2017)
- Introductory Physics I TA (Fall 2017)
- General Chemistry TA (Spring 2017)
- Member of Physics Club Student Organization