

# Whitney C. Blocher McTigue

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## RESEARCH INTERESTS

My research focuses on using complex coacervation, which is a liquid-liquid phase separation phenomenon, to encapsulate and thermally stabilize biomacromolecules. These self-assembling polyelectrolyte systems give insight into biomacromolecules and their interactions with the intracellular environment, thus providing stepping-stones for advancements in biomedicine. Additionally, the stabilization of biologic moieties decreases the need for the cold chain to keep vaccines and other therapeutics viable, allowing relief programs to provide more aid with fewer cold chain logistical constraints.

## EDUCATION

- May 2020      *Doctor of Philosophy in Chemical Engineering, Certificate in Soft Materials for Life Sciences*, University of Massachusetts Amherst, Amherst, MA
- May 2015      *Bachelor of Science in Chemical Engineering with Great Distinction, Minor in Mathematics*, Clarkson University, Potsdam, NY

## RESEARCH EXPERIENCE

### University of Massachusetts Amherst

#### Advisor: Dr. Sarah L. Perry

- Oct. 2015 -      Encapsulation and Stabilization of Biomacromolecules (Ph.D.)
- Employs complex coacervation to encapsulate and stabilize biomacromolecules
  - Utilizes Bradford assay and circular dichroism to determine stability
  - Programs and uses pipetting robot to monitor polyelectrolyte kinetics
  - Uses ternary systems to better understand the influence of surfactants on coacervation

## PUBLICATIONS

### Peer-Reviewed Publications

(\*corresponding author)

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1. **W.C. Blocher McTigue**, S.L. Perry\*, “Design Rules for Encapsulating Proteins into Complex Coacervates,” *Soft Matter*, 2019, **15**, 3089 – 3103.
2. **W.C. Blocher**, S.L. Perry\*, “Biomimetic Complex Coacervate-Based Materials for Biomedicine,” *WIREs Nanomedicine and Nanobiotechnology*, 2017, **9**(4), e1442.

### Manuscripts in Preparations

(\*corresponding author, †undergraduate)

1. **W.C. Blocher McTigue**, E. Voke<sup>†</sup>, L.W. Chang, S.L. Perry\*, “The Benefit of Poor Mixing: Tracking the Kinetics of Complex Coacervation,” (in preparation).

## PRESENTATIONS

### Invited Presentations

(†undergraduate)

1. S.L. Perry, L.W. Cheng, T.K. Lytle, **W.C. Blocher McTigue**, A. Cabral, S. Traiger, C.E. Sing, *Coacervation of Sequence Controlled Polypeptides: Understanding Biology and Designing Materials*, AIChE Annual Meeting, Orlando, FL, November 2019.
2. C.L. Heldt, X. Mi, **W.C. Blocher McTigue**, M. Bunker<sup>†</sup>, P.U. Joshi, S.L. Perry, *Understanding Virus Surface Interactions and Stability*, AIChE Annual Meeting, Orlando, FL, November 2019.

### Contributed Presentations

(†undergraduate)

1. **W.C. Blocher McTigue**, A. Cabral<sup>†</sup>, S. Traiger<sup>†</sup>, and S.L. Perry, *Encapsulating Proteins into Complex Coacervates*, AIChE Annual Meeting, Orlando, FL, November 2019.
2. S.L. Perry, L.-W. Chang, T. Lytle, **W.C. Blocher McTigue**, A. Cabral<sup>†</sup>, S. Traiger<sup>†</sup>, C.E. Sing, *Coacervation of Sequence Controlled Polypeptides: Understanding Biology and Designing Materials*, AIChE Annual Meeting, Orlando, FL, November 2019.
3. **W.C. Blocher McTigue**, A. Cabral<sup>†</sup>, S. Traiger<sup>†</sup>, X. Mi, C.L. Heldt, S.L. Perry, *Protein and Virus Encapsulation: Stepping Stones Toward Thermal Stability* (poster), BMES Annual Meeting, Philadelphia, PA, October 2019.
4. S.L. Perry, **W.C. Blocher McTigue**, A. Cabral<sup>†</sup>, S. Traiger<sup>†</sup>, *Design Rules for Encapsulating Proteins into Complex Coacervates*, ACS Colloids and Surface Science Symposium, Atlanta, GA, June 2019.
5. **W.C. Blocher McTigue**, X. Mi, C. Heldt, S.L. Perry, *Reducing Cold Chain Dependence: Encapsulation and Thermal Stability of Biologics with Complex Coacervates*, National Research Traineeship Retreat, Amherst, MA, May 2019.

6. E. Voke<sup>‡</sup>, **W.C. Blocher McTigue**, S.L. Perry, *The Effects of Charge Patterning on the Kinetics of Complex Coacervation*, 25<sup>th</sup> Annual Massachusetts Statewide Undergraduate Research Conference, Amherst, MA, April 2019.
7. H. Tjo<sup>‡</sup>, **W.C. Blocher McTigue**, S.L. Perry, (poster) *Exploring the Phase Behavior of Polyelectrolyte-Surfactant Systems*, 25<sup>th</sup> Annual Massachusetts Statewide Undergraduate Research Conference, Amherst, MA, April 2019.
8. A. Cabral<sup>‡</sup>, S. Traiger<sup>‡</sup>, **W.C. Blocher McTigue**, S.L. Perry (poster), *Encapsulation of Biomolecules Through Complex Coacervation*, 25<sup>th</sup> Annual Massachusetts Statewide Undergraduate Research Conference, Amherst, MA, April 2019.
9. X. Mi, **W.C. Blocher McTigue**, M.K. Bunker<sup>‡</sup>, P.U. Joshi, S.L. Perry, and C.L. Heldt, *Virus Encapsulation via Electrostatic Polypeptide Dense Phases*, Graduate Research Colloquium, Michigan Technological University, March 2019.
10. X. Mi, **W.C. Blocher McTigue**, M.K. Bunker<sup>‡</sup>, P.U. Joshi, S.L. Perry, and C.L. Heldt, (poster) *Virus Encapsulation via Electrostatic Polypeptide Dense Phases*, American Chemical Society (ACS) Upper Peninsula Local Section, Marquette, MI, March 2019.
11. L.-W. Chang, **W.C. Blocher McTigue**, T.K. Lytle, C.E. Sing, S.L. Perry, (poster) *Molecular Design of Polyelectrolyte Complex Materials*, UMass Chemical Engineering Recruiting Weekend, Amherst, MA, March 2019.
12. **W.C. Blocher McTigue**, X. Mi, C. Heldt, S.L. Perry, *Complex Coacervation as a Novel Method for Thermal Stabilization of Biomacromolecules*, University of Massachusetts Amherst Department of Veterinary and Animal Science Seminar, Amherst, MA, January 2019.
13. E. Voke<sup>‡</sup>, **W.C. Blocher McTigue**, L.-W. Chang, S.L. Perry, (poster) *The Effects of Charge Patterning on the Kinetics of Complex Coacervation*, AIChE Annual Meeting, Pittsburgh, PA, October 2018.
14. **W.C. Blocher McTigue**, L.-W. Chang, X. Meng, V. Liadinskaia, Y. Liu, S.L. Perry, (poster) *Nature-Inspired Materials Design*, NORA Meets BASF Challenges, Cambridge, MA, October 2018.
15. E. Voke<sup>‡</sup>, **W.C. Blocher McTigue**, L.-W. Chang, S.L. Perry, (poster) *The Effects of Charge Patterning on the Kinetics of Complex Coacervation*, UMass-Amherst Fall Polymer Event, Amherst, MA, October 2018.
16. H. Tjo<sup>‡</sup>, **W.C. Blocher McTigue**, S.L. Perry, (poster) *Establishing Compositional Dynamics on Self-Assembly in Polyelectrolyte-Surfactant Systems*, UMass-Amherst Fall Polymer Event, October 2018.
17. **W.C. Blocher McTigue**, X. Mi, C. Heldt, S.L. Perry, *Encapsulation and Thermal Stability of Biomacromolecules using Complex Coacervation*, University of Massachusetts Amherst Department of Chemical Engineering G.R.A.S.S. Seminar, Amherst, MA, October 2018.
18. **W.C. Blocher McTigue**, X. Mi, C. Heldt, S.L. Perry, *Encapsulation and Thermal Stability of Biomacromolecules using Complex Coacervation*, UMass-Amherst Biophysics Lunch Series, Amherst, MA, September 2018.
19. L.-W. Chang, **W.C. Blocher McTigue**, T.K. Lytle, C.E. Sing, S.L. Perry, (poster) *Molecular Design of Polyelectrolyte Complex Materials*, Frontiers of Molecular Engineering, Chicago, IL, September 2018.
20. **W.C. Blocher**, S.L. Perry, R. André, *Stability and Properties of Polyelectrolyte Complexes at High Concentration of Surfactant*, BASF NORA Collaboration Days, Amherst, MA, June 2018.
21. H. Tjo<sup>‡</sup>, **W.C. Blocher**, S.L. Perry, (poster) *Surfactant Incorporated Polyelectrolyte-Micelle Systems: A Fundamental Investigation*, 24<sup>th</sup> Annual Massachusetts Statewide Undergraduate Research Conference, Amherst, MA, April 2018.
22. Y. Liu, **W.C. Blocher**, X. Meng, M. Labbe<sup>‡</sup>, E. Voke<sup>‡</sup>, C. Boucher<sup>‡</sup>, H.H. Winter, M. Corradini, J.D. Schiffman, S.L. Perry, *Dynamics in Polyelectrolyte Complex Materials*, APS March Meeting, Los Angeles, CA, March, 2018.
23. **W.C. Blocher**, R. Hershman<sup>‡</sup>, S.L. Perry, *Encapsulation and Thermal Stability of Immunological Biologics using Complex Coacervation*, AIChE Annual Meeting, Minneapolis, MN, October 2017.
24. **W.C. Blocher**, L.-W. Chang, X. Meng, Y. Liu, S.L. Perry, (poster) *Nature-Inspired Materials Design*, NORA Meets BASF Challenges, Cambridge, MA, October 2017.
25. **W.C. Blocher**, S.L. Perry, *Encapsulation and Thermal Stability of Immunological Biologics Using Complex Coacervation*, UMass-Amherst Fall Polymer Event, Amherst, MA, October 2017.
26. **W.C. Blocher**, S.L. Perry, (poster) *Protein Encapsulation Using Complex Coacervation of Oppositely-Charged Polypeptides*, UMass-Amherst Fall Polymer Event, October 2017.
27. **W.C. Blocher**, Y. Liu, P. Harney<sup>‡</sup>, S.L. Perry, *Novel Method for Protein Stability and Delivery through the Formation of Complex Coacervates*, AIChE Annual Meeting, San Francisco, CA, November 2016.
28. **W.C. Blocher**, S.L. Perry, (poster) *Protein Encapsulation via Coacervation using Oppositely-Charged Polyelectrolytes*, Soft Materials for Life Sciences Retreat, Amherst, MA, October 2016.
29. P. Harney<sup>‡</sup>, **W. Blocher**, S.L. Perry, (poster) *Coacervate-Based Hemoglobin Stabilization for Artificial Blood Applications*, 22<sup>nd</sup> Annual Massachusetts Statewide Undergraduate Research Conference, Amherst, April 2016.
30. P. Harney<sup>‡</sup>, **W. Blocher**, S.L. Perry, (poster) *Coacervate-Based Hemoglobin Stabilization for Artificial Blood Applications*, University of Massachusetts Amherst iCons Research Showcase, Amherst, MA, April 2016.

## RESEARCH PROPOSALS

### Funded Research Proposals

1. *Chemical Engineering Fellowship Research Proposal*, PPG Corporation, W.C. Blocher McTigue (PI), 2019, \$16,500.
2. *Chemical Engineering James M. Douglas Fellowship Proposal*, Department of Chemical Engineering, W.C. Blocher McTigue (PI), 2018, \$20,000.

## Submitted Research Proposals Not Funded

1. *Materials Strategy for Thermostable Vaccines*, Ruth L. Kirschstein National Research Service Award (Predoctoral Fellowship, F31) from the National Institutes of Health, W.C. Blocher McTigue (PI), S.L. Perry (Sponsor), C.L. Baldwin (Co-Sponsor), (not funded).

## HONORS & AWARDS

### University of Massachusetts Amherst

Spring 2019	Eldridge Award for G.R.A.S.S. Presentation
Spring 2019	PPG Fellowship
Fall 2018	James M. Douglas Fellowship
Fall 2017	Eldridge Teaching Assistant Award
Nov. 2017	SMLS-NRT Travel Grant, Soft Materials for Life Sciences National Science Foundation National Research Traineeship
2016 – 2017	SMLS-NRT Fellowship, Soft Materials for Life Sciences National Science Foundation National Research Traineeship
2016 – 2018	SMLS-NRT Trainee, Soft Materials for Life Sciences National Science Foundation National Research Traineeship

## TEACHING EXPERIENCE

### University of Massachusetts Amherst

#### Instructor of Record

Fall 2019 Freshman Seminar Instructor (3 sections)

#### Teaching Assistant

Fall 2017 Introduction to Chemical Engineering

Fall 2016 Introduction to Chemical Engineering

#### Guest Lecturer

Spring 2019 “Complex Coacervation as a Novel Method for Thermal Stabilization of Biomacromolecules,” Animal Diseases, Department of Veterinary and Animal Sciences

Spring 2019 “Model Fitting and Vapor Pressure Calculations,” Thermodynamics I, Department of Chemical Engineering

Spring 2019 “2D Phase Diagrams: Redlich-Kwong EOS,” Thermodynamics I, Department of Chemical Engineering

Spring 2019 “Carnot Cycle of an Ideal Gas,” Thermodynamics I, Department of Chemical Engineering

Fall 2018 “Encapsulation and Thermal Stability of Biomacromolecules using Complex Coacervation,” Introduction to Chemical Engineering, Department of Chemical Engineering

#### Seminar Instructor (0 Credit Course)

Spring 2019 MATLAB Seminar Instructor

Fall 2018 MATLAB Seminar Instructor

Spring 2018 MATLAB Seminar Instructor

### Clarkson University

#### Teaching Assistant

Spring 2015 Introduction to Use of the Computer

Fall 2013 – Spring 2015 Organic Chemistry

Spring 2013 Introduction to Use of the Computer

## TEACHING INTERESTS

Introduction to Chemical Engineering

MATLAB for Engineers

Science Fiction and its Connection to Modern Technology: Where can we go?

Journal Club: New Technologies from Old Ideas

## **MENTORING AND LEADERSHIP EXPERIENCE**

### **University of Massachusetts Amherst**

2016 – Mentored 12 students in the Perry Lab as scientists and as academic learners; four of these students have worked / are working on projects under my guidance

## **LABORATORY SKILLS AND TECHNIQUES**

- Formulation; Turbidimetry; Optical Microscopy; Bradford Assay; Emission and Excitation Spectroscopy; Absorbance Spectroscopy; Circular Dichroism; MTT Assay; BCA Assay
- Creating and writing standard operating procedures for pH balancing, stock solutions, Bradford assay, coacervation experiments, etc.
- Use, programming, and training of a liquid handling robot

## **PROGRAMS AND COMPUTER SKILLS**

MATLAB; Adobe Photoshop; Adobe Illustrator; Origin

## **PROFESSIONAL WORK EXPERIENCE**

Aug. 2018 ABET Evaluation – UMass Amherst, Amherst, MA

- Worked with Undergraduate Program Committee to see how ABET objective changes would affect undergraduate curriculum
- Spoke with professors and put together scheme of how the current curriculum meets the new criteria

Summer 2014 Ras Labs, LLC Internship – Quincy, MA

- Worked on synthetic muscle and its ability to expand / contract via current
- Researched radiation resistance in electro-active polymers for the Center for Advancement of Science in Space

Summer 2013 Naval Research Enterprise Internship Program Intern – San Diego, CA

- Fluorescence and UV/Vis Spectroscopy
- Extractions and analysis of biofuels and conventional fuels
- Researched fuel and biofuel contamination of seawater

## **PROFESSIONAL TRAINING**

May 2019 Getting Ready to Be an Instructor, Office of Professional Development

May 2019 CV Clinic, Office of Professional Development

May 2018 Creating a Syllabus for Fall 2018, Office of Professional Development

Apr. 2018 Teaching Statements Interactive Workshop, Office of Professional Development

Apr. 2018 How to Cope When You Feel Burned Out, Office of Professional Development

Apr. 2018 Teaching Portfolios and Statements: An Overview, Office of Professional Development

Apr. 2018 5 Things to Do on the Last Day of Class, Office of Professional Development

Oct. 2017 Women Graduate Students and Post-Doctorates Workshop, AIChE

2016 – 2018 Soft Materials for Life Science National Research Traineeship (SMLS-NRT) Trainee, University of Massachusetts Amherst

## **PROFESSIONAL AFFILIATIONS**

Center for the Integration of Research, Teaching and Learning (CIRTL) Associate

Biomedical Engineering Society (BMES)

American Institute of Chemical Engineers (AIChE)

Omega Chi Epsilon Chemical Engineering Honor Society

Phi Kappa Phi Honor Society

## **OUTREACH**

Aug. 2019 Graduate School's Teaching Assistant Orientation Panelist

Jul. 2016 "Summer Engineering Institute" for local high school students at UMass