

Blair Kathryn Brettmann

901 Atlantic Dr. NW, Ste. 3100P
Atlanta, GA 30332

404-894-2535
blair.brettmann@chbe.gatech.edu

Education

Massachusetts Institute of Technology

Cambridge, MA

Ph.D. Chemical Engineering

May 2012

Advisor: Bernhardt Trout

Thesis Title: Electrospinning for Pharmaceutical Applications

Minor in Science Writing

M.S. Chemical Engineering Practice

May 2009

Internships at GlaxoSmithKline (Upper Merion, PA) and Mawana Sugar Works (Mawana, India)

The University of Texas at Austin

Austin, TX

B.S. Chemical Engineering, high honors

May 2007

GPA: 3.95/4.0

Semester honors, 7 semesters from 2004-2007

Employment History

Georgia Institute of Technology

Atlanta, GA

Assistant Professor, Chemical and Biomolecular Engineering

January 2019-Present

Assistant Professor, Materials Science and Engineering

January 2017-Present

The University of Chicago

Chicago, IL

Postdoctoral Researcher, Institute for Molecular Engineering, Advisor: Matthew Tirrell

July 2014-Dec 2016

Saint-Gobain

Northboro, MA

Senior Research Engineer, Polymer Competency R&D Labs

July 2012-June 2014

Awards and Honors

- Air Force Research Lab Summer Faculty Fellow (2019)
- International Union of Pure and Applied Chemistry Young Observer, sponsored by the National Academies of Sciences, Engineering and Medicine (2019)
- Ralph E. Powe Junior Faculty Enhancement Award (2018)
- Poster Presentation Award, Soft Matter Summer School, Seoul, South Korea (2015)
- One of ten graduate students selected for National Nanotechnology Infrastructure Network International Winter School on Nanofabrication, Bangalore, India, (2011)
- Rosemary Wojtowicz Fellowship, David H. Koch '62 Fellowship (2007)
- NSF Graduate Research Fellowship Honorable Mention (2007, 2008)
- University of Texas Semester Honors (7 semesters from 2004-2007)
- Member of Tau Beta Pi and Omega Chi Epsilon Engineering Honors Societies
- National Merit Scholar

Peer-Reviewed Publications (*denotes corresponding author)

18. Faubel, J, R Patel, W Wei, J Curtis, **Blair Brettmann***, "Giant Hyaluronan Brushes Display Polyelectrolyte Brush Polymer Physics Behavior", ACS Macro Letters, 2019, 8, 1323-1327.
17. Woods, H., A Boddorff, E Ewaldz, Z Adams, M Ketcham, DJ Jang, E Sinner, N Thadhani, **Blair Brettmann***, "Rheological considerations for binder development in direct ink writing of energetic materials", Propellants, Explosives, Pyrotechnics, DOI:10.1002/prop.201900159, 2019.
16. Ewaldz, E., **Blair Brettmann***, "Molecular Interactions in Electrospinning: From Polymer Mixtures to Supramolecular Assemblies", ACS Applied Polymer Materials, 2019, 1 (3), 298-308.
15. Khan, N, **Blair Brettmann***, "Intermolecular Interactions in Polyelectrolyte and Surfactant Complexes in Solution", MDPI Polymers, 2019, 11 (1), 51.
14. M Banerjee, LG Willows, S Saraswatula, **Blair Brettmann***, "Pharmaceutical Crystallization in Surface-Modified Nanocellulose Organogels", Journal of Materials Chemistry B, **2018**, DOI:10.1039/C8TB01554F.
13. E Ewaldz, R Patel, M Banerjee, **Blair Brettmann***, "Material Selection in Electrospinning Microparticles," Polymer, **2018**, 153, pp 529-537.
12. J Yu, NE Jackson, X Xu, **Blair Brettmann***, M Ruths, JJ de Pablo, M Tirrell, "Multivalent Ions Induce Lateral Structural Inhomogeneities in Polyelectrolyte Brushes," Science Advances, **2017**, 3 (12), eaao1497.
11. N Jackson, **Blair Brettmann**, V Vishwanath, M Tirrell, JJ de Pablo, "Comparing Solvophobic and Multivalent Induced Collapse in Polyelectrolyte Brushes," ACS Macro Letters, **2017**, 6, 155-160.
10. **Brettmann, Blair**, P Pincus, M Tirrell, "Lateral Structure Formation in Polyelectrolyte Brushes Induced by Multivalent Ions," Macromolecules, **2017**, 50 (3), 1225-1235.
9. Marciel, AB, E J Chung, **Blair Brettmann**, L Leon, "Bulk and Nanoscale Polypeptide Based Polyelectrolyte Complexes," Advances in Colloid and Interface Science, **2016**, 239, pp 187-198.
8. **Brettmann, Blair**, N Laugel, N Hoffmann, P Pincus, M Tirrell, "Bridging Contributions to Polyelectrolyte Brush Collapse in Multivalent Salt Solutions," J Poly Sci A: Poly Chem, **2015**, 54 (2), 284-291.
7. Quon, JL, K Chadwick, GPF Wood, I Sheu, **Blair Brettmann**, AS Myerson, BL Trout, "Templated nucleation of acetaminophen on spherical agglomerates," Langmuir, **2013**, 29 (10), pp 3292-3300.
6. **Brettmann, Blair**, K Cheng, AS Myerson, BL Trout, "Electrospun formulations containing crystalline active pharmaceutical ingredients," Pharm Res, **2012**, pp 1-9.
5. **Brettmann, Blair**, S Tsang, KM Forward, GC Rutledge, AS Myerson, BL Trout, "Free surface electrospinning of fibers containing microparticles," Langmuir, **2012**, 28 (25), pp 9714-9721.
4. **Brettmann, Blair**, AS Myerson, BL Trout, "Solid-state nuclear magnetic resonance study of the physical stability of electrospun drug and polymer solid solutions," J Pharm Sci, **2012**, 101 (6), pp 2185-2193.
3. **Brettmann, Blair**, E Bell, AS Myerson, BL Trout, "Design and characterization of high-loading solid solutions of API and excipients formed by electrospinning," J Pharm Sci, **2012**, 101 (4), pp 1538-1545.
2. He, Xihua, **Blair Brettmann**, H Jung, "Effects of Test Methods on Crevice Corrosion Repassivation Potential Measurements of Alloy 22," Corrosion, **2009**, 65 (7), pp 449-460.

1. Matteucci, Michal, **Blair Brettmann**, T Rogers, E Elder, RO Williams, KP Johnston, “*Design of Potent Amorphous Drug Nanoparticles for Rapid Generation of Highly Supersaturated Media*,” Mol Pharm, **2007**, 4 (5), pp 782-793.

Granted Patents and Patent Applications

Composite Bearings having a Polyimide Matrix, US Patent 10,266,722, **2019**

Composite Bearings having a Polyimide Matrix, US Patent 9,890,298, **2018**

Layer Processing for Pharmaceuticals, US Patent 9,205,089, WO App., 2012149326, **2015**

Coating Materials and Low Haze Heat Rejection Composites, US App., 14/572,432, **2013**

Electroprocessing of Active Pharmaceutical Ingredients, US App., 13/832,812, **2012**

Invited Seminars and Presentations (underline denotes presenting author)

H Woods, I Campbell, Z Adams, M Ketcham, Blair Brettmann, “*Direct ink write additive manufacturing of high particle content suspensions.*”, 3D Printing IPRIME Midyear Workshop, Minneapolis, MN, Jan 2020. Invited Oral Presentation.

H Woods, I Campbell, Z Adams, M Ketcham, Blair Brettmann, “*Direct ink write additive manufacturing of high particle content suspensions.*”, 3M Corporation, Minneapolis, MN, Jan 2020. Invited Seminar.

Brettmann, B. “*Surface modified cellulose nanocrystals for drug polymorph screening*,” 13th IEEE International Conference on Nano/Molecular Medicine & Engineering, Gwangju, Korea, November 2019. Invited Oral Presentation.

Ewaldz, E, I Campbell, R Patel, J Randrup, Brettmann, B. “*Increasing the functionality of electrospun polymer fibers through large particle inclusion*,” Southeastern Regional Meeting of the American Chemical Society, Savannah, GA, October 2019. Invited Oral Presentation.

Banerjee, M, N Khan, M Goswami, Brettmann, B. “*Molecular Interactions with Cellulose: Polyelectrolyte Complexes to CNC Surface Modification*,” International Symposium on Materials from Renewables, Athens, GA, October 2019. Invited Oral Presentation.

Brettmann, B. “*Electrospinning of Hard to Spin Materials*,” Telluride Science Research Conference on the Role of Assembly in Dictating the Functionality and Applications of Organic Semiconductors, Telluride, CO, July 2019. Invited Oral Presentation.

Brettmann, B., “*Molecular Interactions with Cellulose: Polyelectrolyte Complexes to CNC Surface Modification*,” Bio-Environmental Polymer Society, Greenville, SC, June 2019. Invited Oral Presentation.

Brettmann, B., “*Processing of High Particle Loading Polymer/Particle Mixtures*,” AFRL-Munitions, Eglin AFB, June 2019, Invited Seminar.

Brettmann, B., “*Solution Processing of High Particle Loading Polymer/Particle Mixtures*,” PPG Industries, May 2019, Invited Seminar.

Brettmann, B. *“Pharmaceutical Oral Dosage Forms: New Approaches for a Classic Drug Delivery Method,”* University of Puerto Rico, Molecular Science, March 2019, Invited Seminar.

Brettmann, B. *“Processing High Particle Loading Polymer Composites via Additive Manufacturing and Electrospinning,”* University of Tennessee Knoxville, Department of Materials Science and Engineering, March 2019, Invited Seminar.

Brettmann, B. *“Pharmaceutical Oral Dosage Forms: New Approaches for a Classic Drug Delivery Method,”* University of Georgia, Department of Chemical, Materials and Biomedical Engineering, February 2019, Invited Seminar.

Brettmann, B. *“Processing High Particle Loading Polymer Composites via Additive Manufacturing,”* Saint-Gobain Research North America, Northboro, MA, February 2019, Invited Seminar.

Brettmann, B., *“Latest Research on Applications of Continuous Processing in Drug Products,”* Commercializing Continuous Processing, Cambridge, MA, Jan 2019. Invited Oral Presentation.

Brettmann, B. *“Processing High Particle Loading Polymer Composites via Additive Manufacturing and Electrospinning,”* University of Alabama, Chemical Engineering Department, November 2018, Invited Seminar.

Brettmann, B. *“Molecular Engineering of Multicomponent Complex Mixtures,”* Kimoto Tech, 2018 Kimoto Technical Conference, Rome, GA, October 2018. Invited Oral Presentation.

Brettmann, B. *“Rheology and Formulation Considerations for Direct Ink Writing of High Solids Slurries for Energetic Materials,”* Naval Surface Warfare Center, Indian Head, MD, September 2018. Invited Seminar.

Brettmann, B. *“Encapsulation of High Loadings of Microparticles During Electrospinning,”* 4th Functional Polymeric Materials Conference, Nassau, Bahamas, June 2018. Invited Oral Presentation.

Brettmann, B. *“Multivalent Ion-driven Structure Formation in Polyelectrolyte Brushes,”* Fyl Fest: New forms of organization in soft matter physics, Les Houches, France, May 2017. Invited Oral Presentation.

Brettmann, B. *“Molecular Engineering for Integrated Product Development,”* Rensselaer Polytechnic Institute, Chemical Engineering Department, March 2016. Invited Seminar.

Brettmann, B. *“Molecular Engineering for Integrated Product Development,”* University of Rhode Island, Chemical Engineering Department, March 2016. Invited Seminar.

Brettmann, B. *“Molecular Engineering for Integrated Product Development,”* The University of Massachusetts, Amherst, Polymer Science and Engineering Department, March 2016. Invited Seminar.

Brettmann, B. *“Molecular Engineering for Integrated Product Development,”* Arizona State University, Polytechnic School, February 2016. Invited Seminar.

Brettmann, B. *“Molecular Engineering for Integrated Product Development,”* Northwestern University, Chemical Engineering Department, February 2016. Invited Seminar.

Brettmann, B. *“Molecular Engineering for Integrated Product Development,”* Colorado School of Mines, Chemical Engineering Department, February 2016. Invited Seminar.

Brettmann, B. *“Molecular Engineering for Integrated Product Development,”* Auburn University, Chemical

Engineering Department, February 2016. Invited Seminar.

Brettmann, B, "*Molecular Engineering for Integrated Product Development*," Georgia Institute of Technology, Materials Science and Engineering Department, February 2016. Invited Seminar.

Brettmann, B, "*Molecular Engineering for Integrated Product Development*," Princeton University, Chemical Engineering Department, February 2016. Invited Seminar.

Brettmann, B, "*Molecular Engineering for Integrated Product Development*," North Carolina State University, Chemical Engineering Department, February 2016. Invited Seminar.

Brettmann, B, "*Molecular Engineering for Integrated Product Development*," The University of Houston, Chemical Engineering Department, January 2016. Invited Seminar.

Brettmann, B, "*Molecular Engineering for Integrated Product Development*," Kansas State University, Chemical Engineering Department, January 2016. Invited Seminar.

Brettmann, B, "*Molecular Engineering for Integrated Product Development*," Imperial College, London, Chemical Engineering Department, January 2016. Invited Seminar.

Brettmann, B, "*Molecular Engineering for Integrated Product Development*," The University of California, Davis, Chemical Engineering Department, January 2016. Invited Seminar.

Brettmann, B, "*Molecular Engineering for Integrated Product Development*," The University of Nebraska, Lincoln, Chemical Engineering Department, December 2015. Invited Seminar.

Contributed Seminars and Presentations (underline denotes presenting author)

Faubel, J, R Patel, J Curtis, Brettmann, B, "*Giant hyaluronan polymer brushes display polyelectrolyte brush polymer physics behavior*," AIChE Annual Meeting, November 2020. Oral Presentation.

Ewaldz, E, Woods, H, Campbell, I, Adams, Z, Brettmann, B, "*Drug form considerations in continuous solution processing of oral solid dosage products*", AIChE Annual Meeting, November 2020. Oral Presentation.

Brettmann, B, "*Surface modifications of nanocellulose for assembly of a stable organogel support for drug crystallization*", International Union of Pure and Applied Chemistry General Assembly, Paris, France, July 2019. Oral Presentation.

Brettmann, B, "*Giant hyaluronan polymer brushes display polyelectrolyte brush polymer physics behavior*," ACS Colloids and Surface Science Symposium, June 2019. Oral Presentation

Brettmann, B, "*Processing High Solids Suspensions via Additive Manufacturing*," ACS Colloids and Surface Science Symposium, June 2019. Oral Presentation

Brettmann, B, "*Pharmaceutical oral dosage forms: New approaches for a classic drug delivery method*," Preclinical Form and Formulation for Drug Discovery Gordon Research Conference, June 2019, Poster Presentation.

Brettmann, B, "*Encapsulation of High Loadings of Microparticles During Electrospinning*," AIChE Annual Meeting, October 2018. Oral Presentation

Brettmann, B, "*Nanocellulose Gels as a Flexible, High Surface Area Material for Crystallizing Pharmaceuticals*", AIChE Annual Meeting, October 2018. Oral Presentation

Brettmann, B, "Multivalent Ion and Solvophobic Contributions to Polyelectrolyte Collapse," Materials Research Society Fall Meeting, November 2017. Oral Presentation

Brettmann, B, "Molecular Interactions between Nanocellulose and Crystallizing Pharmaceuticals," AIChE Annual Meeting, October 2017. Oral Presentation.

Brettmann, B, "Nanostructure Formation on Collapse of Polyelectrolyte Brushes," AIChE Annual Meeting, October 2017. Oral Presentation.

Brettmann, B, "Solvophobic and Multivalent Ion Induced Collapse in Polyelectrolyte Brushes," ACS Colloids and Surface Science Symposium, July 2017. Oral Presentation.

Brettmann, B, "Polyelectrolyte Brush Interactions with Multivalent Ions Lead to a Nanostructured Collapsed State," Southeast Polymer Forum, June 2017. Oral Presentation.

Brettmann, B, P Pincus, M Tirrell, "Polyelectrolyte Brush Conformations in Multivalent Ion-driven Brush Collapse," AIChE Annual Meeting, November 2016. Oral Presentation.

Brettmann, B, P Pincus, M Tirrell, "Chain Bridging Contributions to Polyelectrolyte Brush Conformations and Interactions in the Presence of Multivalent Ions," ACS Colloids and Surface Science Symposium, June 2016. Oral Presentation

Brettmann, B, N. Laugel, P. Pincus, M. Tirrell, "Chain Bridging Contributions to Polyelectrolyte Brush Collapse in the Presence of Multivalent Ions," AIChE National Meeting, Nov 2015. Oral Presentation.

Brettmann, B, N. Laugel, P. Pincus, M. Tirrell, "Multivalent counterion-induced bridging of polyelectrolyte chains," ACS National Meeting, Aug 2015. Oral Presentation.

Brettmann, B, N. Laugel, P. Pincus, M. Tirrell, "Polyelectrolyte Brushes in Multivalent Salt Solutions: Bridging Effects", Soft Matter Summer School: Polymers in Biology, Seoul, South Korea, June 2015. Oral and poster presentation.

Brettmann, B, N. Laugel, P. Pincus, M. Tirrell, "Bridging contributions to polyelectrolyte brush collapse in the presence of multivalent ions," ACS Colloids and Surface Science Symp., June 2015. Oral Presentation.

Brettmann, B, "Heat Rejection Coating Formulations," Saint-Gobain Wet Coatings Symposium, Paris, France, March 2014. Oral Presentation.

Brettmann, B, E Bell, AS Myerson, BL Trout, "Solid State NMR Relaxation Measurements to Evaluate Methods of Forming Amorphous Solid Solutions," AAPS Annual Meeting, Oct. 2011. Poster.

Press Releases and Media

Electrospinning: A Promising Approach to Continuous Manufacturing for Pharmaceuticals (Aug 2018), https://www.ondrugdelivery.com/publications/89/Georgia_Tech.pdf, ONdrugDelivery Early Insight Article.

Researchers Target Rapid Changes to Downstream Continuous Manufacturing (May 29, 2018), <https://www.biopharma-reporter.com/Article/2018/05/29/Researchers-target-rapid-changes-to-downstream-continuous-manufacturing>, BioPharma-reporter, William Reed Media Ltd.

Electrospinning and the Future of Continuous Pharmaceutical Manufacturing (March 26, 2018)
<https://www.pharmaceuticalonline.com/doc/electrospinning-the-future-of-continuous-pharmaceutical-manufacturing-0001>

Guest Column for *Pharmaceutical Online*, featured in *Biosimilar Development*, *Outsourced Pharma*,

The Next Frontier in Molecular Engineering (March 13, 2018)

<https://coe.gatech.edu/news/next-frontier-molecular-engineering>

Featured in *Pharmaceutical Processing*

Perking Up and Crimping the ‘Bristles’ of Polyelectrolyte Brushes (December 12, 2017)

<http://www.rh.gatech.edu/news/599811/perking-and-crimping-bristles-polyelectrolyte-brushes>

Featured in *EurekaAlert! Science News*, *Phys Org*, *AZO Materials*, *Technology Breaking News*, *Science Daily*

Teaching Experience

Georgia Institute of Technology, Atlanta, GA

CHBE 2100, Chemical Process Principles, Spring 2020

MSE 4775/CHBE 4775/CHEM 4775/ME 4775, Polymer Science and Engineering 1, Fall 2018, 2019

MSE 4420, Capstone Senior Design, Materials Science and Engineering, Spring 2017, 2018, 2019

- Taught project-based senior design with ~35 students and 6 industrially-sponsored projects

Massachusetts Institute of Technology, Cambridge, MA

Teaching Assistant, Department of Chemical Engineering, Fall 2009

- Assisted professors in teaching integrated chemical engineering to 70 undergraduate students
- Hosted office hours to provide individual attention to students

Massachusetts Institute of Technology, Cambridge, MA

Supervisor for Undergraduate Researchers, Department of Chemical Engineering, 2011-2012

- Mentored two undergraduate researchers through projects in pharmaceutical manufacturing

Professional Contributions

Society Offices, Activities, and Membership

- Member of American Institute of Chemical Engineers
- Member of American Chemical Society
- Member of Bioenvironmental Polymer Society
- International Union of Pure and Applied Chemistry – Young Observer 2019 and Polymer Nomenclature Committee Member

Organization and Chairmanship of Technical Sessions, Workshops, and Conferences

- American Chemical Society
 - 3) 2020 ACS National Meeting, Symposium Organizer: “Polymer Processing: Additive Manufacturing of Functional Materials”
 - 2) 2019 Southeast Regional Meeting, Symposium Organizer: “Polymers at Interfaces”

1) 2019 Colloids and Surface Science Symposium: Track Chair for “Formulation, Processing and Manufacturing on the Colloidal Length Scale and Beyond”

- American Institute of Chemical Engineers

3) 2019 Annual Meeting: Track Chair for “Advancements in Particle Engineering and Material Sciences in Pharmaceutical Process Development” track in Pharmaceutical Discovery, Development and Manufacturing Forum, Chair of award session, “Rising Stars in the Polymer Industry” in Area 08A, Chair of “Polymer Processing and Rheology” in Area 08A

2) 2018 Annual Meeting: Track Chair for “Advancements in Particle Engineering and Material Sciences in Pharmaceutical Process Development” track in Pharmaceutical Discovery, Development and Manufacturing Forum, Initiator and Chair of new award session, “Rising Stars in the Polymer Industry” in Area 08A, Chair of “Polymer Processing and Rheology” and “Polymer Characterization” in Area 08A

1) 2017 Annual Meeting: Co-chair of “Nanoscale Phenomena in Macromolecular Systems” in Area 08A

- Other

2019 Workshop on Macromolecule-Mediated Crystallization at Georgia Tech, Co-Organizer

2018 Soft Matter Frontiers Symposium at Georgia Tech, Co-Organizer

Technical Journal or Conference Referee Activities

Reviewer for Molecular Pharmaceutics, Crystal Growth and Design, Journal of the American Chemical Society, Journal of Colloid and Interfacial Science, Biomacromolecules, Food Hydrocolloids, Macromolecular Research, Journal of Chemical Physics, ACS Macro Letters, Progress in Polymer Science, MDPI Polymers, ACS Energy and Fuels, ACS Applied Polymer Materials, Macromolecules, Science Advances, ACS Applied Materials and Interfaces, ACS Omega, ACS Nano, Scientific Reports

Public and Community Service

Career Panels and Presentations

Professional development presentation “Project Management Skills in Academia”

- MSE Teaching Practicum, Georgia Tech, November 2018
- University of Illinois at Chicago Mentored Professional Development Seminar Series, July 2018
- ASEE Inspire² Workshop at Georgia Tech, April 2018

Career Panels

- CRIDC Panel on Academic Career Paths, Georgia Tech, Feb 2018, Feb 2019
- STEM panel at GirlFest at Atlanta Girls School, May 2018

Science Communications

- Speaker for Georgia Tech Alumni Association of Cincinnati, April 2019.

- Contributor to FunSize Physics, an NSF-DMR sponsored outreach website (blog post “Creating Nanoscale Octopus Structures from Polymer Brushes” and classroom activity “Using a Laser Pointer to Measure the Thickness of your Hair”).
- Guest on “Inside the Black Box” radio show, Georgia Tech, January 2017

Other Public and Community Service

- Member of Floor360 and Association for Innovation in Sustainability, Industry-Academia-Government consortiums in Northwest Georgia, Summer 2017-August 2018.
- Developed and ran 10 hour course for Francis W. Parker high school students on Polymer Theory, The University of Chicago, Spring 2016

Leadership and Management Experience

Senior Research Engineer, Saint-Gobain High Performance Materials, 2012-2014

- Supervised technicians of varying experience levels on research projects in polymer processing
- Managed a team of three on a product development project including directing full-scale plant trials to prepare for a new product launch

Graduate Resident Tutor, Massachusetts Institute of Technology, 2009-2012

- Provided counseling and support to undergraduate students in a community living group
- Organized monthly study breaks and dinners during finals week

Water Polo and Synchronized Swimming Coach, various 2003-2019

- Coached youth synchronized swimming teams in Texas and Massachusetts
- Coached college women’s water polo team in Massachusetts, masters team in Atlanta