Alexandra V. Bayles

Assistant Professor of Chemical and Biomolecular Engineering, University of Delaware
Colburn Laboratory, 150 Academy St, Newark, DE 19716
avbayles@udel.edu | https://sites.udel.edu/avbayles | twitter/X: @bayleslab

Education

Ph.D. in Chemical Engineering, University of California Santa Barbara 09/2013 - 12/2018
Advisors: Matthew E. Helgeson and Todd M. Squires
Dissertation foci: Anomalous diffusion in ionic liquids and ionogels | Differential dynamic microscopy of soft materials

B.S. in Chemical Engineering, University of Delaware 09/2009 - 05/2013
Minors: Mathematics, Sustainable Energy Technology, Chemistry |*summa cum laude*| Honors Degree with Distinction
Thesis Advisor: Eric M. Furst | Honors thesis focus: Micromechanics of anisotropic partially crystalline emulsions

Professional Experience

Assistant Professor, tenure-track 01/2022 - present
Department of Chemical and Biomolecular Engineering | University of Delaware, Newark, DE

Postdoctoral Research Fellow, Eidgenössische Technische Hochschule Fellow 02/2019 - 12/2021
Department of Materials | Laboratory of Soft Materials, PI: Jan Vermant | ETH Zürich, Zürich, Switzerland

Research Interests

The Bayles Research Group engineers fluidic platforms to build functional materials and characterize their performance. Close attention is paid to interfaces within multiphase materials, which can serve as templates to pattern hierarchical structures and as boundaries for mass transfer. Fundamental questions related to rheology, diffusion, structure, and dynamics have implications in diverse applications and industries. Projects in my group address grand challenges in additive manufacturing, bioprinting, sustainable formulation science, consumer products, food texturing, and soft robotics. Experimental efforts develop and exploit unique tools, including:

- Advective assembly extruders: modular and scalable devices that build hierarchical architectures in flow
- Microfluidic Fabry-Perot interferometer: an instrument that locates impediments to mass transfer
- Static rheometers: deployable static mixers designed to measure non-linear rheology

Honors and Awards

AIChE University of Delaware Outstanding Alumna 2024
NSF CAREER Award 2024
ACS Engineering Au Inaugural Rising Star in Chemical Engineering 2023
Oak Ridge Associated Universities Ralph E. Powe Junior Faculty Award 2023
European Colloid and Interface Society Polymers Award 2021
Eidgenössische Technische Hochschule Postdoctoral Research Fellowship 2019
MIT Rising Star in Chemical Engineering 2018
University of Delaware Future Faculty Workshop Participant 2018
US Delegate to 67th Lindau Nobel Laureate Meeting on Chemistry 2017
AIChE Women's Initiatives Committee Travel Award 2016
CSP Technologies Teacher-Scholar Fellowship 2016
University of California Santa Barbara Chemical Engineering Distinguished Service Award 2015
National Science Foundation Graduate Research Fellowship 2013 - 2016
University of California Santa Barbara Heslin Fellowship 2013 - 2014
Sigma Xi Undergraduate Thesis Award (One of three awarded university wide) 2013
University of Delaware Chemical Engineering Industrial Sponsors Undergraduate Research Award 2013
Barry M. Goldwater National Scholarship 2012
American Chemical Society Delaware Section Top Student in Chemical Engineering 2012
University of Delaware Chemical Engineering Class of 1950 Scholar 2012
AIChE Donald F. Othmer Sophomore Academic Excellence Award 2011
Steven R. and Linda Justice Myrick Award 2011, 2012
University of Delaware General Honors Award 2011
University of Delaware and City of Newark Community Service Award 2011
University of Delaware Honors Program Scholarship 2009 - 2013

Peer-reviewed Publications

For most recent publications and citations, visit: Google Scholar | ORCID: 0000-0001-9689-9361
*Corresponding author | †Co-first authors | ‡Undergraduate student author

- **A. V. Bayles***, T. Pleij, J. E. Nam, M. N. Murdock, J. Vermant, "From Electronics to Extrusion: Adapting Boolean Logic to Model Fluid Flow and Design Material Assemblies," *submitted.*

17. P. J. McCauley, **A. V. Bayles***, "Nozzle innovations that improve capacity and capabilities of multimaterial additive manufacturing," *ACS Engineering Au.* Rising Stars in Chemical Engineering Special Issue. 2024. DOI: 10.1021/acsengineeringau.4c00001
16. T. Pleij, **A. V. Bayles**, J. Vermant*, "Advective assembler-enhanced support bath direct ink writing," *Advanced Materials Technologies.* 2400005, 2024. DOI: 10.1002/admt.202400005.
15. P. Danner, T. Pleij, G. Siqueira, **A. V. Bayles**, T. R. Venkatesan, J. Vermant*, D. M. Opris*. "Polysiloxane inks for multimaterial 3D printing of high-permittivity dielectric elastomers," *Advanced Functional Materials*, 34 (17), 2313167, 2024. DOI: 10.1002/adfm.202313167
14. **A. V. Bayles**, J. Vermant. "Divide, conquer, and stabilize: Engineering strong liquid-liquid interfaces," *Langmuir*, 38, 21, 6499–6505, 2022. DOI: 10.1021/acs.langmuir.2c00948
13. **A. V. Bayles**, T. Pleij, M. Hofmann, F. Hauf, T. A. Tervoort, J. Vermant. "Structuring hydrogel cross-link density using hierarchical filament 3D printing," *ACS Applied Materials and Interfaces*, **14**, 13, 15667–15677, 2022. DOI: 10.1021/acsami.2c02069 **Supplemental cover article.**
12. R. Martineau, **A. V. Bayles**, C. Hung, K. Reyes, M. E. Helgeson, and M. Gupta. "Engineering gelation kinetics in living silk hydrogels by differential dynamic microscopy microrheology and machine learning," *Advanced Biology*, **6**, 1, 2101070, 2022. DOI: 10.1002/adbi.202101070

Prior to University of Delaware

11. **A. V. Bayles**, J. Fisher, C. S. Valentine‡, A. Nowbahar, M. E. Helgeson and T. M. Squires. "Hydrogen bonding strength determines water diffusivity in polymer ionogels," *Journal of Physical Chemistry B*, **125**, 20, 5408–5419, 2021. DOI: 10.1021/acs.jpcb.1c01460
10. M. Hofmann, **A. V. Bayles**, and J. Vermant. "Stretch, fold and breakup : intensification of emulsification of high viscosity ratio systems by fractal mixers," *AIChE J*, **67**, 1-14, 2021. DOI: 10.1002/aic.17192
9. **A. V. Bayles**, C. S. Valentine‡, T. Überrück, S. P. O. Danielsen, S. Han, M. E. Helgeson and T. M. Squires. "Anomalous solute diffusivity in ionic liquids: label-free visualization and physical origins," *Physical Review X*, **9**, 011048, 2019. DOI: 10.1103/PhysRevX.9.011048
8. T. D. Brown†, M. Nowak†, **A. V. Bayles**, B. Prabhakarpandian, P. Karande, J. Lahann, M. E. Helgeson and S. Mitragotri. "A microfluidic model of human brain (μHuB) for assessment of blood brain barrier," *Bioengineering & Translational Medicine.* 1-13, 2019. DOI: 10.1002/btm2.10126
7. **A. V. Bayles**†, T. A. Prileszky†, P. T. Spicer, and E. M. Furst, "A model of structured emulsion droplet stability and reconfigurability," *Langmuir*, **34**, 4116-4121, 2018. DOI: 10.1021/acs.langmuir.8b00469
6. **A. V. Bayles**, T. M. Squires, and M. E. Helgeson, "Probe microrheology without particle tracking using differential dynamic microscopy," *Rheologica Acta*, **11**, 863-869, 2017. DOI: 10.1007/s00397-017-1047-7
5. P. M. de Molina, M. Zhang, **A. V. Bayles**, and M. E. Helgeson "Oil-in-water-in-oil multi-nanoemulsi- ons for templating complex nanoparticles," *Nano Letters*, **12**, 7325-7332, 2016. **Cover article**. DOI: 10.1021/acs.nanolett.6b02073
4. **A. V. Bayles**, T. M. Squires, and M. E. Helgeson, "Dark-field differential dynamic microscopy," *Soft Matter*, **12**, 2440-2452, 2016. DOI: 10.1039/C5SM02576A
3. M. Caggioni, J. Lenis, **A. V. Bayles**‡, E. M. Furst and P. T. Spicer, "Temperature-induced collapse, and arrested collapse, of anisotropic endoskeleton droplets," *Langmuir*, **31**, 8558-8565, 2015. DOI: 10.1021/acs.langmuir.5b00321
2. M. Caggioni, **A. V. Bayles**‡, J. Lenis, E. M. Furst and P. T. Spicer, "Interfacial stability and shape change of anisotropic endoskeleton droplets," *Soft Matter*, **10**, 7647-7652, 2014. DOI: 10.1039/C4SM01482K
1. K. M. Schultz, **A. V. Bayles**‡, A. D. Baldwin, K. L. Kiick and E. M. Furst, "Rapid, high resolution screening of biomaterial hydrogelators by μ^2rheology," *Biomacromolecules*, **12**, 4178-4182, 2011. DOI: 10.1021/bm201214r

Patents and Patent Applications

8. **Provisional USPTO** 63/515,160 "INSTRUMENT FOR MEASURING YIELD STRESS OF COMPLEX FLUIDS" Inventors: W. Hartt IV, A. V. Bayles. Filing date: July 24, 2023.
7. **Pending EPO** 60012EP "SHEAR THINNING TWO-PHASE COMPOSITION AND PRODUCTS MADE THEREOF" Inventors: P. Danner, D. Opris, J. Vermant, T. Pleij, A. V. Bayles. Filing date: March 09, 2023.

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6. **Pending WIPO** WO2021205020A1 "METHOD FOR PRODUCING EMULSIONS" Inventors: **A. V. Bayles,** M. Hofmann, J. Vermant. Proprietor: Emulco E. & S. bvba. Publication date: Oct, 14, 2021. Filing date: Apr

10, 2020.

5. **Pending EPO** EP20169207 "METHOD FOR PRODUCING EMULSIONS" Inventors: **A. V. Bayles**, M. Hofmann, J. Vermant. Proprietor: Emulco E. & S. bvba. Filing date: Apr 10, 2020.
4. **Granted USPTO** US9597648B2 "NON-SPHERICAL DROPLET" Inventors: P.T. Spicer, M. Caggioni, J. Lenis-Abril, **A. V. Bayles**. Issued Date: Mar 21, 2017, Publication date: Aug 25, 2016, Filing date: Oct 17, 2013, Priority date: Feb 17, 2012. Application number: 14/056,160.
3. **Pending WIPO** WO2014062866A3 "SHAPE-CHANGING DROPLET" Inventors: P.T. Spicer, M. Caggioni, J. Lenis-Abril, **A. V. Bayles**. Publication date: June 19, 2014, Filing date: Oct 17, 2013, Priority date: Feb 17, 2012. Application number: 14/056,160.
2. **Pending CNIPA** CN104736688A "SHAPE-CHANGING DROPLET" Inventors: P.T. Spicer, M. Caggioni, J. Lenis-Abril, **A. V. Bayles**. Publication date: June 24, 2015, Filing date: Oct 17, 2013, Priority date: Feb 17, 2012. Application number: 14/056,160.
1. **Granted EPO** EP2909299B1 "SHAPE-CHANGING DROPLET" Inventors: P.T. Spicer, M. Caggioni, J. Lenis-Abril, **A. V. Bayles**. Issue Date: Nov 30, 2016. Publication date: Apr 23, 2014, Filing date: Oct 17, 2013, Priority date: Feb 17, 2012. Application number: 14/056,160.

Book Contributions and Software

2. R. Schaller, M. Hofmann, **A. V. Bayles**, R. Van Hooghten, H. Meijer, T. Tervoort, J. Vermant, "Efficient processing pathways to create high interface materials," Chapter 8, *Bijels: Bicontinuous particle-stabilized emulsions*. Editor: P. S. Clegg. Royal Society of Chemistry, Cambridge, 2020. DOI: 10.1039/9781839160974-00193
1. "DDMCalc" **A. V. Bayles**, Y. Gao, T. M. Squires, M. E. Helgeson. MATLAB Software package for performing differential dynamic microscopy. Copyright ©University of California, Santa Barbara. January 20, 2016. Available at http://engineering.ucsb.edu/~helgeson/ddm.html.

Invited Presentations

Presenting author

16. *upcoming* M. T. Tran **A. V. Bayles**. "Harnessing chaotic advection to order contrasting polymer solutions and program hydrogel actuation." Keynote in the session on *Structure and Dynamics of Polymers in Solutions and at Interfaces* at ACS National Meeting. March 23-27, 2024.
15. *upcoming* **A. V. Bayles**. Keynote in the session on *Additive and Digital Manufacturing of Multifunctional Materials* at Materials Research Society Fall Meeting. December 1 - 6, 2024.
14. *upcoming* **A. V. Bayles**. "Harnessing chaotic advection to manufacture functional materials." Keynote at Mid-Atlantic Soft Matter Workshop. November 22, 2024. Newark, DE.
13. **A. V. Bayles**. "Patterning highly-filled 3D printing inks via advective assembly." Faculty highlight in the Frontiers in Soft Matter and Macromolecular Networks Symposium. October 25, 2024. San Diego, CA.
12. **A. V. Bayles**. "Advective assembly: Building functional composites using modular flows," Faculty highlight at TA Instruments Q3 America's Commercial Meeting. August 15, 2024. Virtual.
11. **A. V. Bayles**. "Combining microfluidics and optical microscopy to sweep composition space," Workshop on Formulation Science and Engineering for the Common Good. June 1, 2024. Princeton, NJ.
10. **A. V. Bayles**. "Microfluidic nozzles that improve capacity and capabilities of 3D printing," Princeton Advanced Manufacturing Symposium. April 29, 2024. Princeton, NJ.
9. **A. V. Bayles**. "Advective processing strategies for architecting high interfacial area materials," Gordon Research Conference: Colloidal, Electrolyte and Macromolecular Solutions. February 14, 2024, Ventura, CA.
8. **A. V. Bayles**. "Advective processing strategies for generating, structuring, and designing high interfacial area materials," Dow Chemical Company, Discussion Group on Interface Science. February 8, 2022, Midland, MI. Virtual.

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7. **A. V. Bayles**, T. Pleij, M. Hofmann, J. Vermant, "Sculpting hydrogels using advective processing," European Colloid and Interface Society Annual Meeting, September 5, 2021, Athens, Greece. Keynote. **ECIS Polymers Award.**
6. **A. V. Bayles**, T. Pleij, M. Hofmann, J. Vermant, "Sculpting hydrogels using advective processing," Sofia University, July 14, 2021, Varna, Bulgaria, Virtual.
5. **A. V. Bayles**. "Observing, understanding and engineering solute diffusion in ionic liquids and ionogels," DSM Materials Science Center, September 10, 2019, Geleen, Netherlands.
4. **A. V. Bayles**. "Observing, understanding and engineering solute diffusion in ionic liquids and ionogels," Colloids, Polymers & Surfaces Seminar, Carnegie Mellon University, January 25, 2019, Pittsburgh, PA.
3. **A. V. Bayles**. "Observing, understanding and engineering solute diffusion in ionic liquids and ionogels," Center

for Molecular & Engineering Thermodynamics Seminar, University of Delaware, January 14, 2019, Newark, DE.

2. **A. V. Bayles**. "Label-free visualization of anomalous diffusion in heterogeneous soft materials," MIT ChemE Rising Stars Symposium, October 4-5, 2018. Boston, MA.
1. **A. V. Bayles**, M. E. Helgeson, T. M. Squires. "Liquids as solids: visualizing anomalous diffusion in ionic liquids," Materials Research Outreach Symposium, January 31 - February 1, 2018, Santa Barbara, CA.

Presentations

*Corresponding author | **Presenting author**

Presentations by Bayles Group Members and Collaborators

10. R. L. Martineau, A. V. Bayles, M. K. Gupta, and **M. E. Helgeson.** "Formulating Biomolecular Gels for 3D Bioprinting Using High-Throughput Autonomous Microrheology," AIChE 2024 National Meeting, November 2024, San Diego, CA.
9. **J. E. Nam**, Y. P. Medapati, A. V. Bayles, "Machine learning guided inverse design of multimaterial additive manufacturing coextrusion nozzles," 95th Society of Rheology Annual Meeting, October 13-17, 2024, Austin, TX.
8. **P. J. McCauley**, C. Middleton, R. Wilson, C. A. Fromen, A. V. Bayles, "Plug-and-play patterning: bioprinting via rheologically-dictated advective assembly extrusion," 95th Society of Rheology Annual Meeting, October 13-17, 2024, Austin, TX.
7. K. Azhar, A. Seucan, A. V. Bayles, **W. Hartt IV.**, "Using ideal porous media, or static mixers, for yield stress measurement," 95th Society of Rheology Annual Meeting, October 13-17, 2024, Austin, TX.
6. **W. Hartt IV.**, A. V. Bayles, K. Azhar, T. Jung, A. Seucan, E. Tozzi. "Using static mixers to build mathematical models of shear-sensitive fluids," North American Mixing Forum. June 24 - 27, 2024.
5. **J. E. Nam**, A. V. Bayles*, "Increasing the Throughput of Bioprinting Using Machine Learning Optimized Advective Assembly," Mid-Atlantic Soft Matter Symposium. February 16, 2024.
4. **P. J. McCauley**, A. V. Bayles, "Improving throughput in extrusion bioprinting via advective assembly," Mid-Atlantic Soft Matter Symposium. February 16, 2024.
3. **J. E. Nam**, A. V. Bayles*, "Increasing the Throughput of Bioprinting Using Machine Learning Optimized Advective Assembly," Women in Engineering Research Symposium. January 19, 2024. Poster presentation.
2. **M. N. Murdock**, S. Chauhan, A. V. Bayles*, "Probing Operation Limits of Advective Assembly in Additive Manufacturing using Digital Twins," International Congress on Rheology, August 2023, Athens, Greece. Poster presentation.
1. Y. Luo, A. V. Bayles, M. Gu, Y. He, R. L. Martineau, M. K. Gupta, T. M. Squires, M. T. Valentine, and **M. E. Helgeson.** "Automated high-throughput microrheology for material formulation," AIChE 2022 National Meeting, November 2022, Phoenix, AZ.

Presentations by Principal Investigator Bayles

32. M. T. Tran, **A. V. Bayles***, "One-step manufacturing of soft actuators by advective assembly," 98th ACS Colloids and Surface Science Symposium, Seattle, Washington.
31. M. N. Murdock, S. Chauhan, **A. V. Bayles***, "Using Digital Twins to Model and Optimize Millifluidic, Multi-Material 3D Printing Nozzles," AIChE 2023 National Meeting, November 2023, Orlando, FL.
30. M. T. Tran, M. N. Murdock, **A. V. Bayles***, "One-step manufacturing of soft actuators by viscoplastic advective assembly," International Congress on Rheology, August 2023, Athens, Greece.
29. **A. V. Bayles***, T. Pleij, M. N. Murdock, J. Vermant, "Architecting Soft Materials Using Fluidic Gates: A Practical Analogy to Boolean Logic," American Physical Society March Meeting, March 2023, Las Vegas, NM.
28. **A. V. Bayles***, T. Pleij, M. N. Murdock, J. Vermant, "Architecting Soft Materials Using Fluidic Gates: A Practical Analogy to Boolean Logic," AIChE 2022 National Meeting, November 2022, Phoenix, AZ.
27. **A. V. Bayles***, T. Pleij, M. N. Murdock, J. Vermant, "Structuring multi-material 3D printing filaments using fluidic gates: A practical analogy to Boolean logic," 93rd Society of Rheology Annual Meeting, October 2022, Chicago, IL.
26. **A. V. Bayles**, "Bop It, Twist It, Pull It: Using Demonstrations to Promote Application of Soft Material Design Principles," American Society of Engineering Education (ASEE)/American Institute of Chemical Engineers Summer School for New Faculty, July 2022, Golden, CO. Poster presentation.

Prior to University of Delaware

25. **A. V. Bayles**, T. Pleij, M. Hofmann, J. Vermant, "Sculpting hydrogels using additive advective processing," AIChE 2021 National Meeting, November 2021, Boston, MA.
24. **A. V. Bayles**, T. Pleij, M. Hofmann, J. Vermant, "Sculpting hydrogels using additive advective processing," 92nd Society of Rheology Annual Meeting, October 1, 2021, Virtual.
23. **A. V. Bayles**, T. Pleij, M. Hofmann, J. Vermant, "Sculpting hydrogels using advective processing," Soft Matter

Composites Annual Meeting, June 1, 2021, Virtual.

22. **A. V. Bayles**, T. Pleij, M. Hofmann, J. Vermant, "Sculpting hydrogels using advective processing," ETH Zürich Materials Department Colloquium, May 5, 2021.
21. **M. E. Helgeson**, A. V. Bayles, T. M. Squires, R. L. Martineau, M. Gupta. "No more particle tracking: toward automated, high-throughput microrheology," International Congress on Rheology, December 13, 2020, Virtual.
20. **A. V. Bayles**, M. Hofmann, F. Hauf, T. A. Tervoort, J. Vermant. "Templating Hydrogels Using Fractal Flow Processing," AIChE 2020 National Meeting, November 19, 2020, Virtual.
19. **A. V. Bayles**, M. E. Helgeson, T. M. Squires. "Anomalous solute diffusivity in ionic liquids and ionogels: label-free visualization and physical origins," 24th Swiss Soft Days, March 22, 2019, Fribourg, Switzerland.
18. **A. V. Bayles**, M. E. Helgeson, T. M. Squires. "Visualizing sorption and anomalous solute diffusion in ionic liquids and ionogels," AIChE 2018 National Meeting, October 29-November 2, 2018, Pittsburgh, PA.
17. **A. V. Bayles**, C. S. Valentine, M. E. Helgeson, T. M. Squires. "Visualizing sorption and anomalous solute diffusion in ionic liquids and ionogels," Poster presentation at Gordon Research Conference: Ionic Liquids, August 13-17, 2018, Newry, ME. **Award for second place.**
16. **A. V. Bayles**, C. S. Valentine, M. E. Helgeson, T. M. Squires. "*In situ* characterization of sorption and diffusion in ionic liquids," American Physical Society March Meeting, March 5-9, 2018, Los Angeles, CA.
15. **A. V. Bayles**, C. S. Valentine, M. E. Helgeson, T. M. Squires. "*In situ* characterization of activated H_2O hopping in ionic liquids," Poster presentation at Gordon Research Conference: Colloidal, Macromolecular and Polyelectrolyte Solutions, February 5-9, 2018, Ventura, CA.
14. A. V. Bayles, Y. Gao, T. M. Squires, **M. E. Helgeson**. "Probing complex fluid microdynamics and microrheology using differential dynamic microscopy," Poster presentation at Gordon Research Conference: Colloidal, Macromolecular & Polyelectrolyte Solutions, February 5, 2018, Ventura, CA.
13. **A. V. Bayles**, T. M. Squires, M. E. Helgeson. "Probe microrheology without particle tracking by differential dynamic microscopy," 89th Society of Rheology Annual Meeting, October 8-12, 2017, Denver, CO.
12. **A. V. Bayles**, C. S. Valentine, M. E. Helgeson, T. M. Squires. "*In situ* characterization of sorption and diffusion in ionic liquids," Chalmers-UCSB Workshop on Materials, September 11-12, 2017, Gothenburg, Sweden.
11. A. V. Bayles, T. M. Squires, **M. E. Helgeson**. "No tracking necessary: probe microrheology by differential dynamic microscopy," 88th Society of Rheology Annual Meeting, February 12-16, 2017, Tampa, FL.
10. **A. V. Bayles**, C. S. Valentine, M. E. Helgeson, T. M. Squires. "Measuring ion-dynamics at ionic liquid-vapor interfaces," AIChE 2016 National Meeting, November 12-16, 2016, San Francisco, CA.
9. **A. V. Bayles**, T. M. Squires, and M. E. Helgeson. "Dark-field differential dynamic microscopy of plasmonic nanoparticles," Poster presentation at Gordon Research Seminar: Colloidal, Macromolecular and Polyelectrolyte Solutions, February 6-7, 2016, Ventura, CA.
8. **A. V. Bayles**, T. M. Squires, and M. E. Helgeson. "Dark-field differential dynamic microscopy of plasmonic nanoparticles," Poster presentation at Ed Kramer Memorial Conference, January 6-8, 2016, Santa Barbara, CA. **Award for first place.**
7. **A. V. Bayles**, T. M. Squires, M. E. Helgeson. "Dark-field differential dynamic microscopy of gold nanoparticles," AIChE 2015 National Meeting, November 8-13, 2015, Salt Lake City, UT.
6. **P. M. de Molina**, A. V. Bayles, S. Lad, M. E. Helgeson. "Oil-in-water-in-oil double nanoemulsions: structure and stability," AIChE 2015 National Meeting, November 8-13, 2015, Salt Lake City, UT.
5. A. V. Bayles, Y. Gao, T. M. Squires, **M. E. Helgeson**. "Probing microrheology with and without probes by differential dynamic microscopy," 87th Society of Rheology Annual Meeting, October 11-15, 2015, Baltimore, MD.
4. **A. V. Bayles**, T. M. Squires, M. E. Helgeson. "Differential dynamic dark-field microscopy of nanoparticle dispersions," 89th ACS Colloid and Surface Science Symposium, June 15-17, 2015, Carnegie Mellon University, Pittsburgh, PA.
3. **P. M. de Molina**, A. V. Bayles, S. Lad, M. E. Helgeson. "Structure and stability of oil-in-water-in-oil double nanoemulsions," 89th ACS Colloid and Surface Science Symposium, June 15-17, 2015, Carnegie Mellon University, Pittsburgh, PA.
2. **E. M. Furst**, A. V. Bayles, P. T. Spicer, M. Caggioni. "Mechanics of non-spherical, shape-changing endoskeletal droplets," symposium on Particles, Colloids and Drops, 246th ACS National Meeting, September 8-12, 2013, Indianapolis, IN.
1. **A. V. Bayles**, E. M. Furst, and P. T. Spicer. "Micromechanics of partially crystalline emulsions," Poster presentation at AIChE Annual Student Conference, October 26-29 2012, Pittsburgh, PA. **Award for first place.**

Researchers Supervised

Current Graduate Student and Postdoctoral Researchers

	Name	Dept/Univ.	Title	Period
8.	Yamini P. Medapati	DS/UDel	MS Data Science rotation student	03/2023 - 08/2024
7.	Kaan Murat	CBE/UDel	PhD candidate	01/2024 - Present
6.	Nina Fratto	CBE/UDel	PhD candidate co-advised with T.H. Epps	01/2024 - Present
	Distinction: NRT MIDAS Fellow, University of Delaware Collins Fellow			
5.	Patrick J. McCauley	CBE/UDel	Postdoctoral fellow co-advised with C.A. Fromen	09/2023 - Present
	Distinction: Inaugural Engineering Driven Health Postdoctoral Fellow			
4.	Lakshmi Sudini	DS/UDel	MS Data Science rotation student	09/2023 - 12/2023
3.	Juliana E. Nam	CBE/UDel	PhD candidate	01/2023 - Present
	Distinction: NRT MIDAS trainee, University of Delaware Collins Fellow			
	Distinction: Women In Engineering Poster Award Winner			
2.	Matthew N. Murdock	CBE/UDel	MS student	01/2022 - 08/2023
	Distinction: PhD qualifier exam commendation, PhD coursework commendation			
	Distinction: DoD SMART Fellowship Semifinalist			
	Distinction: Philadelphia Society of Tribology Engineers Scholarship			
1.	Minh T. Tran	CBE/UDel	MS in Chemical Engineering	01/2022 - 08/2024
	MS Thesis: Encoding hydrogel actuation with flow-templated architecture			

Current Undergraduate Student Researchers

	Name	Dept/Univ.	Title	Period
6.	Clara Middleton	CHARM REU	BS student	06/2024 - 08/2024
5.	Rita Wilson	CHARM REU	BS student	06/2024 - 08/2024
4.	Tiffany Jung	CBE/UDel	BS student	06/2023 - 05/2024
3.	Adrian Seucan	CBE/UDel	BS student	06/2023 - Present
2.	Shivam Chauhan	CBE/UDel	BS student	01/2023 - 03/2023
	Distinction: UDel Winter Scholars			
1.	Kainat Azhar	CBE/UDel	BS student	01/2023 - Present

Thesis Committees of Graduate Students

	Name	Dept/Univ.	Title	Advisor	Period
12.	Jay Ashish Shah	CBE/UDel	PhD student	Jayaraman	06/2023 - Present
11.	Jodi Graf	CBE/UDel	PhD student	Fromen/A. Kloxin	06/2023 - Present
10.	Will Rears	CBE/UDel	PhD student	C. Kloxin	06/2023 - Present
9.	Jack Rooks	CBE/UDel	PhD student	Wagner	06/2023 - Present
8.	Stephen Kronenberger	CBE/UDel	PhD student	Jayaraman	06/2023 - Present
7.	Yinkui Yu	CBE/UDel	PhD student	Fromen	06/2023 - Present
6.	Sampanna V. Mhatre	MSE/UDel	PhD student	Korley/Epps	01/2023 - Present
5.	Tazio Pleij	MATL/ETHZ	PhD student	Vermant	12/2022 - Present
4.	Tristan Myers	CBE/UDel	PhD student	Jayaraman	08/2022 - Present
3.	Ted Egnaczyk	CBE/UDel	PhD candidate	Wagner	08/2022 - Present
2.	William Hartt V	CBE/UDel	PhD candidate	Wagner	08/2022 - Present
1.	Sean Farrington	CBE/UDel	PhD candidate	Wagner/Beris	08/2022 - Present

Thesis Committees of Undergraduate Students

	Name	Dept/Univ.	Title	Advisor	Period
4.	Joaquina Somma	CBE/UDel	BS student	Fromen	08/2024 - 05/2025
3.	Genevieve Kroll	CBE/UDel	BS student	Epps	08/2024 - 05/2025
2.	Saurav Padhye	CBE/UDel	BS student	Fromen	08/2023 - 05/2024
1.	Simone Sabnis	BME/UDel	BS student	Fromen	08/2022 - 05/2023

Supervised Prior to University of Delaware

	Name	Dept/Univ.	Title	Recent Position	Period
7.	Tazio Pleij	DMATL/ETHZ	MS, PhD student	ETHZ, Switzerland	03/2020 - 12/2022
	MS Thesis: Advective Processing of Dielectric Elastomers				
6.	Uxue Aizarna Lopetegui	DMATL/ETHZ	PhD student visitor	CIC biomaGUNE, Spain	09/2021 - 10/2021
	Project: Rheological characterization of smart hybrid bioinks for 3D bioprinting of complex tissue models				
5.	Patrick Zumsteg	DMATL/ETHZ	MS student	ETHZ, Switzerland	06/2021 - 09/2022
	MS Thesis: Linear stability analysis of confined multilayer flow				
4.	Claudiu Patrascu	DMATL/ETHZ	PhD student visitor	UPB Bucharest, Romania	05/2020 - 08/2020

	Project: Multiphase flow stability in millifluidic devices				
3.	Florian Gebhard	ChE/UCSB	PhD student visitor	TU Munich, Germany	06/2017 - 08/2017
	Project: Dynamics of H_2O sorption by ionic liquid - PEO mixtures				
2.	Connor S. Valentine	ChE/UCSB	BS student	Carnegie Mellon Univ.	03/2016 - 05/2017
	Project: Dynamics of H_2O sorption by methylimidazolium ionic liquids				
1.	Yuning Shen	ChE/UCSB	BS REU student	Fudan Univ., China	06/2015 - 08/2015
	Project: Halide-based ionic liquid etching of thin Ag and Au films				

Teaching

Courses Instructed

	Name	Type	Students	Notes	Semester
6.	CHEG341: Fluid Mechanics	UG core	72	co-Instructor w/J. Enszer	F2024
5.	CHEG832: Soft Materials, Colloids and Polymers	Grad elective	13	sole-Instructor	SII2024
	Co-listed for undergraduates as CHEG667	UG elective	4		
4.	CHEG341: Fluid Mechanics	UG core	73	co-Instructor w/J. Enszer	F2023
3.	CHEG832: Soft Materials, Colloids and Polymers	Grad elective	13	sole-Instructor	SII2023
2.	CHEG832: Soft Materials, Colloids and Polymers	Grad elective	24	new, sole-Instructor	SII2022
	Prior to University of Delaware				
1.	CHE210B: Transport Processes: Heat Transfer	UG core	48	UCSB, co-Instructor w/M. O'Malley	W2017

Guest Lectures

	Name	Type	Students	Notes	Semester
	Prior to University of Delaware				
1.	DMATL3271207: Engineering with Soft Materials	Grad elective	>30	ETHZ	F2019,20,21

Recent Course Reviews

CHEG832: Soft Materials, Colloids and Polymers, Spring 2023

	Question	Mean	Std. Dev.
6.	Instructor is well prepared for class.	4.77	0.44
5.	Instructor has thorough knowledge of the subject.	4.69	0.48
4.	Instructor communicates the subject well.	4.77	0.44
3.	Instructor stimulates interest in the subject.	4.92	0.28
2.	Instructor is one of my best teachers.	4.77	0.44
1.	Instructor fostered a respectful environment.	5	0

Student comments:

"I really appreciated Professor Bayles' choices to include recitation demos and encourage participation in class, regardless of how it would affect the timeline of our lectures. This made this class feel enjoyable in addition to being informative. Some of the information I received from those extra qualities of this class were what really stuck with me and I feel impacted my understanding of the field."

"Prof Bayles is amazing! She did a great job explaining the concepts and went above and beyond during recitations. Her demos were creative and fun. Her unique teaching style and personality set her apart from other professors."

"Prof Bayles seemed to genuinely care about our progress. She went through a lot of effort to give individualized notes for each person's design project ideas, which I appreciated. Before class, she engaged with students and asked about how our other classes are going. She seemed understanding when the class was stressed from other classes and treated everyone with respect."

"[I liked] the materials design focused nature of the course. This gave me useful ideas for my own research."

"The vibes were great."

Professional Service

Conference Organization - Programming

AIChE Annual Meeting: Area 1J Fluid Mechanics, elected committee member 11/2022 - Present

Conference Organization - Session Chair or co-Chair

AIChE Annual Meeting, co-chair of Area 1J Session: Complex Fluids 11/2024

Society of Rheology Annual Meeting, co-chair of Flow Induced Instabilities and Non-Newtonian Fluids 08/2024

ACS Colloids Annual Meeting, co-chair of Programmable Materials and Additive Manufacturing 06/2024

ACS Spring Meeting, co-organizer of Industry-Academia Dialogue Networking Forum 03/2024
(with Matt Lynch of P&G & Dan Miller of Dow Chemical)
AIChE Annual Meeting, co-chair of Area 1J Session: Microfluidic & Microscale Flows: Multiphase & Fields 11/2023
AIChE Annual Meeting, co-chair of Area 1J Session: Microfluidic & Microscale Flows: Multiphase & Fields 11/2022
AIChE Annual Meeting, co-chair of Area 1J Session: Complex Fluids 11/2021

Membership In Professional Organizations

American Chemical Society (ACS) 2024 - Present
American Physical Society (APS) 2018 - Present
Society of Rheology (SoR) 2015 - Present
American Institute of Chemical Engineers (AIChE) 2011 - Present

Participation in Professional Development Courses

University of Delaware NSF Career Academy 12/2022 - 06/2023
American Society of Engineering Education (ASEE)/AIChE Summer School for new faculty 07/2022

Review Panels

NSF Particulate and Multiphase Processes (NSF PMP) 05/2022

Journal Reviewer

Nature Communications, Proceedings of the National Academies of Sciences, Soft Matter, Langmuir, American Institute of Chemical Engineers Journal, Materials Research Society Bulletin

University of Delaware Service

Women in Engineering (WIE) Faculty Advisor 02/2024 - Present
College of Engineering Junior Advisory Council Member 01/2024 - Present
UDel Decision Day Moderator: Women and Underrepresented Minorities 04/2023
UDel Society of Women Engineers (SWE) Panelist 11/2022
NSF Graduate Research Fellowship Coach 10/2022, 10/2023
ExxonMobil Site Visit Coordinator 09/2022
UDel Future Faculty Workshop Panelist 06/2022

University of Delaware Dept. of Chemical and Biomolecular Engineering Service

Undergraduate Education Committee Member 10/2022 - 08/2024
CBE Department Seminar Coordinator 06/2022 - 08/2024
Undergraduate student advisor, class of 2026 09/2022 - Present
Blue and Gold Saturday CBE Panelist 09/2022
CBE Doctoral Fellowship Internal Reviewer 12/2021, 12/2022, 12/2023