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# ALEXANDRA V. BAYLES

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Assistant Professor of Chemical and Biomolecular Engineering, University of Delaware  
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## EDUCATION

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**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

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## PROFESSIONAL EXPERIENCE

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**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

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## RESEARCH INTERESTS

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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

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## SELECTED HONORS AND AWARDS

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**ACS Unilever Award: Outstanding Young Investigator in Colloid and Surfactant Science** 2025

*Rheologica Acta* Early Career Researcher 2025

AICHE Delaware Valley Section Outstanding Faculty Award 2025

AICHE Delaware Valley Section 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

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## PEER-REVIEWED PUBLICATIONS

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For most recent publications and citations, visit: [Google Scholar](#) | ORCID: [0000-0001-9689-9361](#)

\*Corresponding author | <sup>†</sup>Co-first authors | <sup>‡</sup>Undergraduate student author

19. P. J. McCauley, C. A. Fromen, **A. V. Bayles\***, "Cell viability in extrusion bioprinting: the impact of process parameters, bioink rheology, and cell mechanics," *Rheologica Acta*. *In press*. Invited contribution to special issue on Early Career Researchers. 2025 [DOI: 10.1007/s00397-025-01504-z](#)
18. P. M. Danner, T. Pleij, F. Liechti, J. Wolf, **A. V. Bayles**, J. Vermant, D. M. Opris, "Rapid manufacturing of high-permittivity dielectric elastomer actuator fibers," *Advanced Materials Technologies*. **10**, 2500190, 2025. [DOI: 10.1002/admt.202500190](#)
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. **4**, 4, 368–380, 2024. [DOI: 10.1021/acsengineeringau.4c00001](#)
16. T. Pleij, **A. V. Bayles**, J. Vermant\*, "Advection assemblers-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](#)

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### Prior to University of Delaware

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11. **A. V. Bayles**, J. Fisher, C. S. Valentine<sup>‡</sup>, 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<sup>‡</sup>, 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<sup>†</sup>, M. Nowak<sup>†</sup>, **A. V. Bayles**, B. Prabhakarpandian, P. Karande, J. Lahann, M. E. Helgeson and S. Mitragotri. "A microfluidic model of human brain ( $\mu$ HuB) for assessment of blood brain barrier," *Bioengineering & Translational Medicine*. 1-13, 2019. [DOI: 10.1002/btm2.10126](#)
7. **A. V. Bayles**<sup>†</sup>, T. A. Prileszky<sup>†</sup>, 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-nanoemulsions 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**<sup>‡</sup>, 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**<sup>‡</sup>, 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**<sup>‡</sup>, A. D. Baldwin, K. L. Kiick and E. M. Furst, "Rapid, high resolution screening of biomaterial hydrogelators by  $\mu^2$ rheology," *Biomacromolecules*, **12**, 4178–4182, 2011. [DOI: 10.1021/bm201214r](#)

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## PATENTS AND PATENT APPLICATIONS

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7. **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.
6. **Pending EPO** EP4428196A1 "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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#### Prior to University of Delaware

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5. **Pending WIPO WO2021205020A1 | Pending EPO EP20169207 | Pending USPTO US20230172252A1** | "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.
4. **Granted USPTO US9597648B2 | Granted EPO EP2909298B1** | "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.

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#### BOOK CONTRIBUTIONS AND SOFTWARE

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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](https://doi.org/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>.

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#### INVITED PRESENTATIONS

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##### Presenting author

- *Declined due to maternity leave.* Keynote in the session on *Polymers in Additive Manufacturing* at the AIChE Annual Meeting. November 2025.
- *Declined due to maternity leave.* Keynote in the session on *Additive and Advanced Manufacturing* at the Society of Rheology Annual Meeting. October 2025.
- *Declined due to maternity leave.* Invited speaker for the *Symposium honoring Norm Wagner, recipient of the 2025 ACS Colloid Chemistry Award* at the ACS Fall Meeting. August 2025.
- *Postponed until 2026 due to pregnancy.* *ACS Unilever Award: Outstanding Young Investigator in Colloid and Surfactant Science* at the annual ACS Colloids Meeting. June 2025.
- *Postponed until 2027 due to pregnancy.* Invited speaker for the *Molecular Engineering of Soft Matter: Spanning Small Molecules to Macromolecules* at the Telluride Science Center. May 2025.
- 16. 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, 2025.
- 15. **A. V. Bayles**. "Harnessing Chaotic Advection to Improve the Capabilities and Capacity of Multi-Material Direct Ink Writing Nozzles." Keynote in the session on *Additive and Digital Manufacturing of Multifunctional Materials* at Materials Research Society Fall Meeting. December 1 - 6, 2024. Boston, MA.
- 14. **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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#### Prior to University of Delaware

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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.

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## PRESENTATIONS

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\*Corresponding author | Presenting author

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#### Presentations by Bayles Group Members and Collaborators

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12. **A. B. C. Escobedo**, K. Murat, A. V. Bayles. "Interfacial behavior and environmental transport of PFAS-analog surfactants," University of Delaware Summer Scholars Symposium, August 14, 2025, Newark, DE.
11. **T. Pleij**, J. Vermant, A. V. Bayles. "From flow to function: multi-materials structuring with advective assembly," Annual European Rheology Conference, April 14-17, 2025, Lyon, France.
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.

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#### Presentations by Principal Investigator Bayles

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32. M. T. Tran, **A. V. Bayles\***. "One-step manufacturing of soft actuators by advective assembly," 98th ACS Colloids and Surface Science Symposium, June 2024, 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<sub>2</sub>O 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

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### CURRENT GRADUATE STUDENT AND POSTDOCTORAL RESEARCHERS

<u>Name</u>	<u>Dept/Univ.</u>	<u>Title</u>	<u>Period</u>
9. Benke Li	CBE/UDEL	Postdoctoral fellow co-advised with N.J. Wagner	05/2025 - Present
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 III	01/2024 - Present
		<i>Distinction: NRT MIDAS Fellow, University of Delaware Collins Fellow</i>	
5. Patrick J. McCauley	CBE/UDEL	Postdoctoral fellow co-advised with C.A. Fromen	09/2023 - Present
		<i>Distinction: Inaugural Engineering Driven Health Postdoctoral Fellow</i>	
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
		<i>Distinction: Koerner Family Foundation Graduate Student Fellowship</i>	
		<i>Distinction: NRT MIDAS trainee, University of Delaware Collins Fellow</i>	
		<i>Distinction: Women In Engineering Poster Award Winner</i>	
2. Matthew N. Murdock	CBE/UDEL	MS student	01/2022 - 08/2023
		<i>Distinction: PhD qualifier exam commendation, PhD coursework commendation</i>	
		<i>Distinction: DoD SMART Fellowship Semifinalist</i>	
		<i>Distinction: Philadelphia Society of Tribology Engineers Scholarship</i>	
1. Minh T. Tran	CBE/UDEL	MS in Chemical Engineering	01/2022 - 08/2024
		<i>MS Thesis: Encoding hydrogel actuation with flow-templated architecture</i>	

### CURRENT UNDERGRADUATE STUDENT RESEARCHERS

<u>Name</u>	<u>Dept/Univ.</u>	<u>Title</u>	<u>Period</u>
9. Quinlan Kraft	CBE/UDEL	BS student	06/2025 - Present
8. Andres Escobedo	CBE/UDEL	BS student	02/2025 - Present
7. Prisha Chakraborty	CBE/UDEL	BS student	02/2025 - Present
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	4+1 BS/MSc student	06/2023 - Present
2. Shivam Chauhan	CBE/UDEL	BS student	01/2023 - 03/2023
		<i>Distinction: UDel Winter Scholars</i>	
1. Kainat Azhar	CBE/UDEL	BS student	01/2023 - 01/2025

### THESIS COMMITTEES OF GRADUATE STUDENTS

<u>Name</u>	<u>Dept/Univ.</u>	<u>Title</u>	<u>Advisor</u>	<u>Period</u>
13. Matthew Pitell	CBE/UDEL	PhD student	Furst	06/2024 - Present
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 - 08/2025

#### THESIS COMMITTEES OF UNDERGRADUATE STUDENTS

<u>Name</u>	<u>Dept/Univ.</u>	<u>Title</u>	<u>Advisor</u>	<u>Period</u>
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 —

<u>Name</u>	<u>Dept/Univ.</u>	<u>Title</u>	<u>Recent Position</u>	<u>Period</u>
7. Tazio Pleij	DMATL/ETHZ	MS, PhD student	ETHZ, Switzerland	03/2020 - 12/2022
		<i>MS Thesis: Advection Processing of Dielectric Elastomers</i>		
6. Uxue Aizarna Lopetegui	DMATL/ETHZ	PhD student visitor	CIC biomaGUNE, Spain	09/2021 - 10/2021
		<i>Project: Rheological characterization of smart hybrid bioinks for 3D bioprinting of complex tissue models</i>		
5. Patrick Zumsteg	DMATL/ETHZ	MS student	ETHZ, Switzerland	06/2021 - 09/2022
		<i>MS Thesis: Linear stability analysis of confined multilayer flow</i>		
4. Claudiu Patrascu	DMATL/ETHZ	PhD student visitor	UPB Bucharest, Romania	05/2020 - 08/2020
		<i>Project: Multiphase flow stability in millifluidic devices</i>		
3. Florian Gebhard	ChE/UCSB	PhD student visitor	TU Munich, Germany	06/2017 - 08/2017
		<i>Project: Dynamics of H<sub>2</sub>O sorption by ionic liquid - PEO mixtures</i>		
2. Connor S. Valentine	ChE/UCSB	BS student	Carnegie Mellon Univ.	03/2016 - 05/2017
		<i>Project: Dynamics of H<sub>2</sub>O sorption by methylimidazolium ionic liquids</i>		
1. Yuning Shen	ChE/UCSB	BS REU student	Fudan Univ., China	06/2015 - 08/2015
		<i>Project: Halide-based ionic liquid etching of thin Ag and Au films</i>		

#### TEACHING —

##### COURSES INSTRUCTED

<u>Name</u>	<u>Type</u>	<u>Students</u>	<u>Notes</u>	<u>Semester</u>
7. CHEG832: Soft Materials, Colloids and Polymers	Grad elective	15	sole Instructor	SII2025
Co-listed for undergraduates as CHEG667	UG elective	1		
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
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##### GUEST LECTURES

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

##### RECENT COURSE REVIEWS

CHEG832: Soft Materials, Colloids and Polymers, Spring 2023

<u>Question</u>	<u>Mean</u>	<u>Std. Dev.</u>
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."

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## PROFESSIONAL SERVICE

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### 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 EDITORIAL BOARD

JACS Au Early Career Advisory Board

08/2025 - Present

### 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