

## **Charles Edward Sing**

### **Chemical and Biomolecular Engineering**

Associate Professor, University of Illinois at Urbana-Champaign  
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#### **Current Position**

2020-Present

**Associate Professor**

**Donald and Dolores Morris Professional Scholar  
Chemical and Biomolecular Engineering**

*Department of Materials Science and Eng. (Affiliate)*

*Beckman Institute (Part-time Affiliate)*

*Center for Biophysics and Quantitative Biology (Affiliate)*

University of Illinois, Urbana-Champaign

#### **Previous Professional Positions**

2014-2020

**Assistant Professor**

**Chemical and Biomolecular Engineering**

*Department of Materials Science and Eng. (Affiliate, 2014)*

*Beckman Institute (Part-time Affiliate, 2017)*

*Center for Biophysics and Quantitative Biology (Affiliate, 2019)*

University of Illinois, Urbana-Champaign

2012-2014

**Postdoctoral Fellow, Materials Science and Engineering  
International Institute of Nanotechnology**

Northwestern University

Supervisor: Prof. Monica Olvera de la Cruz

#### **Education**

2008-2012

**PhD. Material Science and Engineering**

Program in Polymer Science and Technology

Massachusetts Institute of Technology

*Dissertation: "Blood-Clotting Inspired Polymer Physics"*

Advisor: Prof. Alfredo Alexander-Katz

2007-2008

**M.S. Macromolecular Science and Engineering**

Case Western Reserve University

*Thesis: "Photoluminescent Dye and Polymer Blends as Tunable Time-Temperature Indicators"*

Advisor: Prof. Christoph Weder

2004-2008

**B.S.E. Polymer Science and Engineering**

Case Western Reserve University

#### **Research Areas**

- Computer simulations of polymer dynamics and equilibrium
- Statistical mechanics and dynamics of charged polymer systems
- Physical chemistry of biological polymers
- Polymer solution rheology and dynamics
- Polymer architecture
- Sequence-Defined Polymers

#### **Honors and Awards**

- American Physical Society John H. Dillon Medal (2024)
- AIChE 35 Under 35 (2020)
- Helen Corley Petit Scholar (2020)

- ACS PMSE Young Investigator (2020)
- Invited Attendee, US Frontiers of Engineering Symposium (2018)
- UIUC SCS Teaching Award (2018)
- Molecular Systems Design and Engineering Emerging Investigator (2018)
- List of Teachers Ranked as Excellent, UIUC (8 times)
- NSF CAREER Award (2017)
- Forbes 30 under 30 in Science (2015)
- MIT DMSE Best PhD Thesis Award (2013)
- International Institute for Nanotechnology Postdoctoral Fellow (2012)
- MIT DMSE Graduate Student Teaching Award (2012)
- APS DPOLY Padden Award Finalist (2012)
- MRS Graduate Student Award Silver Medalist (2011)
- National Defense Science and Engineering Graduate Fellowship (NDSEG)
- MIT-Dupont Alliance Presidential Fellowship

#### **In Preparation or Under Review Publications**

86. Walker, D.J.; **Sing, C.E.** "Effect of Extensional Flow on Charge Transport in Semidilute Redox-Active Polymer Solutions" **2024**, *In Preparation*.
85. Kang, H.; Pan, T.; **Sing, C.E.** "Coarse-grained, Implicit Side-Chain Model of Bottlebrush Polymer Melts" **2024**, *In Preparation*.
84. Bello, L.; **Sing, C.E.** "Mechanisms of Diffusive Charge Transport in High Valency Redox-Active Polymer Solutions" **2024**, *In Preparation*.
83. Romo, A.I.B.; Pudar, S.; Bello-Fernandez, L.; Ibrahimi, N.; Wang, Y.; Wu, Q.; Ewoldt, R.H.; **Sing, C.E.**; Rodríguez López, J. "Electrifying Metallopolymers: Controlling Charge Percolation in Metal Redox Active Polymers (M-RAPs)" **2024**, *Submitted*.
82. Knoerdel, A.R.; **Sing, C.E.** "Transfer Matrix Model of Patterned Polyelectrolyte Complex Coacervation" **2023**, *In Preparation*.

#### **Peer-Reviewed Publications (Since Start of Independent Career, \*Co-corresponding Authors)**

81. Lin, T.-W.; **Sing, C.E.** "Effect of Penetrant-Polymer Interactions and Shape on the Motion of Molecular Penetrants in Dense Polymer Networks." *J. Chem. Phys.* **2024**, *160*, 114905.
80. Jeon, S.; Kamble, Y.; Kang, H.; Shi, J.; Wade, M.A.; Patel, B.B.; Pan, T.; Rogers, S.A.;\* **Sing, C.E.**; \* Guironnet, D.S.\*; Diao, Y.\* "UV-Assisted Direct-Ink-Write 3D Printing of Crosslinkable Bottlebrush Block Copolymers for On-the-Fly Control of Structural Color." *Proc. Natl. Acad. Sci. USA*, **2024**, *121*, e2313617121.
79. Walker, D.J.; **Sing, C.E.** "Effect of Hydrodynamic Interactions and Flow on Charge Transport in Redox-Active Polymer Solutions" *J. Phys. Chem. B.* **2024**, *128*, 1796-1811.
78. Dutta, S.; **Sing, C.E.** "Dynamics of Bottlebrush Polymers in Dilute Solution Under Simple Shear and Uniaxial Extensional Flows." *J. Chem. Phys.* **2024**, *160*, 044901.
77. Jeon, H.; Gu, J.; Mwasame, P.; Patankar, K.; Yu, D.; **Sing, C.E.** "Modeling the Competition Between Phase Separation and Polymerization Under Explicit Polydispersity" *Soft Matter*. **2024**, *20*, 681-692.
76. Qin, J.; **Sing, C.E.** "Bridging Field Theory and Ion Pairing in the Theory of Polymer Complex Coacervation" *Macromolecules*. **2023**, *56*, 5941-5963.
75. Lin, T.W.; Mei, B.; Schweizer, K.S.; **Sing, C.E.** "Simulation Study of the Effects of Polymer Network Dynamics and Mesh Confinement on the Diffusion and Structural Relaxation of Molecular Penetrants." *J. Chem. Phys.* **2023**, *159*, 014904.
74. Choi, S.; Knoerdel, A.R.; **Sing, C.E.**;\* Keating, C.D.\* "The Effect of Chain-Length Mismatch on the Apparent pH Environment in a Complex Coacervate." *J. Phys. Chem. B.* **2023**, *127*, 5978-5991.
73. Madinya, J.J.; Tjo, H.; Meng, X.; Ramírez Marrero, I.A., **Sing, C.E.**;\* Perry, S.L.\* "Surface Charge Density and Steric Repulsion in Polyelectrolyte-Surfactant Coacervation" *Macromolecules*, **2023**, *56*, 3973-3988.

72. Mei, B.; Lin, T.W.; **Sing, C.E.**; Schweizer, K.S. "Self-Consistent Hopping Theory of Activated Relaxation and Diffusion of Dilute Penetrants in Dense Crosslinked Polymer Networks." *J. Chem. Phys.*, **2023**, *158*, 184901.
71. Mei, B.; Lin, T.W.; Sheridan, G.S.; Evans, C.M.; **Sing, C.E.**.\* Schweizer, K.S.\* "How Segmental Dynamics and Mesh Confinement Determine the Selective Diffusivity of Molecules in Crosslinked Dense Polymer Networks." *ACS Cent. Sci.* **2023**, *9*, 508-518.
70. Blocher McTigue, W.C.; **Sing, C.E.** "Competing Time Scales in Surface-Driven Solution Depolymerization." *Macromolecules*, **2022**, *55*, 8998-9010.
69. Mei, B.; Lin, T.-W.; Sheridan, G.S.; Evans, C.\* **Sing, C.E.**.\* Schweizer, K.S.\* "Structural Relaxation and Vitrification in Dense Crosslinked Polymer Networks: Simulation, Theory, and Experiment." *Macromolecules*, **2022**, *55*, 4159-4173.
68. Madinya, J.J.; **Sing, C.E.** "Field Theory Description of Oppositely-Charged Polyelectrolyte and Surfactant-Micelle Interactions and Phase Separation." *Macromolecules*, **2022**, *55*, 2358-2373.
67. Patel, B.; Pan, T.; Chang, Y.; Walsh, D.; Kwok, J.; Park, K.S.; Patel, K.; Guironnet, D.S.; **Sing, C.E.**; Diao, Y. "Concentration-Driven Self-Assembly of PS-b-PLA Bottle-brush Diblock Copolymers in Solution" *ACS Polym. Au* **2022**, *Online*. **ACS Editor's Choice.**
66. Pan, T.; Dutta, S.; Kamble, Y.; Patel, B.; Wade, M.; Rogers, S.A.; Diao, Y.; Guironnet, D.S.; **Sing, C.E.** "Materials Design of Highly-Branched Bottlebrush Polymers at the Intersection of Modeling, Synthesis, Processing, and Characterization" *Chem. Mater.* **2022**, *34*, 1990-2024. **Invited Perspective.**
65. Pan, T.; Dutta, S.; **Sing, C.E.** "Interaction Potential for Coarse-Grained Models of Bottlebrush Polymers" *J. Chem. Phys.* **2022**, *156*, 014903. **Invited for Emerging Investigator Special Collection.**
64. Knoedel, A.R.; Blocher McTigue W.C.; **Sing, C.E.** "Transfer Matrix Model of pH Effects in Polymeric Complex Coacervation" *J. Phys. Chem. B*, **2021**, *125*, 8965-8980. **Invited for Carol Hall Festschrift.**
63. Young, C.D.; Zhou, Y.; Schroeder, C.M.; **Sing, C.E.** "Dynamics and Rheology of Ring-Linear Semidilute Solutions in Extensional Flow. Part I: Modeling and Molecular Simulations" *J. Rheology*, **2021**, *65*, 757-777. **Invited for Ring Polymer Special Issue.**
62. Zhou, Y.; Young, C.D.; Lee, M.; Banik, S.; Kong, D.; McKenna, G.B.; Robertson-Anderson, R.; **Sing, C.E.**; Schroeder, C.M. "Dynamics and Rheology of Ring-Linear Semidilute Solutions in Extensional Flow: Single Molecule Experiments" *J. Rheology*, **2021**, *65*, 729-744.
61. Pan, T.; Patel, B.B.; Walsh, D.J.; Dutta, S.; Guironnet, D.; Diao, Y.; **Sing, C.E.** "Implicit Side-Chain Model and Experimental Characterization of Bottlebrush Block Copolymer Solution Assembly" *Macromolecules*, **2021**, *54*, 3620-3633.
60. Liu, Y.; Santa Chalarca, C.F.; Carmean, R.N.; Olson, R.A.; Madinya, J.; Sumerlin, B.S.; **Sing, C.E.**; Emrick, T.; Perry, S.L. *Macromolecules*, **2020**, *53*, 7851-7864.
59. Bello, L.; **Sing, C.E.** "The role of conformational motion and charge-hopping kinetics on diffusive charge transport in redox-active polymer solutions" *Macromolecules*, **2020**, *53*, 7658-7671.
58. Patel, S.F.; Young, C.D.; **Sing, C.E.**; Schroeder, C.M. "Comb Polymer Relaxation in Semi-dilute Solutions" *Phys. Rev. Fluids*. **2020**, *5*, 121301.
57. Dutta, S.; **Sing, C.E.** "Two Force-Extension Regimes in Bottlebrush Polymers" *Macromolecules*, **2020**, *53*, 6946-6955.
56. **Sing, C.E.**.\* Perry, S.L.\* "Recent Progress in the Science of Complex Coacervation" *Soft Matter*, **2020**, *16*, 2885-2914. **Invited Review.**
55. Perry, S.L.\* **Sing, C.E.**\* "100<sup>th</sup> Anniversary of Macromolecular Science Viewpoint: Opportunities in the Physics of Sequence-Defined Polymers" *ACS Macro Lett.* **2020**, *8*, 216-225. **Invited Viewpoint.**
54. **Sing, C.E.** "Micro- to Macro-Phase Separation Transition in Sequence-Defined Coacervates." *J. Chem. Phys.* **2020**, *152*, 024902.

53. Madinya, J.; Chang, L.-W.; Perry, S.L.\*; **Sing, C.E.\*** "Transfer Matrix Model for Sequence-Dependent Polyampholyte Phase Behavior" *Mol. Syst. Des. Eng.* **2020**, *5*, 632-644.
52. Young, C.D.; **Sing, C.E.** "Out-of-Equilibrium Stretching of Semidilute Polymer Solutions in Extensional Flow" *J. Chem. Phys.* **2019**, *151*, 124907.
51. Dahlke, K.; **Sing, C.E.** "Influence of Nucleoid Associated Proteins on DNA Supercoiling Behavior." *J. Phys. Chem. B.* **2019**, *123*, 10152-10162.
50. Dahlke, K.; Zhou, J.; **Sing, C.E.\***; Banigan, E.\* "Force-dependent Facilitated Dissociation can Generate Protein-DNA Catch Bonds." *Biophys. J.* **2019**, *117*, 1085-1100.
49. Kim, A.; Zhou, C.; Yao, L.; Ni, S.; Luo, B.; **Sing, C.E.**; Chen, Q. "Tip-patched Nanoprisms from Growth of Ligand Islands." *J. Am. Chem. Soc.* **2019**, *141*, 11796-11800.
48. Dutta, S.; Pan, T.; **Sing, C.E.** "Bridging Simulation Length Scales of Bottlebrush Polymers Using a Wormlike Cylinder Model." *Macromolecules.* **2019**, *52*, 4858.
47. Walsh, D.J.; Dutta, S.; **Sing, C.E.\***; Guirounet, D.\* "Engineering of Molecular Geometry in Bottlebrush Polymers." *Macromolecules.* **2019**, *52*, 4847.
46. Ong, G.M.C.; **Sing, C.E.** "Mapping the phase behavior of coacervate-driven self-assembly in diblock copolyelectrolytes" *Soft Matter.* **2019**, *15*, 5116.
45. Young, C.D.; Qian, J.R.; Marvin, M.; **Sing, C.E.** "Ring polymer dynamics and tumbling-stretch transitions in planar mixed flows." *Phys. Rev. E.* **2019**, *99*, 062502.
44. Lytle, T.K.; Chang, L.W.; Markiewicz, N.; Perry, S.L.\*; **Sing, C.E.\*** "Designing Electrostatic Interactions via Polyelectrolyte Monomer Sequence" *ACS Central Science.* **2019**, *5*, 709-718.
43. Dutta, S.; Wade, M.; Walsh, D.J.; Guirounet, D.; Rogers, S.A.; **Sing, C.E.** "Dilute Solution Structure of Bottlebrush Polymers" *Soft Matter.* **2019**, *15*, 2928-2941. **Cover Article.**
42. Young, C.D.; Marvin, M.D.; **Sing, C.E.** "Conformationally averaged iterative Brownian dynamics simulations of semidilute polymer solutions." *J. Chem. Phys.* **2018**, *149*, 174904.
41. Lytle, T.K.; Salazar, A.; **Sing, C.E.** "Interfacial Properties of Polymeric Complex Coacervates from Simulation and Theory." *J. Chem. Phys.* **2018**, *149*, 163315. **Invited Article for Polyelectrolytes Special Issue**
40. Dahlke, K.; **Sing, C.E.** "Force-Extension Behavior of DNA in the Presence of DNA-Bending Nucleoid Associated Proteins." *J. Chem. Phys.* **2018**, *148*, 084902.
39. Lytle, T.K.; **Sing, C.E.** "Tuning Chain Interaction Entropy in Complex Coacervation Using Polymer Stiffness, Architecture, Hydrophobicity, and Salt Valency." *Mol. Syst. Des. Eng.* **2018**, *3*, 183. **Invited for Emerging Investigator Special Issue**
38. Chang, L.W.; Lytle, T.K.; Radhakrishna, M.; Madinya, J.J.; Velez, J.; **Sing, C.E.\***; Perry, S.L.\* "Sequence and Entropy-Based Control of Complex Coacervates." *Nat. Comm.* **2017**, *8*, 1273.
37. Lytle, T.K.; **Sing, C.E.** "Transfer Matrix Theory of Polymer Complex Coacervation." *Soft Matter*, **2017**, *13*, 7001-7012. **Invited Article for Coacervation Special Issue**
36. Johnston, B.M.; Johnston, C.W.; Letteri, R.A.; Lytle, T.K.; **Sing, C.E.**; Emrick, T.; Perry, S.L. "The Effect of Comb Architecture on Complex Coacervation." *Org. Biomol. Chem.* **2017**, *15*, 7630-7642.
35. Miao, L.; Young, C.D.; **Sing, C.E.** "An Iterative Method for Hydrodynamic Interactions in Brownian Dynamics Simulations of Polymer Dynamics." *J. Chem. Phys.* **2017**, *147*, 024904.
34. Radhakrishna, M.; Basu, K.; Liu, Y.; Shamsi, R.; Perry, S.L.; **Sing, C.E.** "Molecular Connectivity and Correlation Effects on Polymer Coacervation." *Macromolecules* **2017**, *50*, 3030-3037.
33. Dahlke, K.; **Sing, C.E.** "Facilitated Dissociation of Dimeric Nucleoid-Associated Proteins Follows Universal Curve." *Biophys. J.* **2017**, *112*, 543-551.
32. Smith, C.E., Ermenwein, D.; Clay, N.; Shkumatov, A.; Park, J.; Lee, J.; Misra, S.; **Sing, C.E.**; Zimmerman, S.C.; Kong, H. "Orthogonal Control of Shape and Sensitivity of Paramagnetic Nanoparticle Cluster for Low Dose Diagnosis Imaging" *ACS Appl. Mat. Interf.* **2017**, *9*, 1219-1225.

31. **Sing, C.E.** "Development of the Modern Theory of Polymeric Complex Coacervation," *Adv. Coll. Interface Sci.* **2017** 239, 2-16. **Invited Review Article for Coacervation Special Issue**
30. Lytle, T.K.; Radhakrishna, M.; **Sing, C.E.** "High Charge Density Coacervate Assembly via Hybrid Monte Carlo-Single Chain in Mean Field Theory." *Macromolecules* **2016** 49, 9693-9705.
29. Hsiao, K.W.; Schroeder, C.M.; **Sing, C.E.** "Ring Polymer Dynamics are Governed by a Coupling Between Architecture and Hydrodynamic Interactions." *Macromolecules* **2016** 49, 1961-1971.
28. Radhakrishna, M.; **Sing, C.E.** "Charge Correlations for Precise, Coulombically-Driven Self Assembly." *Macromol. Chem. Phys.* **2016** 217, 126-136. **Invited 'Talents' Review for Young Investigator Special Issue**
27. Perry, S.L.; **Sing, C.E.** "PRISM-based Theory of Complex Coacervation: Excluded Volume versus Chain Correlation," *Macromolecules.* **2015** 48(14), 5040-5053.
26. Giuntoli, R.G.; Linzer, N.B.; Banigan, E.J.; **Sing, C.E.**; Olvera de la Cruz, M.; Graham, J.S.; Johnson, R.C. Marko, J.F. "Dissociation of Proteins from DNA Facilitated by DNA Segments in Solution," *Journal of Molecular Biology* **2015** 427, 3123-3136.
25. Mai, D.J.; Marciel, A.B.; **Sing, C.E.**; Schroeder, C.M. "Topology-Controlled Relaxation Dynamics of Single Branched Polymers," *ACS Macro Letters.* **2015** 4, 446-452.
24. **Sing, C.E.**; Zwanikken, J.W.; Olvera de la Cruz, M. "Theory of Melt Polyelectrolyte Blends and Block Copolymers: Phase Behavior, Surface Tension, and Microphase Periodicity," *J. Chem. Phys.* **2015** 142, 034902.

**Peer-Reviewed Publications (Prior to Start of Independent Career)**

23. **Sing, C.E.**; Olvera de la Cruz, M.; "Polyelectrolyte Blends and Nontrivial Behavior in Effective Flory-Huggins Parameters," *ACS Macro Letters.* **2014** 3, 698-702.
22. **Sing, C.E.**; Zwanikken, J.W.; Olvera de la Cruz, M.; "Electrostatic Control of Block Copolymer Morphology." *Nat. Mater.* **2014** 13, 694-698. **Cover Article**
21. **Sing, C.E.**; Olvera de la Cruz, M.; Marko, J.F. "Multiple-binding-site mechanism explains concentration-dependent unbinding rates of DNA-binding proteins." *Nuc. Acids Res.* **2014** 42, 3783-3791.
20. **Sing, C.E.**; Zwanikken, J.W.; Olvera de la Cruz, M.; "Correlation-induced phase separation in polyelectrolyte blends." *ACS Macro Letters.* **2013** 2, 1042-1046.
19. **Sing, C.E.**; Zwanikken, J.W.; Olvera de la Cruz, M.; "Interfacial behavior in polyelectrolyte blends: hybrid liquid-state integral equation and self-consistent field theory study." *Phys. Rev. Lett.* **2013** 111, 168303.
18. **Sing, C.E.**; Selvidge J.G.; Alexander-Katz, A.; "Von Willebrand Adhesion to Surfaces at High Shear Rates is Controlled by Long-Lived Bonds." *Biophys. J.* **2013** 105, 1475-1481.
17. **Sing, C.E.**; Zwanikken, J.W.; Olvera de la Cruz, M.; "Effect of Ion-Ion Correlations on Polyelectrolyte Gel Collapse and Reentrant Swelling." *Macromolecules.* **2013** 46, 5053-5065.
16. **Sing, C.E.**; Alexander-Katz, A.; "Designed Molecular Mechanics Using Self-associating Polymer Components" *Soft Matter* **2012** 8, 11871-11879.
15. **Sing, C.E.**; Alexander-Katz, A.; "Force Spectroscopy of Self-Associating Homopolymers" *Macromolecules* **2012** 45(16), 6704-6718.
14. **Sing, C.E.**; Alexander-Katz, A.; "Giant non-monotonic stretching response of a self-associating polymer in shear flow" *Phys. Rev. Lett.* **2011** 107, 198302.
13. **Sing, C.E.**; Alexander-Katz, A.; "Equilibrium Structure and Dynamics of Self-Associating Single Polymers" *Macromolecules* **2011** 44(17), 6962-6971.
12. **Sing, C.E.**; Alexander-Katz, A.; "Non-monotonic lift forces on stretched polymers near surfaces." *EPL* **2011** 95, 48001.
11. Einert, T.A.; **Sing, C.E.**; Alexander-Katz, A.; Netz, R.R.; "Internal Friction of Homo-polymeric Systems Studied by Diffusion and Non-equilibrium Unfolding of Globules." *Eur. Phys. J. E.* **2011** 34, 130.

10. **Sing, C.E.**; Einert, T.A.; Netz, R.R.; Alexander-Katz, A.; "Probing Structural Transitions in Polymer Globules by Force." *Phys. Rev. E* **2011** 83(4), 040801(R).
9. **Sing, C.E.**; Alexander-Katz, A.; "Collapsed polymer behavior in combinations of shear and elongational flow fields." *J. Chem. Phys.* **2011** 135, 014902.
8. **Sing, C.E.**; Alexander-Katz, A.; "Theory of tethered polymers in shear flow: the strong stretching limit." *Macromolecules* **2011** 44(22), 9020-9028.
7. Moran, S.E.; **Sing, C.E.**; Alexander-Katz, A.; "Self-Assembled Micro-Walkers" *Proc. of the 2<sup>nd</sup> Eur. Conf. on Microfluidics.* **2010**.
6. Van Lehn, R.C.; **Sing, C.E.**; Chen, H.; Alexander-Katz, A.; "Multidimensional targeting: using physical and chemical forces in unison." *Curr. Pharm. Biotechno.* **2010** 11, 320-332.
5. **Sing, C.E.**; Alexander-Katz, A.; "Globule-stretch transitions of collapsed polymers in elongational flow fields." *Macromolecules* **2010** 43(7), 3532-3541.
4. **Sing, C.E.**; Alexander-Katz, A.; "Elongational flow induces the unfolding of von Willebrand Factor at physiological flow rates." *Biophys. J.* **2010** 98(9), L35- L37.
3. **Sing, C.E.**; Schmid, L.; Schneider, M.; Franke, T.; Alexander-Katz, A.; "Self-assembled colloidal walkers: from single chain motion to controlled surface-induced flows." *Proc. Natl. Acad. Sci. U.S.A.* **2010** 107(2), 535-540. **Featured on the MIT Homepage, as well as numerous media outlets**
2. **Sing, C.E.**; Kunzelman, J.; Weder, C.; "Time-temperature indicators for high temperature applications." *J. Mat. Chem.* **2009**, 19(1), 104-110.
1. Crenshaw, B.; Kunzelman, J.; **Sing, C.E.**; Ander, C.; Weder, C.; "Threshold Temperature Sensors with Tunable Properties." *Macromol. Chem. Phys.* **2007**, 208, 572-580.

#### **Book Chapter**

1. **Sing, C.E.**; Alexander-Katz, A.; "Microwalkers" *Artificial Cilia* **2013**, eds. J. den Toonder and P. Onck. Ch. 9.

#### **Patent**

1. **Sing, C.E.**; Steimel, J.P.; Alexander-Katz, A. "Systems and Methods for Detecting Molecular Interactions Using Magnetic Beads" May 28, 2015. US Patent No. 9977015B2.

#### **Invited Talks**

56. "Controlling Liquid-Liquid Phase Separation and Assembly with Polyelectrolyte Charge Sequence" Bioinspired Materials GRC, June 2024.
55. "Modeling Bottlebrush Polymers for Self-Assembly and Printing" International Conference in Science and Technology of Complex Fluids, San Luis Potosí, Mexico, June 2024.
54. "Coarse-grained Models for Block Bottlebrush Self-Assembly" Department of Macromolecular Science and Engineering, Case Western Reserve University, Cleveland OH, Apr. 2024.
53. "Models for Complexation and Coacervation in Charged Macromolecules" Dow Discussion Group on Interfacial Science, Midland MI (*Virtual*), Apr. 2024.
52. "Developing Straightforward Models to Address Complex (Coacervate) Problems in Sequence-Defined Polyelectrolytes" Dillon Medal Award Lecture, American Physical Society March Meeting, Minneapolis MN, Mar. 2024.
51. "Bioinspired Thermodynamics of Polyelectrolyte Complex Coacervates" Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis MN, Oct. 2023.
50. "Bioinspired Thermodynamics of Polyelectrolyte Complex Coacervates" Department of Physics, University of Illinois Chicago, Chicago IL, Sept. 2023.
49. "Bioinspired Thermodynamics of Polyelectrolyte Complex Coacervates" Department of Chemical Engineering, Johns Hopkins University, Baltimore MD, Sept. 2023.
48. "Bioinspired Thermodynamics of Polyelectrolyte Complex Coacervates" Korea Institute for Advanced Study, Seoul, South Korea, July 2023.

47. "Bioinspired Thermodynamics of Polyelectrolyte Complex Coacervates" Pohang University of Science and Technology, Pohang, South Korea, July 2023.
46. "Coarse-Grained Models for Block Bottlebrush Self-Assembly" NanoKorea Conference, Goyang, South Korea, 7/2023.
45. "Bioinspired Thermodynamics of Polyelectrolyte Complex Coacervates" Department of Chemical and Biomolecular Engineering, Seoul National University, Seoul, South Korea, July 2023.
44. "Bioinspired Thermodynamics of Polyelectrolyte Complex Coacervates" Department of Chemical and Biomolecular Engineering, Sogang University, Seoul, South Korea, July 2023.
43. "Bioinspired Thermodynamics of Polyelectrolyte Complex Coacervates" Department of Chemistry, Dartmouth University, Hanover NH, Apr. 2023.
42. "Modeling the Phase Behavior of Complex Coacervates Formed from Polyelectrolytes and Surfactant Micelles" COMSEF, AIChE National Meeting, Phoenix AZ, Nov. 2022.
41. "Bioinspired Thermodynamics of Polyelectrolyte Complex Coacervates" Department of Chemical Engineering, University of California Los Angeles, Los Angeles CA, Nov. 2022.
40. "Coarse-Grained Models for Predicting Bottlebrush Block Copolymer Self-Assembly." Area 08A, AIChE National Meeting, Phoenix AZ, Nov. 2022.
39. "Building a Bridge from Complex Coacervation Models to Biomolecular Phase Separation" Colloidal, Macromolecular, and Polyelectrolyte Solutions GRC, Nov. 2022.
38. "Coarse-Grained Models for Block Bottlebrush Self-Assembly" Stanford Polymer Collective, Stanford University, Palo Alto CA, Nov. 2022.
37. "Bioinspired Thermodynamics of Polyelectrolyte Complex Coacervates" Department of Chemical Engineering, University of Michigan, Ann Arbor MI, Oct. 2022.
36. "Bioinspired Thermodynamics of Polyelectrolyte Complex Coacervates" Department of Chemical Engineering, Stanford University, Palo Alto CA, Oct. 2022.
35. "Thermodynamics and Design of Sequence-Defined Macromolecular Complexes" Department of Chemical Engineering, University of Illinois Chicago, Chicago IL, Apr. 2022.
34. "The Role of Hydrodynamics in Flowing Semidilute Solutions of Ring/Linear Polymer Blends" APS March Meeting, Chicago IL, Mar. 2022.
33. "Thermodynamics and Design of Sequence-Defined Macromolecular Complexes" Department of Chemical Engineering, Brigham Young University, Provo UT (*Virtual*), Jan. 2022.
32. "Mechanisms of Diffusive Charge Transport in Redox-Active Polymer Solutions" MRS Spring Meeting (*Virtual*), April 2021.
31. "Thermodynamics and Design of Sequence-Defined Polyelectrolyte Complexes" Department of Chemical and Biomolecular Engineering, Georgia Tech, Atlanta GA (*Virtual*), Oct. 2020.
30. "Tuning Polyelectrolyte Assembly via Charged Monomer Sequence" ACS Fall National Meeting, San Francisco CA (*Virtual*), August 2020.
29. "Thermodynamics of Sequence-Defined Polyelectrolyte Complexes" Dow Discussion Group on Interfacial Science, Midland MI (*Virtual*), June 2020.
28. "Thermodynamics of Sequence-Defined Polyelectrolyte Complexes" Department of Chemical and Biomolecular Engineering, University of Pennsylvania, Philadelphia PA, Oct. 2019.
27. "Thermodynamics of Coacervates with Sequence-Defined Polyelectrolytes" Telluride Polymer Physics Workshop, Telluride CO, July 2019.
26. "Tuning Polyelectrolyte Interactions via Charged Monomer Sequence", Princeton Institute for the Science and Technology of Materials, Princeton University, Princeton NJ, April 2019.
25. "Coarse-Grained Simulation of Dilute Bottlebrush Polymers", ACS Spring National Meeting, Orlando FL, April 2019.
24. "Tuning Polyelectrolyte Interactions via Charged Monomer Sequence", Department of Polymer Science and Engineering, University of Massachusetts Amherst, Amherst MA, January 2019.

23. "Tuning Polyelectrolyte Interactions via Charged Monomer Sequence", Department of Macromolecular Science and Engineering, Case Western Reserve University, Cleveland OH, November 2018.
22. "Designing Polymer Materials Using Precise Placement of Molecular Charge", Program in Polymers and Soft Materials, MIT, Cambridge MA, October 2018.
21. "Designing Polymer Materials Using Precise Placement of Molecular Charge" Department of Chemical and Biological Engineering, Northwestern University, Evanston IL, October 2018.
20. "Designing Polymer Materials Using Precise Placement of Molecular Charge" International Symposium on Polyelectrolytes, Wageningen University, Netherlands, August 2018.
19. "Designing Polymer Materials Using Precise Placement of Molecular Charge" Gordon Research Conference in Polymer Physics, Mt. Holyoke PA, July 2018.
18. "Designing Polyelectrolyte Materials Using the Precise Placement of Molecular Charge" Midwest Thermodynamics and Statistical Mechanics Conference, University of Pittsburgh, Pittsburgh PA, June 2018.
17. "Designing Polymer Materials Using Precise Placement of Molecular Charge" University of Wisconsin, Department of Chemical and Biological Engineering, Madison WI, April 2018.
16. "Conformational Averaging as a Route to Understanding Out-of-Equilibrium Polymer Solutions in Flow" APS National Meeting, Los Angeles CA, March 2018.
15. "Designing Polymer Materials Using Precise Placement of Molecular Charge" Purdue University, Department of Materials Engineering, West Lafayette IN, February 2018.
14. "Can the Tools of Polymer Field Theory be Applied to Polymer Solution Dynamics?" Area 01J, AIChE National Meeting, Minnesota MN, October 2017.
13. "Tuning Complex Coacervation Using Sequence-Defined Polyelectrolytes – A Molecular Understanding" ACS Colloids, New York NY, July 2017.
12. "Monomer Sequence to Self-Assembly in Charged Polymers" Midwest Thermodynamics and Statistical Mechanics Conference, Notre Dame, South Bend IN, June 2017.
11. "Spanning Length Scales in Polymeric Complex Coacervate Self-Assembly" ACS National Meeting, San Francisco CA, April 2017.
10. "Monomer Sequence to Self-Assembly in Charged Polymers" University of Southern Mississippi, Hattiesburg MS, Mar. 28 2017.
9. "Molecular and Sequence Effects in Charged Materials" ACS National Meeting, Philadelphia PA, Aug. 2016.
8. "Exposing New Opportunities in Coacervate Control" ACS National Meeting, Boston MA, Aug. 17 2015.
7. "Blood Clotting and Coarse-Grained Biophysics" MBTG Colin A. Wraight Memorial Symposium, UIUC, Nov. 14 2014.
6. "Polymeric Materials with Highly Correlated Charges" Soft Materials Seminar, Department of Materials Science and Engineering, UIUC, Sept. 2 2014.
5. "Polyelectrolyte Melt Interfaces: Charge Correlation Effects" Polymer Physics Gordon Research Seminar, July 13 2014.
4. "Polymer Theory as a Tool for Biological Understanding and Materials Design" University of North Carolina – Chapel Hill, Feb. 19 2013.
3. "Biologically-Inspired Polymer Physics: Theory as a Tool for Understanding and Design" University of Illinois Urbana-Champaign, Jan. 24 2013.
2. "Blood Clotting-Inspired Polymer Physics" University of Washington, Aug. 8 2012. *Distinguished Young Scholar Summer Seminar Series*
1. "Blood Clotting-Inspired Polymer Physics" Case Western Reserve University, Feb. 24 2012.

**Contributed Abstracts (>80 Since Start of Independent Career)**



**Teaching****Postdocs Mentored as PI**

Neha Tyagi (Postdoc, 2021-Present)

Whitney Blocher-McTigue (Postdoc, 2020-2022, now Asst. Prof. at Lehigh University)

Sarit Dutta (Postdoc, 2017-2021, now Research Scientist at ENS Lyon)

Mithun Radhakrishna (Postdoc, 2014-2016, now Asst. Prof. at IIT Gandhinagar)

**Ph.D. Students Mentored as PI**

Dr. Katelyn Dahlke (ChBE PhD Student, 2014-2019, now Instructional Faculty at University of Wisconsin)

Dr. Tyler Lytle (Chemistry PhD Student, 2014-2019, now at EPIC Software)

Linling Miao (ChBE PhD Student, 2015-2017)

Dr. Charles Young (ChBE PhD Student, 2016-2021, now Postdoc at University of Wisconsin)

Jason Madinya (ChBE PhD Student, 2016-2022, now Postdoc at University of Delaware)

Michael Samp (ChBE PhD Student, 2017-2018)

Gary Ong (ChBE PhD Student, 2017-2019)

Liliana Bello-Fernandez (ChBE PhD Student, 2018-2023, now Consultant at Exponent)

Tianyuan Pan (MatSE PhD Student, 2018-2023, now Research Scientist at Huawei)

Ashley Knoerdel (Biophysics PhD Student, 2019-2023, now Postdoc at University of Illinois)

Hyeonmin Jeong (ChBE PhD Student, 2019-Present)

Tsai-Wei Lin (ChBE PhD Student, 2020-Present)

Dejuante Walker (ChBE PhD Student, 2020-Present)

Haisu Kang (ChBE PhD Student, 2021-Present)

Yun-Ju Chen (MatSE PhD Student, 2021-Present)

Siri Phuangthong (ChBE PhD Student, 2022-Present)

Min-Hsien Lin (ChBE PhD Student, 2023-Present)

**Masters Students Mentored as PI**

Michael Marvin (M.S. Materials Science, 2014-2016, now at Hyland Software)

**Undergraduate Students Mentored as PI**

Christina Mardyla (ChBE Undergraduate Student, 2015-2016)

June Qian (ChBE Undergraduate Student, 2016-2018)

Anthony Salazar (ChBE Undergraduate Student, 2017-2019)

Jing Zhou (ChBE Undergraduate Student, 2017-2019)

Natalia Markiewicz (ChBE Undergraduate Student, 2018-2020)

Sejal Karwa (ChBE Undergraduate Student, 2020-2021)

Chantal Korde (ChBE Undergraduate Student, 2022-Present)

Charles Carroll (ChBE Undergraduate Student, 2022-Present)

**Classes Taught at University of Illinois**

Statistical Thermodynamics for Chemical Engineers (ChBE 525) – Developed Course

Thermodynamics for Chemical Engineers (ChBE 321)

Statistics for Chemical Engineers (ChBE 494)

Process Control and Dynamics (ChBE 440)

Statistical Physics of Polymers (ChBE 594) – Developed Course

**Service**

**Journal reviewer:** ACS Macro Letters; ACS Central Science; Advances in Colloid and Interfacial Science; Biophysical Journal; Chemical Communications; Chemical Science; Colloids and Surfaces A: Physicochemical and Engineering Aspects; Current Opinion in Chemical Biology; Journal of the American Chemical Society; Journal of Chemical Physics; Journal of the Royal Society Interface; Journal of Physical Chemistry B; Journal of Polymer Science Part B: Polymer Physics; Macromolecules; Physical Review E; Physical Review Letters; Proceedings of the National Academy of Science of the USA; Science Advances; Soft Matter

**Proposal reviewer:** National Science Foundation (CBET, DMR, CHE), DOE (BES), ACS PRF, ERC

**Session chair/co-chair:** American Institute for Chemical Engineers Annual Meeting (2014-2020),

American Physical Society (2015, 2017- 2019), American Chemical Society (2020, 2022), Society of Rheology (2022)

**Conference organizer:** Midwest Statistical Mechanics and Thermodynamics Meeting (June 2019)

**Journal/Professional Organization Positions:** Macromolecules Editorial Advisory Board (2020-2022), APS DPOLY Membership Committee (2020-2022) APS DPOLY Education Committee (2022-2024)