

# Douglas R. Tree

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## Education

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Univ. of California Santa Barbara <i>Materials Research Laboratory</i>	Postdoctoral Scholar <i>Advisor: Glenn Fredrickson</i>	2014–2017
University of Minnesota <i>Chemical Eng. &amp; Materials Sci.</i>	Ph.D, Chemical Engineering <i>Advisor: Kevin Dorfman</i>	2009–2014
Brigham Young University	B.S. Chemical Engineering <i>magna cum laude</i>	2003–2009

## Appointments

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Brigham Young University <i>Chemical Engineering</i>	Associate Professor	2024 – present
Brigham Young University <i>Chemical Engineering</i>	Assistant Professor	2017 – 2024

## Awards

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CAREER Award, National Science Foundation, DMR	2024
Soft Matter Emerging Investigator, RSC Soft Matter	2021
Doctoral New Investigator Award, ACS Petroleum Research Fund	2018
Best Presentation, AIChE Annual Meeting, Complex Fluids: Macromolecules	2017
Journal of Polymer Science Poster Prize, Kramer Memorial Conference, UCSB	2016
APS Padden Award Finalist	2014
University of Minnesota Doctoral Dissertation Fellowship	2013 – 2014
Honorable Mention, NSF Graduate Research Fellowship	2011
Brigham Young University Heritage Scholarship	2003 – 2009

## Publications

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For a current citation count, see [Google Scholar](#) or [Web of Science](#).

- [33] Pierre Kawak, Christopher Akiki, and Douglas R. Tree. “Effect of local chain stiffness on oligomer crystallization from a melt”. *Physical Review Materials*, 8, p. 075606 (2024). doi: 10.1103/physrevmaterials.8.075606.
- [32] Nicholas P. Bair, Qinyu Zhu, Byron A. Staynings, Douglas R. Tree, and Walter F. Paxton. “Ready, Set, Grow: From Micelles to Giant Vesicles via Biocatalytic Activation”. *Langmuir*, 40, pp. 15293–15300 (2024). doi: 10.1021/acs.langmuir.4c01925.

- [31] Mark N. McDonald, Douglas R. Tree, and Cameron K. Peterson. “Chemical herding as a multiplicative factor for top-down manipulation of colloids”. *Physical Review E*, 109, p. 064609 (2024). DOI: [10.1103/physreve.109.064609](https://doi.org/10.1103/physreve.109.064609).
- [30] Jan Garcia, Douglas R. Tree, Alyssa Bagoyo, Tatsuhiko Iwama, Kris Delaney, and Glenn Fredrickson. “Coarsening dynamics of ternary polymer solutions with mobility and viscosity contrasts”. *Journal of Chemical Physics* (2023). DOI: <https://doi.org/10.1063/5.0173992>.
- [29] Rami Alhasan, Tanner A. Wilcoxson, Dakota S. Banks, Sion Jung, and Douglas R. Tree. “Nonsolvent-induced phase separation inside liquid droplets”. *The Journal of Chemical Physics*, 158, 214903 (2023). DOI: [10.1063/5.0143928](https://doi.org/10.1063/5.0143928).
- [28] Elisabeth Lloyd, Rami Alhasan, Sujata Dhakal, Svetlana Morozova, Douglas R. Tree, and Robert Hickey. “Hierarchical, Porous Hydrogels Demonstrating Structurally Dependent Mechanical Properties”. *Research Square (preprint)* (2023). DOI: [10.21203/rs.3.rs-2954017/v1](https://doi.org/10.21203/rs.3.rs-2954017/v1).
- [27] Qinyu Zhu and Douglas R. Tree. “Simulations of morphology control of self-assembled amphiphilic surfactants”. *Journal of Polymer Science*, 61, pp. 1214–1240 (2023). DOI: [10.1002/pol.20220771](https://doi.org/10.1002/pol.20220771).
- [26] Mark N. McDonald, Qinyu Zhu, Walter F. Paxton, Cameron K. Peterson, and Douglas R. Tree. “Active control of equilibrium, near-equilibrium, and far-from-equilibrium colloidal systems”. *Soft Matter*, 19, pp. 1675–1694 (2023). DOI: [10.1039/D2SM01447E](https://doi.org/10.1039/D2SM01447E).
- [25] Mark N. McDonald, Cameron K. Peterson, and Douglas R. Tree. “Steering particles via micro-actuation of chemical gradients using model predictive control”. *Biomicrofluidics*, 17, 014107 (2023). DOI: [10.1063/5.0126690](https://doi.org/10.1063/5.0126690).
- [24] Rami Alhasan and Douglas R. Tree. “Gibbs–Duhem Relation for Phase-Field Models of Polymeric Mixtures”. *Macromolecules*, 55, pp. 759–765 (2022). DOI: [10.1021/acs.macromol.1c02021](https://doi.org/10.1021/acs.macromol.1c02021).
- [23] Mukul D. Tikekar, Kris T. Delaney, Michael C. Villet, Douglas R. Tree, and Glenn H. Fredrickson. “A phase field model for dynamic simulations of reactive blending of polymers”. *Soft Matter*, 18, pp. 877–893 (2022). DOI: [10.1039/D1SM01686E](https://doi.org/10.1039/D1SM01686E).
- [22] Pierre Kawak, Dakota S. Banks, and Douglas R. Tree. “Semiflexible oligomers crystallize via a cooperative phase transition”. *The Journal of Chemical Physics*, 155, p. 214902 (2021). DOI: [10.1063/5.0067788](https://doi.org/10.1063/5.0067788).
- [21] Qinyu Zhu, Timothy R. Scott, and Douglas R. Tree. “Using reactive dissipative particle dynamics to understand local shape manipulation of polymer vesicles”. *Soft Matter*, 17 Cover Article, pp. 24–39 (2021). DOI: [10.1039/D0SM01654C](https://doi.org/10.1039/D0SM01654C).
- [20] Jan Ulric Garcia, Tatsuhiko Iwama, Eva Y. Chan, Douglas R. Tree, Kris T. Delaney, and Glenn H. Fredrickson. “Mechanisms of Asymmetric Membrane Formation in Nonsolvent-Induced Phase Separation”. *ACS Macro Letters*, 9, pp. 1617–1624 (2020). DOI: [10.1021/acsmacrolett.0c00609](https://doi.org/10.1021/acsmacrolett.0c00609).
- [19] Douglas R. Tree, Lucas F. Dos Santos, Caden B. Wilson, Timothy R. Scott, Jan Ulric Garcia, and Glenn H. Fredrickson. “Mass-transfer driven spinodal decomposition in a ternary polymer solution”. *Soft Matter*, 15 Cover Article, pp. 4614–4628 (2019). DOI: [10.1039/c9sm00355j](https://doi.org/10.1039/c9sm00355j).

- [18] Douglas R. Tree, Tatsuhiko Iwama, Kris T. Delaney, Joshua Lee, and Glenn H. Fredrickson. "Marangoni Flows during Nonsolvent Induced Phase Separation". *ACS Macro Letters*, 7, pp. 582–586 (2018). doi: 10.1021/acsmacrolett.8b00012.
- [17] Douglas R. Tree, Kris T. Delaney, Hector D. Ceniceros, Tatsuhiko Iwama, and Glenn H. Fredrickson. "A multi-fluid model for microstructure formation in polymer membranes". *Soft Matter*, 13, pp. 3013–3030 (2017). doi: 10.1039/C6SM02839J.
- [16] Kevin D. Dorfman, Damini Gupta, Aashish Jain, Abhiram Muralidhar, and Douglas R. Tree. "Hydrodynamics of DNA confined in nanoslits and nanochannels". *Eur. Phys. J. Spec. Top.*, 223, pp. 3179–3200 (2014). doi: 10.1140/epjst/e2014-02326-4.
- [15] Abhiram Muralidhar, Douglas R. Tree, and Kevin D. Dorfman. "Backfolding of Wormlike Chains Confined in Nanochannels". *Macromolecules*, 47, pp. 8446–8458 (2014). doi: 10.1021/ma501687k.
- [14] Douglas R. Tree, Wesley F. Reinhart, and Kevin D. Dorfman. "The Odijk Regime in Slits". *Macromolecules*, 47, pp. 3672–3684 (2014). doi: 10.1021/ma500647v.
- [13] Abhiram Muralidhar, Douglas R. Tree, Yanwei Wang, and Kevin D. Dorfman. "Interplay between chain stiffness and excluded volume of semiflexible polymers confined in nanochannels". *J. Chem. Phys.*, 140, 084905 (2014). doi: 10.1063/1.4865965.
- [12] Douglas R. Tree, Yanwei Wang, and Kevin D. Dorfman. "Modeling the Relaxation Time of DNA Confined in a Nanochannel". *Biomicrofluidics*, 7, p. 054118 (2013). doi: 10.1063/1.4826156.
- [11] Douglas R. Tree, Abhiram Muralidhar, Patrick S. Doyle, and Kevin D. Dorfman. "Is DNA a Good Model Polymer?" *Macromolecules*, 46, pp. 8369–8382 (2013). doi: 10.1021/ma401507f.
- [10] Douglas R. Tree, Yanwei Wang, and Kevin D. Dorfman. "Extension of DNA in a Nanochannel as a Rod-to-Coil Transition". *Phys. Rev. Lett.*, 110, p. 208103 (2013). doi: 10.1103/PhysRevLett.110.208103.
- [9] Liang Dai, Douglas R. Tree, Johan R. C. van der Maarel, Kevin D. Dorfman, and Patrick S. Doyle. "Revisiting Blob Theory for DNA Diffusivity in Slitlike Confinement". *Phys. Rev. Lett.*, 110, p. 168105 (2013). doi: 10.1103/PhysRevLett.110.168105.
- [8] Kevin D. Dorfman, Scott B. King, Daniel W. Olson, Joel D. P. Thomas, and Douglas R. Tree. "Beyond Gel Electrophoresis: Microfluidic Separations, Fluorescence Burst Analysis, and DNA Stretching". *Chem. Rev.*, 113, pp. 2584–2667 (2013). doi: 10.1021/cr3002142.
- [7] Wesley F. Reinhart, Douglas R. Tree, and Kevin D. Dorfman. "Entropic depletion of DNA in triangular nanochannels". *Biomicrofluidics*, 7, p. 024102 (2013). doi: 10.1063/1.4794371.
- [6] Bradley E. Skidmore, Ryan A. Baker, Dila R. Banjade, Jason M. Bray, Douglas R. Tree, and Randy S. Lewis. "Syngas fermentation to biofuels: Effects of hydrogen partial pressure on hydrogenase efficiency". *Biomass and Bioenergy*, 55, pp. 156–162 (2013). doi: 10.1016/j.biombioe.2013.01.034.
- [5] Douglas R. Tree, Yanwei Wang, and Kevin D. Dorfman. "Mobility of a Semiflexible Chain Confined in a Nanochannel". *Phys. Rev. Lett.*, 108, p. 228105 (2012). doi: 10.1103/PhysRevLett.108.228105.
- [4] Yanwei Wang, Wesley F. Reinhart, Douglas R. Tree, and Kevin D. Dorfman. "Resolution limit for DNA barcodes in the Odijk regime". *Biomicrofluidics*, 6, pp. 014101–9 (2012). doi: 10.1063/1.3672691.

- [3] Yanwei Wang, Douglas R. Tree, and Kevin D. Dorfman. "Simulation of DNA Extension in Nanochannels". *Macromolecules*, 44, pp. 6594–6604 (2011). DOI: 10.1021/ma201277e.
- [2] Deshun Xu, Douglas R. Tree, and Randy S. Lewis. "The effects of syngas impurities on syngas fermentation to liquid fuels". *Biomass and Bioenergy*, 35, pp. 2690–2696 (2011). DOI: 10.1016/j.biombioe.2011.03.005.
- [1] Randy S. Lewis, Douglas R. Tree, Peng Hu, and Allyson Frankman. "Syngas Fermentation to Ethanol: Challenges and Opportunities". In: *Bioenergy and Biofuel from Biowastes and Biomass*. Chap. 11, pp. 225–246. American Society of Civil Engineers, 2010. DOI: 10.1061/9780784410899.ch11.

### Invited Presentations

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- [18] Douglas R. Tree. "Multiscale Assembly of Polymer Materials Away from Equilibrium". Brigham Young University, Condensed Matter Physics Seminar Series, Feb. 2025.
- [17] Douglas R. Tree. "Multiscale Assembly of Polymer Materials Away from Equilibrium". Rensselaer Polytechnic Institute, Howard P. Isermann Department of Chemical and Biological Engineering Seminar Series, Sept. 2024.
- [16] Douglas R. Tree. "Searching for a Molecular-Level Understanding of Polymer Crystal Nucleation". AIChE Annual Meeting (Orlando, FL), 191a, Nov. 2023.
- [15] Douglas R. Tree. "Multiscale Assembly of Polymer Materials Away from Equilibrium". Tulane University, Chemical and Biomolecular Engineering Seminar Series, Sept. 2023.
- [14] Douglas R. Tree. "Multiscale Assembly of Polymer Materials Away from Equilibrium". University of Notre Dame, Department of Chemical and Biomolecular Engineering Graduate Seminar Series, Nov. 2022.
- [13] Douglas R. Tree. "Multiscale Assembly of Polymer Materials Away from Equilibrium". University of Houston, Department of Chemical and Biomolecular Engineering Graduate Seminar Series, Sept. 2022.
- [12] Douglas R. Tree. "The Development of Polymer Microstructure: Where Thermodynamics and Kinetics Meet". Penn State University, Polymer Physics Seminar Series, Apr. 2022.
- [11] Douglas R. Tree. "The Development of Polymer Microstructure: Where Thermodynamics and Kinetics Meet". Oklahoma State University, Department of Chemical Engineering Seminar Series, Feb. 2022.
- [10] Douglas R. Tree. "Particle Transport in Multiphase Environments using Fully-Continuum Models". University of California Santa Barbara, Complex Fluids Design Consortium Annual Meeting, Jan. 2022.
- [9] Douglas R. Tree. "The Development of Polymer Microstructure: Where Thermodynamics and Kinetics Meet". University of South Florida, Department of Chemical and Biomedical Engineering Seminar Series, Feb. 2021.
- [8] Douglas R. Tree. "The Development of Polymer Microstructure: Where Thermodynamics and Kinetics Meet". AIChE Annual Meeting, Polymer Thermodynamics and Self-Assembly: Predicting Properties, 551a, Nov. 2020.
- [7] Douglas R. Tree. "The Transition from Student to Professor: a Simulation Scientist's Perspective". Southern California Simulations in Science Conference, Santa Barbara, CA, Feb. 2020.

- [6] Douglas R. Tree. "Phase Separation Processes with Droplets and Particles". University of California Santa Barbara, Complex Fluids Design Consortium Annual Meeting, Feb. 2020.
- [5] Douglas R. Tree. "Nonsolvent Induced Phase Separation in Films and Droplets". BYU Chemical Engineering, Department Seminar, Nov. 2019.
- [4] Douglas R. Tree. "Modeling Phase Separation Dynamics in Polymeric Fluids". University of California Santa Barbara, Complex Fluids Design Consortium Annual Meeting, Feb. 2019.
- [3] Douglas R. Tree. "Modeling Phase Separation Dynamics in Polymeric Fluids". University of California Santa Barbara, Complex Fluids Design Consortium Annual Meeting, Feb. 2018.
- [2] Douglas R. Tree. "Theory and Computation of Polymeric Liquids". BYU Mathematics Department, Applied Math Seminar, Oct. 2017.
- [1] Douglas R. Tree. "DNA Confined in Nanochannels". University of Minnesota, Department of Chemical Engineering and Materials Science, Advanced Doctoral Student Seminar Series, Oct. 2013.

### Funding Awarded

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Douglas R. Tree, REU Supplement to "CAREER: Evaluating Theories of Polymer Crystallization by Directly Calculating the Nucleation Barrier in a Polymer Melt", <i>National Science Foundation, Division of Materials Research, Condensed Matter and Materials Theory</i> , 1 yr. \$8 K.	6/2024 – 5/2025 <sup>§</sup>
Douglas R. Tree, "CAREER: Evaluating Theories of Polymer Crystallization by Directly Calculating the Nucleation Barrier in a Polymer Melt", <i>National Science Foundation, Division of Materials Research, Condensed Matter and Materials Theory</i> , 5 yr. \$508 K.	3/2024 – 2/2029
Devin Rappleye and Douglas R. Tree, "Partnership on Pyrochemical Research between Brigham Young University and Los Alamos National Laboratory", <i>TechSource, Inc., Los Alamos National Laboratory</i> , 3 yr. \$900 K.	1/2024 – 12/2026
Cammy K. Peterson and Douglas R. Tree, "Colloidal Self-Assembly using Diffusiophoresis", <i>BYU College of Engineering, Seed Funding Award</i> , 1 yr. \$12.5 K.	03/2023 – 03/2024
Douglas R. Tree, "Engineering Transport Processes to Create Hierarchical Hydrogels from Triblock Copolymer Solutions", <i>BYU College of Engineering, Mentored Research Grant</i> , 2 yr. \$25 K.	03/2021 – 03/2023
Douglas R. Tree, Walter F. Paxton, and Cammy K. Peterson, "Programming the Morphology of Systems of Synthetic Cells", <i>Brigham Young University, Interdisciplinary Research (IDR) Origination Award (13% acceptance rate)</i> , 2 yr. \$120 K.	05/2020 – 05/2022
Douglas R. Tree, "Creating Bijels by Direct Mixing", <i>BYU College of Engineering, Seed Funding Award</i> , 1 yr. \$12.5 K.	05/2020 – 05/2021
Douglas R. Tree, "Simulation of the Active Self-Assembly of Synthetic Cells", <i>BYU College of Engineering, Mentored Research Grant</i> , 2 yr. \$25 K.	03/2019 – 03/2021
Douglas R. Tree, "The role of nucleation in melt memory effects in semicrystalline polymers", <i>American Chemical Society, Petroleum Research Fund, Doctoral New Investigator Award</i> , 2 yr. \$110 K.	08/2018 – 08/2022

Douglas R. Tree, "Molecular Origami with Two-Dimensional Soft Materials", 01/2018 –  
 BYU College of Engineering, Seed Funding Award, 1 yr. \$12.5 K. 12/2018

## Student Mentoring

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### Primary Graduate Student Advisor (Active)

Aaron Bigelow, PhD (exp. 2028)	Topic: <i>Polymer Crystallization</i>	2024–present
Stephen Laishley, PhD (exp. 2028)	Topic: <i>Control of Active Particles</i>	2024–present
Ashley Wilson, MS (exp. 2026)	Topic: <i>Nonsolvent Induced Phase Separation</i>	2024–present
Dakota Banks, PhD (exp. 2025)	Topic: <i>Transport Models of Molten Salts and Fluid Particle Dynamics</i>	2021–present

### Primary Graduate Student Advisor (Alumni)

Rami Alhasan, PhD	Topic: <i>NIPS, Hydrogels, Bijels</i>	2018–2024
Mark McDonald, PhD Co-advised w/ C. Peterson in ECE	Topic: <i>Control of Non-equilibrium Assembly</i>	2020–2024
Qinyu Zhu, PhD	Topic: <i>Active Polymer Vesicles</i>	2018–2023
Pierre Kawak, PhD	Topic: <i>Polymer Crystallization</i>	2017–2022

## Courses Taught

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Ch En 593R – Grad. Statistical Thermodynamics	10 students, rating: 4.6*	Fall 2024
Ch En 191 – Global Impact of Chem Engrns	66 students, rating: 4.5	Fall 2024
Ch En 691R/791R – MS/PhD Graduate Seminar	42 students, rating: 4.8	Fall 2024
Ch En 263 – Undergrad Computational Tools	18 students, rating: 4.9	Winter 2024
Ch En 533 – Graduate Transport Phenomena	12 students, rating: 4.4	Winter 2024
Ch En 691R/791R – MS/PhD Graduate Seminar	41 students, rating: 4.7	Fall 2023
Ch En 593R – Theory of Electrochemistry	3 students, rating: 0.0 <sup>†</sup>	Fall 2023
Ch En 691R/791R – MS/PhD Graduate Seminar	40 students, rating: 4.5	Winter 2023
Ch En 263 – Undergrad Computational Tools	33 students, rating: 4.5	Winter 2023
Ch En 533 – Graduate Transport Phenomena	10 students, rating: 5.0	Fall 2022
Ch En 593R – Soft Materials Theory	2 students, rating: 5.0	Spring 2022
Ch En 691R/791R – MS/PhD Graduate Seminar	42 students, rating: 4.5	Winter 2022
Ch En 263 – Undergrad Computational Tools	29 students, rating: 4.7	Winter 2022
Ch En 533 – Graduate Transport Phenomena	10 students, rating: 4.4	Fall 2021
Ch En 691R/791R – MS/PhD Graduate Seminar	45 students, rating: 4.6	Winter 2021
Ch En 263 – Undergrad Computational Tools	45 students, rating: 4.6	Winter 2021
Ch En 533 – Graduate Transport Phenomena	9 students, rating: 4.6	Fall 2020
Ch En 263 – Undergrad Computational Tools	13 students, rating: 4.9	Spring 2020
Ch En 391 – Undergraduate Career Skills 2	10 students, rating: 4.0 <sup>‡</sup>	Winter 2020

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<sup>§</sup>Award Dates

Ch En 263 – Undergrad Computational Tools	36 students, rating: 4.6	Winter 2020
Ch En 374 – Undergraduate Fluid Mechanics	53 students, rating: 4.7	Fall 2019
Ch En 391 – Undergraduate Career Skills 2	12 students, rating: 4.6	Winter 2019
Ch En 263 – Undergrad Computational Tools	39 students, rating: 4.4	Winter 2019
Ch En 374 – Undergraduate Fluid Mechanics	90 students, rating: 4.5	Fall 2018
Ch En 263 – Undergrad Computational Tools	54 students, rating: 4.2	Winter 2018
Ch En 374 – Undergraduate Fluid Mechanics	99 students, rating: 4.0	Fall 2017

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\*Ratings are out of 5.

†No students completed ratings.

‡This block class completed just before dismissing for COVID-19 and only one student completed the ratings.