

Frank A. Leibfarth, Ph.D.

Assistant Professor
Department of Chemistry
University of North Carolina Chapel Hill

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Education

University of California, Santa Barbara 2008-2013
Ph.D., Chemistry and Biochemistry, Advisor: Professor Craig J. Hawker
University of South Dakota 2003-2008
B.A. Chemistry and Physics, *Summa Cum Laude*

Professional Experience

Assistant Professor 2016-present
Department of Chemistry, University of North Carolina Chapel Hill
Postdoctoral Fellow 2013-2016
Massachusetts Institute of Technology, Advisor: Professor Timothy F. Jamison

Honors and Awards

Air Force Office of Scientific Research Young Investigator Prize 2017
3M Non-tenured Faculty Award 2017
Emerging Leader Award, University of South Dakota Alumni Association 2017
TEDx Speaker at University of South Dakota TEDx event 2015
NSF Science, Engineering & Education for Sustainability (SEES) Fellowship 2013-2016
NIH Ruth L. Kirschstein NRSA Postdoctoral Fellowship (deferred) 2013
DSM Polymer Technology Award, American Chemical Society 2012
UCSB MRL Outstanding Service to Education Programs Award 2012
NSF Graduate Research Fellowship 2008-2013
DoD National Defense Science & Engineering Graduate Fellowship 2008-2013
Chancellors Fellowship, UC Santa Barbara 2008-2013
Undergraduate thesis with High Distinction, USD 2008
USA Today College Academic All-Star First Team (20 selected nationally) 2007
First team *ESPN The Magazine* Academic All-America Football Team (twice selected) 2006, 2007
Barry M. Goldwater Scholarship 2006
Eagle Scout 2003

Publications

- 28) Williamson, J. B.; Lewis, S.; Manning, I.; Johnson, R. R.; Sheyko, K.; **Leibfarth, F. A.** Polymer C–H Functionalization. *Submitted* (Invited Review).
- 27) **Leibfarth, F. A.**; Russell, M. G.; Langley, D. M.; Seo, H.; Kelly, L. P.; Carney, D. W.; Sello, J. K.; Jamison, T. F. Continuous-flow chemistry in Undergraduate Education: Sustainable Conversion of Reclaimed Vegetable Oil into Biodiesel. *J. Chem. Ed.*, **2018**, *95*, 1371-1375. [[doi](#)]
- 26) Williamson, J. B.; Czaplyski, W. L.; Alexanian, E. J.; **Leibfarth, F. A.** Regioselective C–H Xanthylation as a Platform for Polyolefin Functionalization. *Angew. Chem. Int. Ed.* **57**, 6261-6265. [[doi](#)]

- 25) Reis, M. H.; Davidson IV, C. L. G.; **Leibfarth, F. A.** Continuous-flow Chemistry for the Determination of Comonomer Reactivity Ratios. *Polym. Chem.* **2018**, *9*, 1728-1734. [[doi](#)]
- 24) Wicker, A. M.; **Leibfarth, F. A.**; Jamison, T. F. Flow-IEG Enables Programmable Thermodynamic Properties in Sequence-Defined Synthetic Polymers. *Polym. Chem.* **2017**, *8*, 5786-5794. [[doi](#)]
- 23) **Leibfarth, F. A.**; Johnson, J. A.; Jamison, T. F. Flow-IEG: Scalable Synthesis of Sequence and Architecturally Defined Unimolecular Macromolecules. *Proc. Natl. Acad. Sci. USA*, **2015**, *112*, 10617-10622. [[doi](#)]
- Highlighted by *Chemical & Engineering News* (vol. 93 (33): August 2015 p. 5) [[link](#)]
- 22) Barnes, J. C.; Ehrlich, D. J. C.; Gao, A. X.; **Leibfarth, F. A.**; Jiang, Y.; Zhou, E.; Jamison, T. F.; Johnson, J. A. Efficient Synthesis of Oligotriazoles with Absolute Control over Mass, Sequence, and Stereochemistry. *Nature Chem.* **2015**, *7*, 810-815. [[doi](#)]
- Highlighted by *Chemistry World Magazine* [[link](#)]
- 21) Helmy, S.; Oh, S.; **Leibfarth, F. A.**; Hawker, C. J.; Read de Alaniz, J.; Design and Synthesis of Donor-Acceptor Stenhouse Adducts: A Visible Light Photoswitch Derived from Furfural. *J. Org. Chem.* **2014**, *79*, 11316-11329. [[doi](#)]
- 20) Soh, S. S.; Lee, B. F.; **Leibfarth, F. A.**; Robb, M. R.; Lynd, N. A.; Eisenstein, M. E.; Hawker, C. J.; Soh, H. T. Synthetic aptamer-polymer hybrid constructs for programmed drug delivery into specific target cells. *J. Am. Chem. Soc.* **2014**, *136*, 15010-15015. [[doi](#)]
- 19) Helmy, S.; **Leibfarth, F. A.**; Oh, S.; Poelma, J. E.; Hawker, C. J.; Read de Alaniz, J.; Photoswitching using visible light: A new class of organic photochromic molecules. *J. Am. Chem. Soc.* **2014**, *136*, 8169-8172. [[doi](#)]
- 18) Groote, R.; Szyja, B. M.; **Leibfarth, F. A.**; Hawker, C. J.; Doltsinis, N. L.; Sijbesma, R. P. Strain induced strengthening of the weakest link: The importance of intermediate geometry for the outcome of mechanochemical reactions. *Macromolecules*, **2014**, *47*, 1187-1192. [[doi](#)]
- 17) **Leibfarth, F. A.**; Hawker, C. J. The Emerging Utility of Ketenes in Polymer Chemistry, *J. Polym. Sci. A: Polym. Chem.* **2013**, *51*, 3769-3782. [[doi](#)] (Highlight)
- Highlighted by *Materials views website* [[link](#)]
- 16) **Leibfarth, F. A.**; Mattson, K. M.; Fors, B. P.; Collins, H. A.; Hawker, C. J. External Regulation of Controlled Polymerizations, *Angew. Chem. Int. Ed.*, **2013**, *52*, 199-210. [[doi](#)] (Minireview)
- 15) Jung, H.; **Leibfarth, F. A.**; Woo, S.; Lee, S.; Kang, M.; Moon, B.; Hawker, C. J.; Bang, J. Efficient Surface Neutralization and Enhanced Surface Adhesion through Ketene-Mediated Crosslinking and Functionalization. *Adv. Funct. Mat.*, **2012**, *23*, 1597-1602. [[doi](#)]
- 14) Burke, D. J.; Kawauchi, T.; Kade, M. J.; **Leibfarth, F. A.**; McDearmon, B.; Wolffs, M.; Kierstead, P. H.; Moon, B.; Hawker, C. J. Ketene-based Route to Rigid Cyclobutanediol Monomers for the Replacement of BPA in High Performance Polyesters. *ACS Macro Letters*, **2012**, *1*, 1228-1232. [[doi](#)]
- 13) **Leibfarth, F. A.**; Moreno, N.; Hawker, A.; Shand, J. D. Transforming Polylactide into Value Added Materials. *J. Polym. Sci. A: Polym. Chem.* **2012**, *50*, 4814-4822. [[doi](#)]
- Highlighted in *UCSB Convergence Magazine* [[link](#)]
 - Highlighted as journal cover image [[link](#)]
- 12) Lee, B.; Wolffs, M.; Delaney, K.; Sprafke, J.; **Leibfarth, F. A.**; Hawker, C. J.; Lynd, N. A. Reactivity Ratios and Mechanistic Insight for Anionic Ring-Opening Polymerization of Epoxides. *Macromolecules*, **2012**, *45*, 3722-3731. [[doi](#)]

- 11) **Leibfarth, F. A.**; Wolffs, M.; Campos, L. M.; Delany, K.; Treat, N.; Kade, M. J.; Moon, B.; Hawker, C. J. Low Temperature Ketene Formation in Materials Chemistry through Molecular Engineering. *Chem. Sci.* **2012**, *3*, 766-771. [[doi](#)]
- 10) Spruell, J. M.; Wolffs, M.; **Leibfarth, F. A.**; Stahl, B. C.; Heo, J.; Connal, L. A.; Hu, J.; Hawker, C. J. Reactive, Multifunctional Polymer Films through Thermal Cross-linking of Orthogonal Click Groups. *J. Am. Chem. Soc.* **2011**, *133*, 16698-16706. [[doi](#)]
- 9) **Leibfarth, F. A.**; Hawker, C. J. Mechanically Throwing a Reaction into Reverse. *Science* **2011**, *333*, 1582-1583. [[doi](#)] (Invited perspective on a manuscript in the same journal).
- 8) **Leibfarth, F. A.**; Vermaak, N. Hope for Graduate Student Childbirth Policies. *Science* **2011**, *333*, 1380. [[doi](#)]
- 7) Miyamura, Y.; Park, C.; Kinbara, K.; **Leibfarth, F. A.**; Hawker, C. J.; Aida, T. Controlling Volume Shrinkage in Soft Lithography through Heat-Induced Cross-Linking of Patterned Nanofibers. *J. Am. Chem. Soc.* **2011**, *133*, 2840-2843. [[doi](#)]
- 6) **Leibfarth, F. A.**; Schneider, Y.; Lynd, N. A.; Schultz, A.; Moon, B.; Kramer, E. J.; Bazan, G. C.; Hawker, C. J. Ketene Functionalized Polyethylene: Control of Cross-Link Density and Material Properties. *J. Am. Chem. Soc.* **2010**, *132*, 14706-14709. [[doi](#)]
- 5) **Leibfarth, F. A.**; Kang, M.; Ham, M.; Kim, J.; Campos, L. M.; Gupta, N.; Moon, B.; Hawker, C. J. A Facile Route to Ketene Functionalized Polymers for Broad Materials Applications. *Nature Chem.* **2010**, *2*, 207-212. [[doi](#)]
 - Highlighted in the "News and Views" section of *Nature Chemistry*, "Facilitating Functionality" (*Nature Chemistry* **2010**, *2*, 164-165).
 - Highlighted in *Chemistry World* magazine, "Ketene comes in from the cold" (vol. 7, March 2010).
 - Highlighted in *C&E News*, "Versatile Ketene Polymers" (vol. 88 (6), February 2010, p. 49).
- 4) Nederberg, F.; Lohmeijer, B. G. G.; **Leibfarth, F.**; Pratt, R. C.; Choi, J.; Waymouth, R. M.; Hedrick, J. L. Organocatalytic Ring Opening Polymerization of Trimethylene Carbonate. *Biomacromolecules* **2007**, *8*, 153-160. [[doi](#)]
- 3) Lohmeijer, B. G. G.; Pratt, R. C.; **Leibfarth, F.**; Logan, J. W.; Long, D. A.; Dove, A. P.; Nederberg, F.; Choi, J.; Waymouth, R. M.; Hedrick, J. L. Guanidine and Amidine Organocatalysts for Ring-Opening Polymerization of Cyclic Esters, *Macromolecules* **2006**, *39*, 8574-8583. [[doi](#)]
- 2) Lohmeijer, B. G. G.; Dubois, G.; **Leibfarth, F.**; Pratt, R. C.; Nederberg, F.; Nelson, A.; Waymouth, R. M.; Wade, C.; Hedrick, J. L. Organocatalytic Living Ring-Opening Polymerization of Cyclic Carbosiloxanes. *Org. Lett.* **2006**, *8*, 4683-4686. [[doi](#)]
- 1) Guo, X; Myers, M; Xiao, S.; Lefenfeld, M.; Steiner, R.; Tulevski, G. S.; Tang, J.; Baumert, J.; **Leibfarth, F.**; Yardley, J. T.; Steigerwald, M. L.; Kim, P.; Nuckolls, C.; Chemoresponsive Monolayer Transistors. *Proc. Natl. Acad. Sci.* **2006**, *103*, 11452-11456. [[doi](#)]

Invited Presentations

Leibfarth, F. A.. C-H Fluorination of Aromatic Polymers using Electrophilic Radicals. **ACS Fluoropolymers Workshop**, Denver, CO, June 2018.

Leibfarth, F. A. Stereocontrolled cationic polymerization of vinyl ethers through asymmetric ion-pairing catalysis. **4th Functional Materials Conference**, Nassau, Bahamas, June 2018.

Leibfarth, F. A. C–H Functionalization of Commodity Polymers. **Eastman Chemical Company**, Kingsport, TN, April 2018.

Leibfarth, F. A. Partially fluorinated polymers for spatiotemporal mapping of tissue oxygenation **255th ACS National Meeting**, New Orleans, LA, March 2018.

Leibfarth, F. A. C–H Functionalization of Commodity Polymers. **Creighton University**, Omaha, NE, March 2018.

Leibfarth, F. A. C–H Functionalization of Commodity Polymers. **Reed College**, Portland, OR, February 2018.

Leibfarth, F. A. Late-Stage Diversification of Commodity Polymers. **Exxon Mobil Chemical Company**, Baytown, TX, October 2017.

Leibfarth, F. A. Late-Stage Diversification of Commodity Polymers. **Virginia Commonwealth University**, Chemical & Life Sciences Engineering, Richmond, VA, October 2017.

Leibfarth, F. A. Late-Stage Diversification of Commodity Polymers. **Milliken Chemical Company**, Spartanburg, SC, September 2017.

Leibfarth, F. A. Late-Stage Diversification of Commodity Polymers: Perfluoroalkylation of Aromatic materials **254th ACS National Meeting**, Washington, D. C., August 2017. (Hermann Mark Session)

Leibfarth, F. A.; Johnson, J. A.; Jamison, T. F. Flow-IEG: A scalable route to sequence and architecturally defined, monodisperse macromolecules. **252th ACS National Meeting**, Philadelphia, PA, August 2016. (Sequence-defined Polymers Session)

Leibfarth, F. A.; Johnson, J. A.; Jamison, T. F. Flow-IEG: A scalable route to sequence and architecturally defined, monodisperse macromolecules. **Gordon Research Seminar & Conference**, Mount Holyoke, MA, June 2015, Oral Presentation.

Leibfarth, F. A.; Johnson, J. A.; Jamison, T. F. Flow-IEG: A scalable route to sequence and architecturally defined, monodisperse macromolecules. **Kyoto University Workshop–Micro/Flow Chemistry & Engineering**, Kyoto, Japan, February 2015. Oral Presentation

Leibfarth, F. A.; Hawker, C. J. Chemistry and applications of ketene functionalized polymers. **245th ACS National Meeting**, New Orleans, LA, April 2012. (Excellence in Graduate Polymer Research)

Leibfarth, F. A.; Hawker, C. J. Chemistry and applications of ketene functionalized polymers. **244th ACS National Meeting**, Philadelphia, PA, August 2012. (DSM Polymer Technology award address)

Leibfarth, F. A.; Hawker, C. J. Chemistry and applications of ketene functionalized polymers. **The University of South Dakota**, Vermillion, SD, April 2012.

Leibfarth, F. A.; Moon, B.; Hawker, C. J. Ketenes in materials science: Methodology for general materials applications. **Gordon Research Seminar**, Mount Holyoke, MA, June 2011, Oral Presentation,
• *"Frontiers of graduate polymer science"* keynote address

Course & Seminar Teaching

Spring 2018 UNC CHEM 520L: Polymer Lab

Fall 2017 UNC CHEM 421: Polymer Synthesis

Fall 2016 UNC CHEM 421: Polymer Synthesis

Fall 2014 MIT CHEM 5.47: Organic Tutorial (co-taught with Prof. Rick L. Danheiser)

April 2011 Nationally Competitive Scholarships and Fellowships, UCSB Professional Development

Nov. 2011 Communicating Science through Digital Media, UCSB Professional Development

Service Activities

- 2005–Present** **Member;** American Chemical Society
- 2009–Present** **Referee;** including *Nature Chem.*, *J. Am. Chem. Soc.*, *Angew. Chem. Int. Ed.*, *Macromolecules*, *ACS Macro Letters*, *Polymer Chemistry*, *Prog. Polym. Sci.*, *J. Polym. Sci. A: Polym. Chem.*, *Materials Chem.*, *Nature Chem.*, *Nature Comm.*, & *Chem. Rev.*
- 2014–Present** **Reviewer;** NSF SEES Fellows review panel (2014), NSF GRFP panel (2015), DoD NDSEG review panel (2014-2015), NSF CHEM panel (2018)
- 2016–Present** **Diversity Committee,** UNC Chemistry Department
- 2016–Present** **Faculty Advisor,** UNC Allies for Minorities & Women in Science & Engineering
- 2017** **Hiring Committee,** UNC Chemistry Department Lecturer position

UNC Wonder Connection: The Leibfarth group engages hospitalized children in the thrill of scientific discovery through personal interactions, real-time, technology-based tutorials and research updates, and large group workshops. We have significantly expanded the scope of the UNC Wonder Connection project by spearheading programming in chemistry- and polymer-specific education and engagement with the explicit goal of empowering patients through scientific creativity, increasing their science knowledge, and acting as an inspiration for their futures.

Course-based Undergraduate Research Experience: The PI has restructured the Polymer Synthesis Laboratory course (CHEM 520L) to engage the participants in a hypothesis-driven problem solving through a structured course-based undergraduate research experience (CURE). The CURE enables the students to conduct cutting-edge research within the infrastructure of a laboratory course.

Allies for Minorities and Women in Science and Engineering (AM_WISE): I serve as the Faculty Advisor for the graduate student organization AM_WISE at UNC Chapel Hill. This group advocates for diversity and inclusivity within the graduate student STEM population at UNC. During the 2017-2018 school year, we constructed a Departmental Climate Survey to gain a better understanding of the state of graduate student relationships with their peers, their thesis advisors, and the rest of the departmental community. The survey had greater than a 65% response rate and we are currently reviewing the data and making action plans to better the climate for all students.

Laboratory Course: Introducing Continuous Flow Chemistry into Undergraduate education: Developed, wrote, and instituted a new undergraduate laboratory module entitled “Continuous Flow Chemistry: Sustainable Conversion of Reclaimed Vegetable Oil into Biodiesel.” The laboratory module, part of the Undergraduate Research Inspired Experimental Chemistry Alternatives (URIECA) program within MIT’s chemistry department, is a four-week course that was first implemented in the Spring of 2015. Thirty undergraduates have currently completed the laboratory module and the effort was recently published as a Laboratory Experiment in the *Journal of Chemical Education* ([dx.doi.org/10.1021/acs.jchemed.7b00719](https://doi.org/10.1021/acs.jchemed.7b00719)).

Childbirth Accommodation Policy Committee: Founder and leader of the Graduate Student Association committee tasked with enhancing the current maternity policy for UCSB graduate students. Enhanced policy, which includes a guaranteed four weeks paid leave and one year extension of academic requirements after childbirth, in under one year. [\[link\]](#)