

Kyle E. Broaders

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EDUCATION

- University of California, Berkeley, Ph.D.** 2006-2011
Discipline: Chemistry
Thesis: "Synthesis and evaluation of environmentally responsive polymeric materials"
- Swarthmore College, B.A. with High Honors** 2002-2006
Major : Chemistry Minor : English Literature
Thesis: "Synthesis of novel non-biaryl atropisomeric vinyl phosphines"

RESEARCH EXPERIENCE

- Mount Holyoke College, Department of Chemistry** 2014-present
Principal Investigator
Lead research group on the use of organic and materials chemistry techniques to prepare and characterize biomaterials for applications at the cell-material interface.
- University of California, San Francisco, Department of Pharmaceutical Chemistry** 2011-2014
Advisor: *Professor Zev J. Gartner*
Applied techniques from materials chemistry to the development of improved model tissues for how topographical factors like cell shape and tissue curvature affect multicellular behaviors of mammalian cells
- University of California, Berkeley, Department of Chemistry** 2006-2011
Advisor: *Professor Jean M. J. Fréchet*
Collaboratively led and participated with a multidisciplinary team of chemists, engineers, and biologists in the development of materials for use in safe and effective cancer immunotherapy
- Invented and patented a class of modified polymers that uniquely combine biocompatibility; ease of synthesis; and chemical and biological fine-tuning
 - Demonstrated the effect of material degradation rate on antigen presentation and studied the effect of material composition on the pathway of presentation
 - Investigated microparticle degradation based on biologically relevant reductive and oxidative conditions
 - Developed a new class of acid-degradable nylon for the wall material of liquid-filled impermeable microcapsules
- Swarthmore College, Department of Chemistry** 2005-2006
Advisor: *Professor Robert S. Paley*
Independently synthesized the first known non-biaryl, atropisomeric vinyl phosphine and proved its chirality. Investigated the mechanism of the palladium-catalyzed hydrophosphination in this synthesis.

TEACHING EXPERIENCE

- Assistant Professor, Mount Holyoke College** 2014-present
- Chem 160: Integrated Introduction to Chemistry and Biology (taught in coordination with Bio 160)
 - Chem 199: Introduction to research
 - Chem 291: Scientific Illustration and Data Visualization
 - Chem 302: Organic Chemistry II
 - Chem 316: Chemical Biology
 - Chem 336: Organic Synthesis
 - Chem 399: Senior capstone course
- Coinstructor, University of California, San Francisco** 2013
- Proposal writing course for first year graduate students aimed at predoctoral fellowships
- Graduate Student Instructor (GSI), University of California, Berkeley** 2006-2009
- Organic chemistry laboratory
 - Organic chemistry lecture – head GSI
 - Graduate-level chemical biology

RESEARCH MENTORSHIP

Undergraduate Research Mentor, Mount Holyoke College

2015-present

Asterisk indicates thesis student

Name	Year	Research period	Name	Year	Research period
Jackie Long	2016	Spring 15 – Spring 16	Emily Graham*	2019	Fall 16 – Spring 19
Kristyn Norris	2016	Fall 15 – Spring 16	Yeonsoo Kum	2019	Spring 17 – Summer 18
Annabelle Ooi	2017	Spring 16 – Spring 17	Catherine Peabody	2020	Spring 18 – Present
Aiza Malik	2018	Spring 16 – Spring 18	Xueyi Yang	2020	Spring 18 – Present
Kate Maziarz	2018	Spring 17 – Fall 18	Abby Kaplan	2021	Spring 19 – Present
M. Areeb S. Khichi	2018	Fall 15 – Spring 16	Ariel Kimberley	2021	Spring 19 – Present
Victoria Yan	2018	Fall 17 – Spring 18	Maegan Windus	2021	Spring 19 – Present
Amanda Manaster*	2019	Spring 17 – Spring 19	Qiuyu Zheng	2021	Summer 19 – Present
Beth Yigzaw	2019	Spring 17 – Spring 18	Rainy Wortelboer	Highschool	Summer 19

Summer Research Training Program Mentor, University of California, San Francisco

2013

- Nathan Nguyen – mentored for one summer on tissue culture and advanced microscopy

Undergraduate Research Mentor, University of California, Berkeley

2008-2011

- Sirisha Grandhe – mentored for three years resulting in 2 publications.
- Ayano Kohlgruber – mentored for one year, resulting in 1 publication.

HONORS & AWARDS

- NSF Major Research Instrumentation: acquisition of Confocal microscope (co-PI) 2018
- NSF RUI award: Boronic Ester Modified Polysaccharides for Oxidation-Responsive Delivery Applications 2018
- Mount Holyoke College Fund the Future Research Endowment 2015
- NIH Ruth L. Kirschstein NRSA Postdoctoral Fellowship 2012

PUBLICATIONS

Asterisk indicates undergraduate co-author. Links and metrics available at <https://tinyurl.com/BroadersScholar>

16. “Oxidation-sensitive dextran-based polymer with improved processability through stable boronic ester groups” A.J. Manaster, C. Batty, P.Tiet, A. Ooi, E.M. Bachelder, K.M. Ainslie, **K.E. Broaders**. *ACS Appl. Bio Mater.*, 2019, Article ASAP. DOI:10.1021/acsabm.9b00399
15. “Spirocyclic acetal-modified dextran as a flexible pH-sensitive solubility switching material” E.T. Graham*, **K.E. Broaders**. *Biomacromolecules*, 2019, 20, 2008-2014. DOI:10.1021/acs.biomac.9b00215
14. “Coupling between apical tension and basal adhesion allow epithelia to collectively sense and respond to substrate topography over long distances” **K.E. Broaders**, A.E. Cerchiari, Z.J. Gartner. *Integr. Biol.* 2015, 7, 1611–1621. DOI:10.1039/C5IB00240K
13. "A strategy for tissue self-organization that is robust to cellular heterogeneity and plasticity." A. Cerchiari, J.C. Garbe, M.E. Todhunter, N.Y. Jee, **K.E. Broaders**, D. Peehl, M.A. LaBarge, T. Desai, M. Thomson, Z.J. Gartner. *Proc. Natl. Acad. Sci.*, 2015, 112, 7, 2287–2292. DOI:10.1073/pnas.1410776112
12. “Exclusive formation of monovalent quantum dot imaging probes by steric exclusion.” J. Farlow, D. Seo, **K.E. Broaders**, M. Taylor, R.D. Vale, Y.W. Jun, Z.J. Gartner. *Nat. Methods*, 2013, 10, 1203–1205. DOI:10.1038/nmeth.2682
11. “Chemically programmed cell adhesion with membrane-anchored oligonucleotides.” N.S. Selden, M.E. Todhunter, N.Y. Jee, J.S. Liu, **K.E. Broaders**, Z.J. Gartner. *J. Am. Chem. Soc.*, 2012, 134, 765–768. DOI:10.1021/ja2080949
10. “Mannosylated Dextran Nanoparticles: a pH-Sensitive System Engineered for Immunomodulation through Mannose Targeting.” L. Cui, J.A. Cohen, **K.E. Broaders**, T.T. Beaudette, J.M.J. Fréchet. *Bioconjugate Chem.*, 2011, 22, 949–957. DOI:10.1021/bc100596w
9. “A Biocompatible Oxidation-Triggered Carrier Polymer with Potential in Therapeutics.” **K.E. Broaders**, S. Grandhe*, and J.M.J. Fréchet. *J. Am. Chem. Soc.*, 2011, 133, 756–758. DOI:10.1021/ja110468v
8. “Acid-Degradable Solid-Walled Microcapsules as Environmentally Responsive Burst-release Carriers.” **K.E. Broaders**, S.J. Pastine, S. Grandhe*, J.M.J. Fréchet. *Chem. Commun.*, 2011, 47, 665–667. DOI:10.1039/C0CC04190D
7. “In Vitro Analysis of Acetalated Dextran Microparticles as a Potent Delivery Platform for Vaccine Adjuvants.” E.M. Bachelder, T.T. Beaudette, **K.E. Broaders**, J.M.J. Fréchet, M.T. Albrecht, A.J. Mateczun, K.M. Ainslie, J.T. Pesce, A.M. Keane-Myers. *Mol. Pharmaceutics*, 2010, 7, 826–835. DOI:10.1021/mp900311x
6. “Acetal-Modified Dextran Microparticles with Controlled Degradation Kinetics and Surface Functionality for Gene Delivery in Phagocytic and Non-Phagocytic Cells.” J.A. Cohen, T.T. Beaudette, J.L. Cohen, **K.E. Broaders**, E.M. Bachelder, J.M.J. Fréchet. *Adv. Mater.*, 2010, 22, 3593–3597. DOI:10.1002/adma.201000307

5. “Chemoselective Ligation in the Functionalization of Polysaccharide-Based Particles.” T.T. Beaudette, J.A. Cohen, E.M. Bachelder, **K.E. Broaders**, J.L. Cohen, E.G. Engleman, and J.M.J. Fréchet. *J. Am. Chem. Soc.*, 2009, 131, 10360–10361. DOI:10.1021/ja903984s
4. “In Vivo Studies on the Effect of Co-Encapsulation of CpG DNA and Antigen in Acid-Degradable Microparticle Vaccines.” T.T. Beaudette, E.M. Bachelder, J.A. Cohen, A.C. Obermeyer, **K.E. Broaders**, J.M.J. Fréchet, E.-S. Kang, I. Mende, W.W. Tseng, M.G. Davidson, and E.G. Engleman. *Mol. Pharmaceutics*, 2009, 6, 1160–1169. DOI:10.1021/mp900038e
3. “Acetalated dextran is a chemically and biologically tunable material for particulate immunotherapy.” **K.E. Broaders**, J.A. Cohen, T.T. Beaudette, E.M. Bachelder, and J.M.J. Fréchet. *Proc. Natl. Acad. Sci.*, 2009, 106, 5497–5502. DOI:10.1073/pnas.0901592106
2. “Acid-Degradable Polyurethane Particles for Protein-Based Vaccines: Biological Evaluation and in Vitro Analysis of Particle Degradation Products.” E.M. Bachelder, T.T. Beaudette, **K.E. Broaders**, S.E. Paramonov, J. Dashe, and J.M.J. Fréchet. *Mol. Pharmaceutics*, 2008, 5, 876–884. DOI:10.1021/mp800068x
1. “Acetal-Derivatized Dextran: An Acid-Responsive Biodegradable Material for Therapeutic Applications.” E.M. Bachelder, T.T. Beaudette, **K.E. Broaders**, and J.M.J. Fréchet. *J. Am. Chem. Soc.*, 2008, 130, 10494–10495. DOI:10.1021/ja803947s

PATENTS

1. “Acid-degradable and bioerodible modified polyhydroxylated materials.” E.M. Bachelder, T.T. Beaudette, **K.E. Broaders**, and J.M.J. Fréchet. US Patent 9,644,039 issued May 9, 2017.

PRESENTATIONS

1. A.J. Manaster, A. Ooi, E.T. Graham, X. Yang, **K.E. Broaders** “Processable Boronate-Modified Polysaccharides Through High-Stability Boronic Esters” 256th National Meeting of the American Chemical Society, Boston. August 23, 2018
2. A.J. Manaster, E. Graham, A. Ooi, **K.E. Broaders** “Bioresponsive polysaccharide modification for solubility switching materials” Gordon Research Conference – Drug Carriers in Medicine and Biology. August 13, 2018 (poster)
3. Invited talk: “Modified Polysaccharides as Bioresponsive Materials for Drug Delivery” Smith College, Department of Chemistry. April 5, 2018.
4. Invited talk: “Exploration of New and Improved Bioresponsive Materials for Drug Delivery” Wellesley College, Department of Chemistry. October 2, 2017.
5. A.J. Manaster, E. Graham, A. Ooi, **K.E. Broaders** “Bioresponsive polysaccharide modification for solubility switching materials” Gordon Research Conference – Polymers. June 13, 2017 (poster)
6. A.A. Malik, A. Ooi, **K.E. Broaders**. “Exploration of New Degradation Triggers for Bioresponsive Carrier Degradation.” Gordon Research Conference – Drug Carriers in Medicine and Biology. August 7, 2016 (poster)
7. A. Ooi, A.A. Malik, M. Areeb S. Khichi, J. Long, K. Norris, **K.E. Broaders**. “Chemical manipulation of substrate and microparticle surfaces to control adhesion and sorting.” Gordon Research Conference – Biointerfaces. June 14, 2016 (poster)
8. **K.E. Broaders**, Z.J. Gartner. “Structured Substrates for the Investigation of Shape-Mediated Behavior.” 2012 National Meeting of the American Society for Cell Biology; San Francisco. December 18, 2012. (poster)
9. **K.E. Broaders**, J.A. Cohen, T.T. Beaudette, E.M. Bachelder, and J.M.J. Fréchet. “Acid-Sensitive Modified Polysaccharides for Use in Cancer Immunotherapy.” 239th National Meeting of the American Chemical Society; San Francisco. March 21, 2010.
10. **K.E. Broaders**, J.A. Cohen, T.T. Beaudette, E.M. Bachelder, and J.M.J. Fréchet. “Acetalated Dextran. A Safe Effective Material for Microparticulate Immunotherapy.” Gordon Research Conference – Drug Carriers in Medicine and Biology. August 17, 2010 (poster)

PROFESSIONAL AFFILIATIONS

American Chemical Society

DEPARTMENTAL/COLLEGE SERVICE

Faculty Grants Committee – elected, 3 year term	2019 – Present
Biochemistry program committee	2015 – Present
Pre-health committee	2016 – Present
Microscopy committee	2019 – Present
Tenure track search for analytical chemistry – recruiting and participation	2017
Goldwater selection committee	2015 – 2016
Faculty Learning Circle and Talking About Teaching Lunch – Introverts in the Classroom	2015 – 2016
Quantitative Reasoning faculty seminar	2016
New England Summer Institutes on Scientific Teaching	2015
Tenure track search for biochemistry – recruiting and participation	2014