Kyle E. Broaders Department of Chemistry

Mount Holyoke College
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South Hadley, MA 01075

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EDUCATION

University of California, Berkeley, Ph.D. ..... *2006 – 2011*
Discipline: Chemistry
Thesis: "Synthesis and evaluation of environemntally 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 TRAINING

University of California, San Francisco, Department of Pharmaceutical Chemistry..... *2011 – 2014*
Postdoctoral studies 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*
Graduate studies 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

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*

Term	Course	Course Title	Enrollment	Level
Fall 2014	CHEM 160	Integrated Introduction to Chemistry and Biology	40	Introductory
Spring 2015	CHEM 302	Organic Chemistry II	27	Intermediate
Fall 2015	CHEM 160	Integrated Introduction to Chemistry and Biology	36	Introductory
Fall 2015	BIOCH 399	Senior capstone	16	Upper
Fall 2015	CHEM 202L	Organic Chemistry I lab	14	Lab
Spring 2016	CHEM 302	Organic Chemistry II	28	Intermediate
Spring 2016	CHEM 302	Organic Chemistry II	25	Intermediate
Fall 2016	CHEM 160	Integrated Introduction to Chemistry and Biology	40	Introductory
Fall 2016	CHEM 316	Chemical Biology	10	Upper
Spring 2017	CHEM 302	Organic Chemistry II	23	Intermediate
Spring 2017	CHEM 302L	Organic Chemistry II lab	10	Lab
Spring 2017	CHEM 302L	Organic Chemistry II lab	10	Lab
Fall 2018	CHEM 160	Integrated Introduction to Chemistry and Biology	38	Introductory
Fall 2018	CHEM 316	Chemical Biology	8	Upper
Spring 2019	CHEM 199	Introduction to Research	9	Introductory
Spring 2019	CHEM 291	Scientific Illustration and Data Visualization	10	Upper
Spring 2019	CHEM 302L	Organic Chemistry II lab	14	Lab
Fall 2019	CHEM 160	Integrated Introduction to Chemistry and Biology	37	Introductory
Fall 2019	CHEM 336	Organic Synthesis	10	Upper
Spring 2020	CHEM 202	Organic Chemistry I	40	Intermediate
Spring 2020	CHEM 202L	Organic Chemistry I lab	8	Lab

Co-Instructor, University of California, San Francisco *2013*

Proposal writing course for ~20 first-year graduate students aimed at predoctoral fellowships

Graduate Student Instructor (GSI), University of California, Berkeley ..... *2006 – 2009*

- Chem 3AL: Instructor for 19 student organic chemistry laboratory
- Chem 3A: Head GSI for Organic Chemistry I lecture
- Chem 135: Graduate-level chemical biology

RESEARCH MENTORSHIP

Undergraduate Research Mentor, Mount Holyoke College ..... *2015 – present*

Name	Year	Research period	Next step after leaving group
Jackie Long	2016	Spring 15 – Spring 16	Medical school at Temple
Kristyn Norris	2016	Fall 15 – Spring 16	Graduate school at UMass Worcester
Annabelle Ooi	2017	Spring 16 – Spring 17	Research Technician at Massachusetts General Hospital
M. Areeb S. Khichi	2018	Spring 15 – Spring 16	Undergraduate research in another group
Aiza Malik	2018	Spring 16 – Spring 18	Research Technician at Memorial Sloan Kettering Cancer Center
Victoria Yan	2018	Fall 17 – Spring 18	Graduate school at MD Anderson Cancer Center
Kate Maziarz	2018	Spring 17 – Fall 18	Graduate school at Texas A&M University
Beth Yigzaw	2019	Spring 17 – Spring 18	Transfer to Smith College
Yeonsoo Kum	2019	Spring 17 – Summer 18	Research Technician at Weill Cornell Medical School
Emily Graham*†	2019	Fall 16 – Spring 19	Broad Institute Post-Baccalaureate Program
Amanda Manaster*†	2019	Spring 17 – Spring 19	Veterinary School at UC Davis
Catherine Peabody	2020	Spring 18 – Spring 20	
Xueyi Yang*	2020	Spring 18 – Spring 20	Graduate School at The Scripps Research Institute
Ariel Kimberley	2021	Spring 19 – Fall 19	Undergraduate research in another group
Abby Kaplan*	2021	Spring 19 – Present	
Maegan Windus*	2021	Spring 19 – Present	
Qiuyu Zheng	2021	Summer 19 – Present	
Rainy Wortelboer	Highschool	Summer 19	Brown University combined BA/MD program
Elizabeth Kuehne	2022	Spring 20 – Present	

* indicates thesis student, † indicates first author publication. Map of hometowns available at `https://tinyurl.com/BroadersLabMap`

Theses: Amanda Manaster 2019 Earned High Honor in Biochemistry
Emily Graham 2019 Earned Summa Cum Laude, Ruth Estelle Mills Zencey '36 Award, Phi Beta Kappa thesis award
Xueyi Yang 2020 Earned High Honor in Biochemistry

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.

FUNDING

NSF Major Research Instrumentation grant *2018*

Acquisition of integrated laser scanning/spinning disk confocal microscopy system to advance multidisciplinary research and training at Mount Holyoke College
Role: Co-PI Timeframe: 3 years Award # NSF DBI 1827945

NSF Research in Undergraduate Institutions grant *2018*

Boronic Ester Modified Polysaccharides for Oxidation-Responsive Delivery Applications
Role: PI Timeframe: 3 years Award # NSF DMR 1808073

Mount Holyoke College Fund the Future Research Award *2015*
Quantitative and synthetic tools to understand multicellularity
Role: PI Timeframe: 3 years

NIH Ruth L. Kirschstein NRSA Postdoctoral Fellowship *2012*
The Effects of Tissue Microstructure on the Development of Ductal Cancer
Role: PI Timeframe: 2 years Award # NIH NCI F32 CA165620

PUBLICATIONS

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

1. "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, 2, 3755-3762. DOI:10.1021/acsabm.9b00399
2. "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
3. "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
4. "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
5. "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
6. "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/bc1005962
7. "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
9. "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
10. "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
11. "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
12. "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
13. "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
14. "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
15. "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. Invited talk: "Next-Generation Responsive Biomaterials for Drug Delivery" Colgate College, Department of Chemistry. September 17, 2019.
2. E.T. Graham, **K.E. Broaders** "A New Material for Solubility-Switching in Modified Polysaccharides" Gordon Research Conference – Polymers. June 10, 2019 (poster)
3. 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.
4. 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)
5. Invited talk: "Modified Polysaccharides as Bioresponsive Materials for Drug Delivery" Smith College, Department of Chemistry. April 5, 2018.
6. Invited talk: "Exploration of New and Improved Bioresponsive Materials for Drug Delivery" Wellesley College, Department of Chemistry. October 2, 2017.
7. 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)
8. 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)
9. 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)
10. **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)
11. **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.
12. **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 AND SERVICE

American Chemical Society, Member *2007 – Present*

Peer review for:

- ACS Applied Bio Materials
- ACS Sustainable Chemistry & Engineering
- Biomacromolecules
- Biomaterials Science
- Journal of the American Chemical Society
- Jounal of Biomedical Materials Research, Part A