Melissa B. Gordon

Department of Chemical and Biomolecular Engineering
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Education

Ph.D., Chemical Engineering Degree Awarded: January 2017
Department of Chemical and Biomolecular Engineering, University of Delaware | Newark, DE
Dissertation Title: Development and Characterization of Stimuli-Responsive Systems for Performance Materials
Advisors: Dr. Christopher J. Kloxin and Dr. Norman J. Wagner

B.S., Chemical Engineering with Minor in Bioengineering Degree Awarded: May 2011
Department of Chemical and Biomolecular Engineering, Lafayette College | Easton, PA
Summa cum Laude and Honors in Chemical and Biomolecular Engineering

Academic Appointments and Professional Experience

Lafayette College | Easton, PA
Department of Chemical and Biomolecular Engineering
Associate Professor July 2023 – Present
Assistant Professor January 2017 – June 2023

Columbia University | New York, NY
Department of Chemistry
Visiting Associate Research Scientist January 2021 – June 2021

University of Delaware | Newark, DE
Department of Chemical and Biomolecular Engineering
Visiting Researcher May 2017 – August 2017

Professional Specializations

Research Interests: polymer design and synthesis, stimuli-responsive polymers, bio-based polymers, rheology, and materials characterization
Teaching Interests: polymers, materials science, transport phenomena, experimental design, and statistics

Awards and Honors

Henry Dreyfus Teacher-Scholar, Camille and Henry Dreyfus Foundation, 2025
The Thomas Roy and Lura Forrest Jones Lecture Award, Lafayette College, 2024
CAREER Award, National Science Foundation, 2022 – 2027
New Investigator Award, American Chemical Society (ACS) Petroleum Research Fund (PRF), 2020 – 2022
Walter A. ’59 and Catherine R. Scott Research Fellowship, Lafayette College, 2020 – 2022
American Chemical Society (ACS) Excellence in Graduate Polymer Research Award, 2016
Teaching Fellowship, University of Delaware, 2016
3rd place, Materials Engineering and Science Division (MESD) poster session at AIChE, 2016
Professional Development Award, University of Delaware, 2015
Travel Grant, Society of Rheology, 2015
NASA Space Grant Graduate Fellowship, 2015, 2016
National Science Foundation Graduate Research Fellowship (NSF GRFP), 2011 – 2016
Charles Duncan Fraser Prize for Materials Science, Lafayette College, 2011
Marquis Scholarship (Lafayette College’s highest merit scholarship in 2007), 2007 – 2011

Grant Support

Camille and Henry Dreyfus Foundation, *Design for Degradation: Developing polymers for environmental responsiveness and breakdown*, $75,000, November 2025 – November 2030

National Science Foundation, CAREER: *Gas-regulated mechanochemical activation for bio-inspired responses in polymer networks*, $600,000, April 2022 – March 2027

American Chemical Society (ACS), Petroleum Research Fund (PRF), *Fundamental studies of CO_2-switchable polymer swelling*, $55,000, July 2020 – August 2023

Walter A. ’59 and Catherine R. Scott Research Fellowship, Lafayette College, *Probing strain-stiffening behavior in dynamic biomimetic interpenetrating polymer networks (IPNs) using confocal-rheology,* $5,000, March 2020 – June 2022

National Science Foundation, RUI: Collaborative Research: *Greener processes for the sustainable development of bio-based polyesters*, $300,000 ($161,998 to Lafayette College), co-PI, January 2020 – December 2023

Kern Family Foundation, Meta Mindset Initiative Pedagogical Grant, *Mindset in research*, $1,500, January – May 2018

Academic Research Committee Faculty Research Grant, Lafayette College*, Mechanochemical activation of force-responsive polymers for autonomous self-healing,* $1,800, May-August 2017

Kern Family Foundation, Meta Mindset Initiative Pedagogical Grant, *Polymers as a second language*, $1,500, May – December 2017

National Institute of Science and Technology (NIST) Center for Neutron Research (NCNR), *Investigating accelerated aging in colloidal glasses by simultaneous microstructural and rheological measurements*, 2.0 days of beam time on NG-7 30-m small angle neutron scattering (SANS) instrument, August 14-16, 2017

National Institute of Science and Technology (NIST) Center for Neutron Research (NCNR), *The microstructural basis of colloidal gel aging*, 3.0 days of beam time on NG-7 30-m small angle neutron scattering (SANS) instrument, May 20-23, 2016

NASA Space Grant College and Fellowship Program Graduate Research Fellowship, NASA Grant NNX15AI19H, $9,200, 09/2016 – 12/2016

NASA Space Grant College and Fellowship Program Graduate Research Fellowship, NASA Grant NNX15AI19H, $27,600, 09/2015 – 08/2016

National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP) Fellowship, NSF Grant No. 1247394, $121,500 ($30,000 stipend plus 10,500 cost-of-education allowance for three years over a five-year period), 09/2011 – 08/2016

Publications

(Lafayette undergraduate authors I mentored are underlined, Visiting Graduate Student Scholar authors are italicized, *corresponding author)

M.L. Dodge, L. Goodhope, Q. Pisacane, R. Tang, S.I. Harrill, H.M. LaFrance, A.M. Lehman-Chong, J.F. Stanzione, III , L. Soh*, **M.B. Gordon***, “Thermosets from Birch Bark: A Holistic Approach using Green Solvents and Processes,” ACS Omega (2025). DOI: 10.1021/acsomega.5c05162 [Invited contribution to special issue *Undergraduate Research as the Stimulus for Scientific Progress in the USA* in *ACS Omega*]

S.R. Sergi, J.J. Hastie, F.J.M. Smith, A.G. Devlin, *E.G. Bury*, *M.L. Paterson*, S.B. Kosednar, L.S. Sefcik, **M.B. Gordon***, “Swelling-Shrinking Behavior of a Hydrogel with a CO_2-Switchable Volume Phase Transition Temperature,” *Macromolecular Rapid Communications* (2025). DOI: 10.1002/marc.202400772

I.G. Mercer, K. Yu, A.J. Devanny, **M.B. Gordon**, L.J. Kaufman*, “Plasticity variable collagen-PEG interpenetrating networks modulate cell spreading,” *Acta Biomaterialia* (2024). DOI: 10.1016/j.actbio.2024.08.040

A. Lehman-Chong, C. Cox, E. Kinaci, S.E. Burkert, M.L. Dodge, D.M. Rosmarin, J. Newell, L. Soh, **M.B. Gordon**, J.F. Stanzione, III.*, "Itaconic Acid as a Co-monomer in Betulin-based Thermosets via Sequential and Bulk Preparation," *ACS Sustainable Chemistry & Engineering* (2023). DOI: 10.1021/acssuschemeng.3c04178

M.B. Gordon, C.J. Kloxin, N.J. Wagner*, “Structural and rheological aging in model attraction-driven glasses by Rheo-SANS,” *Soft Matter* (2021). DOI: 10.1039/d0sm01373k

C.A. Addis, R.S. Koh, **M.B. Gordon*,** “Preparation and characterization of a bio-based polymeric wood adhesive derived from linseed oil,” *International Journal of Adhesion and Adhesives* (2020). DOI: 10.1016/j.ijadhadh.2020.102655

S. Curia, S. Dautle, B. Satterfield, K. Yorke, C.E. Cranley, B.E. Dobson, J.J. La Scala, L. Soh, **M.B. Gordon,** J.F. Stanzione, III.*, “Betulin-based thermoplastics and thermosets through sustainable and industrially viable approaches: new insights for the valorization of an underutilized resource,” *ACS Sustainable Chemistry & Engineering* (2019). DOI: 10.1021/acssuschemeng.9b03471

R.E. Young, J. Graf, I. Miserocchi, R.M. Van Horn, **M.B. Gordon**, C.R. Anderson, L.S. Sefcik*, “Optimizing the alignment of thermoresponsive poly(N-isopropyl acrylamide) electrospun nanofibers for tissue engineering applications: A factorial design of experiments approach,” *PLOS ONE* (2019). DOI: 10.1371/journal.pone.0219254

M.B. Gordon, S. Wang, G.A. Knappe, N.J. Wagner, T.H. Epps, III., C.J. Kloxin*, "Force-induced cleavage of a labile bond for mechanochemical crosslinking," *Polymer Chemistry* (2017). DOI: 10.1039/C7PY01431G

M.B. Gordon, C.J. Kloxin, N.J. Wagner*, "Aging and nonlinear rheology of thermoreversible colloidal gels," *Journal of Rheology* (2017). DOI: 10.1122/1.4966039

M.B. Gordon, J.M. French, N.J. Wagner, C.J. Kloxin*, "Dynamic bonds in covalently crosslinked polymer networks for photo-activated strengthening and healing," *Advanced Materials* (2015). DOI: 10.1002/adma.201503870

M.B. Gordon, C.J. Kloxin, N.J. Wagner, "Aging and nonlinear rheology of thermoreversible colloidal gels," *Journal of Rheology* (2017). DOI: 10.1122/1.4966039

M.B. Gordon, J.M. French, N.J. Wagner, C.J. Kloxin, "Dynamic bonds in covalently crosslinked polymer networks for photo-activated strengthening and healing," *Advanced Materials* (2015). DOI: 10.1002/adma.201503870

Patents

M.B. Gordon, S. Wang, G.A. Knappe, N.J. Wagner, T.H. Epps, III., C.J. Kloxin, "Stress-responsive compositions and uses thereof," US 2019/0169340A1, Granted: April 2021.

Selected Presentations

M.B. Gordon, "Dynamic control of hydrogel phase behavior using carbon dioxide," Rowan University Department of Chemical Engineering Seminar Series, November 2025. *Invited*

M.B. Gordon, "CO_2-switchable phase behavior in pNIPAM hydrogels," Lehigh University Department of Materials Science and Engineering Seminar Series, May 2025. *Invited*

M.B. Gordon, "Swelling-shrinking behavior of a CO_2-switchable hydrogel," American Chemical Society (ACS) Spring Meeting, Water Soluble Polymers Symposium, San Diego, CA, March 2025. *Invited*

M.B. Gordon, "Material design from nature: Bio-Inspired and biobased polymers," Thomas Roy and Lura Forrest Jones Lecture, Lafayette College, Easton, PA, November 2024. *Invited*

M.B. Gordon, A.M. Chong, S. Curia, L. Soh, J.F. Stanzione III, "Valorization of betulin for polymers from birch bark," American Chemical Society (ACS) Green Chemistry and Engineering Conference, Symposium for Sustainable Membrane Separations: From Polymers to Processes, Long Beach, CA, June 2023. *Invited*

M.B. Gordon, "Material design from nature: Bio-inspired and bio-based polymers," American Chemical Society (ACS) Spring National Meeting, PMSE, Indianapolis, IN, March 2023. *Invited*

M.B. Gordon, S. Curia, L. Soh, A.M. Chong, J.F. Stanzione, "Developing betulin-based polyesters from birch bark," 27th Bioenvironmental Polymer Society Meeting, June 2021. *Invited*

M.B. Gordon, **"**Being an outsider in STEM: a personal perspective," Upper School, Englewood Cliffs, NJ, May 2020 (via Zoom).

M.B. Gordon, "Material design from nature: stimuli-responsive and bio-based polymers," Columbia University, New York City, NY, January 2020.

B.E. Dobson, C.E. Cranley, **M.B. Gordon,** "Developing betulin-derived polymers from birch bark," American Chemical Society (ACS) Regional Meeting, Baltimore, MD, May 2019.

M.B. Gordon, "Learning from failure: examining famous engineering disasters in an introductory materials science course," 9th North American Materials Education Symposium, University of Michigan, August 2018.

M.B. Gordon, C.J. Kloxin, N.J. Wagner, "Microstructural basis for colloidal gel and glass aging," American Institute of Chemical Engineers (AIChE) Annual Meeting, Minneapolis, MN**,** November 2017.

M.B. Gordon, "Learning from failure: examining famous engineering disasters in an introductory materials science course" American Society of Engineering Education (ASEE) summer school, Raleigh, NC, August 2017.

M.B. Gordon, N.J. Wagner, C.J. Kloxin, "Self-healing materials for improving astronaut protection," International Space Station Research and Development Conference, Washington, D.C, July 2017.

M.B. Gordon, N.J. Wagner, C.J. Kloxin, "Novel stimuli-triggered self-healing and strengthening polymers," American Institute of Chemical Engineers (AIChE) Annual Meeting, San Francisco, CA, November 2016.

M.B. Gordon, C.J. Kloxin, N.J. Wagner, "Aging and nonlinear rheology of an aging thermoreversible colloidal gel," American Institute of Chemical Engineers (AIChE) Annual Meeting, San Francisco, CA, November 2016.

M.B. Gordon, C.J. Kloxin, "Dynamic covalent crosslinking in polymer networks for materials-healing," CIMTEC Meeting, Perugia, Italy, July 2016.

M.B. Gordon, J.M. French, N.J. Wagner, C.J. Kloxin, "Dynamic bonds in covalently crosslinked polymer networks for photo-activated strengthening and healing," American Chemical Society (ACS) National Meeting, San Diego, CA, March 2016.

M.B. Gordon, C.J. Kloxin, N.J. Wagner, "The microstructural basis of colloidal gel aging," Gordon Research Conference: Colloidal, Macromolecular and Polyelectrolyte Solutions, Ventura, CA, February 2016.

M.B. Gordon, C.J. Kloxin, N.J. Wagner, "Aging and nonlinear rheology of thermoreversible colloidal gels," Society of Rheology Meeting, Baltimore, MD, October 2015.

M.B. Gordon, J.M. French, C.J. Kloxin, N.J. Wagner, "Dynamic bonds in covalent crosslinked polymers for mechanically triggered self-healing," ACS Colloid and Surface Science Symposium, Pittsburgh, PA, June 2015.

Research Training

National Science Foundation Graduate Fellow, University of Delaware January 2013 – January 2017
Advised by: Dr. Christopher J. Kloxin and Dr. Norman Wagner
- Developed and characterized light- and mechano-responsive polymers for self-healing applications
- Investigated rheological aging of thermoreversible gels and glasses using neutron scattering and rheology

Payload Developer, NASA International Space Station Flight Opportunity June 2014 – December 2016
- Helped write a grant that was selected by NASA to test recently developed materials on the exterior of the International Space Station
- Collaborated with experts at Johnson Space Center on a weekly basis to ensure materials meet safety requirements and plan for launch on MISSE-X

Research Intern, Argonne National Laboratory June 2010 – August 2010
Advised by: Dr. Richard Brotzman
- Worked on joint project with the Boeing Company to investigate the controlled heating of an adhesive bond line
- Used atomic layer deposition to prepare FeO_xPt superparamagnetic nanocomposites that can serve as additives for adhesives to prevent subjecting structural materials to heat stresses

Teaching Experience

Lafayette College | Easton PA
Assistant Professor January 2017 – June 2023
Associate Professor July 2023 – Present
- Nature of Materials (ES 231)
  - introductory material science course | 40 students/year | instructor effectiveness 4.7/5
- Polymers (CHE 331)
  - upper-level technical elective | 15 students/year | instructor effectiveness 4.8/5
- Transport Phenomena (CHE 311)
  - core course focused on momentum, heat, and mass transfer | 30 students/year | instructor effectiveness 4.8/5
- Experimental Design II (CHE 322)
  - laboratory-based course using pilot-scale equipment to illustrate principles of fluid flow, heat transfer and statistical designs/analysis | 11 students/year | instructor effectiveness 4.9/5
- Mentored ten undergraduates on year-long honors theses
- Serve as an academic advisor to approximately 20 students/year

University of Delaware | Newark, DE
Teaching Fellow January 2016 – May 2016
- Selected to co-teach an undergraduate-level chemical engineering course in statistics with Professor Joshua Enszer
- Prepared and presented lectures, held office hours, and worked directly with students

Mentoring Experience

Student Researchers
Cameron Darkes-Burkey, CBE '18, S17- SU18; Katherine Daly, CBE '19, S17-SU17; Brittany Dobson, CBE '19, S18-S19;

Clark Addis, ME ‘20, S18-S20; Jacob Miller, CBE ‘20, SU18-S20; Cameron Cranley, CBE ‘20, SU18-S20; Leon Yang, CBE ‘21, S18; Sarah Burkert, CBE ‘21, SU19- S21; James Hastie, CBE ‘22, SU19-S22; Abigail Devlin, CBE ‘22, F20-S22; Megan Dodge, CBE ‘23, S20-SU23; Devin Rosmarin, CBE ‘23, S21-S23; Sophia Kosednar, CBE ’24, S22-S23; Finlay Smith CBE ’25, F22-S25; Sophia Harrill CBE ’26 S23-current; Sarah Sergi CBE ’26, SU23-current; Mara Peterson (visiting graduate student) SU23; Alexa LaSasso, CBE ’26, SU24-current; Katherine Pappas, Biochemistry ’26, SU24-current; Georgia Delaney, CBE ’27, SU24-current; ; Elizabeth Bury (visiting graduate student) SU24; Alexis Ritter CBE ’28, SU25-current; Maxwell Duerr CBE ’28, SU25-current

Honors Thesis Students

Cameron Darkes-Burkey, *Effect of Stereolithographic Printing Parameters on the Mechanical Properties of 3D Printed Parts*, AY 2017-2018
Additional Experience: Grand Challenges Scholar (Summer 2018)

Brittany Dobson, *Development and Characterization of Bio-based Thermosets from Birch Bark*, AY 2018-2019
Additional Experience: Excel Scholar (Spring 2017)

Clark Addis, *Design of 3D Printed Shape Memory Polymer Structures*, AY 2019-2020
Additional Experience: Excel Scholar (Summer 2018, Fall 2018), Independent Study (Spring 2018, Spring 2019)

Cameron Cranley, *Engineering CO_2 Responsive Polymers with Tunable Swellability*, AY 2019-2020
Additional Experience: Clare Boothe Luce Scholar (Summer 2018), Excel Scholar (Fall 2018), Independent Research (Spring 2019)

Jacob Miller, *Strengthening Stereolithographic 3D Prints by Imparting Defects*, AY 2019-2020
Additional Experience: Excel Scholar (Summer 2018, Interim 2019, Spring 2019), Independent Research (Fall 2018), Grand Challenges Scholar (Summer 2019)

Sarah Burkert, *Modeling and Synthesizing Polymer Networks for Biomedical and Environmental Applications*, AY 2020-2021
Additional Experience: Clare Boothe Luce Scholar (Summer 2019), Grand Challenges Scholar (Fall 2019), Independent Research (Spring 2020)

James Hastie, *Fundamental Studies of CO_2-Triggered Polymer Swelling*, AY 2021-2022
Additional Experience: Excel Scholar (Summer 2019, 2020, 2021; AY 2019-2020, 2020-2021)

Megan Dodge, *Assessing Tunability and Hydrolytic Degradation of Bio-Based Thermosets*, AY 2022-2023
Additional Experience: Excel Scholar (Spring 2020, AY 2020-2021, AY 2021-2022, Interim 2022, AY 2022-2023)

Devin Rosmarin, *Detecting and Quantifying Mechanoradicals in Swellable Hydrogels*, AY 2022-2023
Additional Experience: Excel Scholar (Spring 2021-Summer 2021, AY 2021-2022), Research Assistant (Summer 2022)

Finlay Smith, *Designing and Characterizing Double Network Hydrogels for Mechanochemistry*, AY 2024-2025
Additional Experience: Excel Scholar (Summer 2023, AY 2023-2024)

Honors Thesis Committees

Alex Ashley, CBE; Ryan Berry, CBE; Ben Ryan, ME; Jodi Graf, CBE; Joanna White, CBE; Rachel Sloan, ME; Zaki Phelan, Chemistry; Sean Hu, CBE; Zvikomborero Machikiti, CBE; Rachel Tritt, Chemistry; Wisam Billan, CBE; Rachel Young, CBE; David Okeibunor, CBE; Ryan Berry, CBE; Alex Ashley, CBE; Ben Ryan, ME; Elizabeth Foker, Chemistry; Jacob McCauley, ME; Tyler Morse, ME

Doctoral Thesis Committees

Alexandra Chong, Chemical Engineering, Rowan University; Heather LaFrance, Chemical Engineering, Rowan University

Service

Departmental Service

Alumni Mentorship Program Coordinator, Lafayette College
Fall 2025– present
- Coordinate and facilitate mentoring relationships between students and alumni by matching each student with an alumnus based on similar interests

AIChE Advisor/Student Experience Coordinator, Lafayette College
Fall 2023 – Spring 2024
- Plan AIChE Spring Symposium for students, faculty, alumni, and guests
- Schedule brown bags (student experience, career exploration, AIChE-related, etc)
- Plan and host departmental social events, including senior dinner
- Attend and encourage student attendance at AIChE conference
- Plan fall finals break activities

Department of Chemical and Biomolecular Engineering Outreach Coordinator, Lafayette College
Fall 2017 – Spring 2022
- Coordinate open houses for prospective students and their families (Engineering Open House and Experience Lafayette Day) (pre-COVID)

- Coordinate and run laboratory experiments with local high school students (pre-COVID)
- Developed and update LinkedIn site connecting over 320 CBE alumni, students, staff, and faculty
- Created and update department Twitter account
- Serve as a liaison between Career Services and the CBE department

College Service

Summer Program to Advance Leadership in STEM (SPAL) Module Leader, Lafayette College
Summer 2023, 2024, 2025
- Designed and led a hands-on module to introduce incoming first-year students to chemical engineering

Clare Boothe Luce (CBL) Summer Research Faculty Presenter, Lafayette College
Summer 2023, 2024, 2025
- Co-developed and presented a workshop on abstract writing to summer research students
- Accompanied research students to annual CBL conference

Faculty Contact, National Science Foundation Graduate Research Fellowship (NSF GRF), Lafayette College
September 2018 – present
- Offer a campus-wide presentation on applying to the NSF GRFP each fall
- Developed and offer campus-wide workshop on writing a competitive application for rising seniors
- Assist students by answering their questions and providing feedback on their application drafts

Governance Committee, Lafayette College
Fall 2023 – Spring 2024
- Nominate faculty for positions on all elected faculty committees
- Document the rules for organization, procedure, and responsibilities of the faculty; standardize the form and phrasing of such rules; and review the faculty handbook prior to its annual issuance; propose the addition or elimination of elected faculty committees
- Review critically the governance structure periodically to identify possible areas of concern and recommend changes

Academic Progress Committee (APC), Lafayette College
August 2019 – January 2020, August 2021-June 2022
- Evaluate academic requests, petitions, and progress of students

Staff Search Committee, Engineering Division
July 2019 – September 2019
- Evaluated application materials of candidates for the position of chemical and environmental laboratory specialist
- Interviewed candidates and provided input based on application materials and interview to department and search committee

Faculty Search Committee, Electrical and Computer Engineering (ECE)
February 2019 – April 2019
- Interviewed and evaluated prospective candidates for a visiting faculty position in the ECE department
- Attended candidate's presentation, answered their questions, and provided a campus tour

Health Professions Advisory Committee (HPAC), Lafayette College
Spring 2018
- Interviewed students seeking a career in the health professionals
- Wrote a composite letter of evaluation on behalf of the college for each student's application package

Professional Service

Symposium Co-Organizer and Co-Chair, American Chemical Society (ACS) Spring Meeting
March 2026 (Accepted)
- Symposium: Celebrating Polymer Research at Primarily Undergraduate Institutions (PUIs)

Symposium Co-Organizer and Co-Chair, American Chemical Society (ACS) Green Chemistry and Engineering Conference
June 2021, 2022 (organizer-only), 2023
- Symposium: Sustainable Production of Biobased Polymers

Session Co-Chair, American Institute of Chemical Engineers (AIChE) National Meeting
November 2020, 2021
- Session: Particulate and Multiphase Flows: Colloids and Polymers (Area 01J)

Grant Reviewer
National Science Foundation, Graduate Research Fellowship Program (GRFP)
National Science Foundation, Division of Materials Research (DMR), Polymers

National Science Foundation, Division of Chemistry (CHE), Macromolecular, Supramolecular, and Nanochemistry
American Chemical Society, Petroleum Research Fund (PRF)

Journal Reviewer
AIChE Journal
Nature Synthesis
Rheologica Acta
Journal of Polymers and the Environment
ACS Biomaterials Science & Engineering

Membership in Professional Organizations
American Institute of Chemical Engineer (AIChE)
American Chemical Society (ACS)