

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

Assistant Professor

January 2017 – Present

Department of Chemical and Biomolecular Engineering

Lafayette College | Easton, PA

Visiting Associate Research Scientist

January 2021 – June 2021

Department of Chemistry

Columbia University | New York, NY

Visiting Researcher

May 2017 – August 2017

Department of Chemical and Biomolecular Engineering

University of Delaware | Newark, DE

Professional Specializations

Teaching Interests: polymers, materials science, transport phenomena, experimental design, and statistics

Research Interests: polymer design and synthesis, stimuli-responsive polymers, bio-based polymers, rheology, and materials characterization

Awards and Honors

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

Summa cum Laude, Lafayette College, 2011

Honors in Chemical and Biomolecular Engineering, Lafayette College, 2011

Charles Duncan Fraser Prize for Materials Science, Lafayette College, 2011

Marquis Scholarship (Lafayette College's highest merit scholarship in 2007), 2007 – 2011

Grant Support

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 CO₂-switchable polymer swelling*, \$55,000, July 2020 – August 2022

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 2022

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 & Presentations

Publications (Lafayette College undergraduate authors underlined)

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

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, 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, N.J. Wagner, C.J. Kloxin, "Dynamic bonds for mechanically-triggered crosslinking and healing," 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, C.J. Kloxin, N.J. Wagner, "Novel materials for improving astronaut survivability: light-activated self-healing polymers and colloidal gel aging," DE Space Grant Research Symposium, Dover, DE, April 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

Assistant Professor January 2017 – Present

Lafayette College | Easton PA

- 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 seven undergraduates on year-long honors theses
- Serve as an academic advisor to approximately 17 students/year

Teaching Fellow January 2016 – May 2016

University of Delaware | Newark, DE

- 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, SP17- SU18; Katherine Daly, CBE '19, SP17-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-present; Devin Rosmarin, CBE '23, S21-present; Sophia Kosednar CBE '24 S22-present

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 CO₂ 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 CO₂-Triggered Polymer Swelling*, AY 2021-2022

Additional Experience: Excel Scholar (Summer 2019, 2020, 2021; AY 2019-2020, 2020-2021)

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

Service

Departmental Service

Department of Chemical and Biomolecular Engineering Outreach Coordinator, Lafayette College

Fall 2017 – present

- 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

Academic Progress Committee (APC), Lafayette College

August 2019 – January 2020, August 2021-June 2022

- Evaluate academic requests, petitions, and progress of students

Faculty Contact, National Science Foundation Graduate Research Fellowship Program (NSF GRFP), Lafayette College

September 2018 – present

- Offer a campus-wide presentation on applying to the NSF GRFP each fall
- Assist students by answering their questions and providing feedback on their drafts of their personal statement and research statement

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, American Chemical Society (ACS) Green Chemistry and Engineering Conference

June 2021, 2022

- 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 Program

Journal Reviewer

Nature Synthesis

Rheologica Acta

Journal of Polymers and the Environment

Membership in Professional Organizations

American Institute of Chemical Engineer (AIChE)

American Chemical Society (ACS)