

MOLLY COOK MCLAUGHLIN

EDUCATION

COLORADO STATE UNIVERSITY

Currently enrolled in degree program for *Ph.D. in Civil and Environmental Engineering*

GPA: 4.0/4.0

Awards: **Whitney Borland Scholarship** (Fall 2015 and Fall 2017);

Graduate Student Council New Graduate Student Research Award (Fall 2016);

Arthur T. Corey Scholarship (Fall 2016);

American Chemical Society (ACS) Graduate Student Award (Spring 2016)

Fort Collins, CO

Fall 2015 - present

COLORADO STATE UNIVERSITY

Master of Science in Civil and Environmental Engineering

GPA: 3.9/4.0

Awards: **Whitney Borland Scholarship** (Fall 2014)

Fort Collins, CO

Fall 2013 - Spring 2016

GEORGIA INSTITUTE OF TECHNOLOGY

Bachelor of Science in Chemical Engineering, Minor in Environmental Chemistry

Graduated with High Honors

Awards: **Georgia Tech President's Undergraduate Research Award** (Spring 2010),

Dean's List (Spring 2009 – Spring 2011),

Georgia Tech Environmental Leadership Award (Spring 2009)

Atlanta, GA

Fall 2008 – August 2011

NATIONAL OUTDOOR LEADERSHIP SCHOOL (NOLS)

Earned "Leave No Trace" certificate and attained "Wilderness First Aid" certificate

New Zealand, South Island

Spring Semester 2008

BROWN UNIVERSITY

Completed three semesters in Good Standing

Providence, RI

Sept. 2006 – Dec. 2007

PRESENTATIONS, POSTERS & PUBLICATIONS

Publications

- Burgos, W.D.; Meza, L.C.; Tasker, T.L.; Geeza, T.J.; Drohan, P.J.; Liu, X.; Landis, J.; Blotevogel, J.; **McLaughlin, M.C.**; Borch, T.; Warner, N.R.: Watershed-scale Impacts from Surface Water Disposal of Oil and Gas Wastewater. *Environ. Sci. Technol.* **2017**, *51*, 8851-8860.
- Oetjen, K.; Giddings, C.G.S.; **McLaughlin, M.**; Nell, M.; Blotevogel, J.; Helbling, D.E.; Mueller, D.; Higgins, C.P.: Current Analytical Methods for the Characterization of Organic Contaminants in Flowback and Produced Water: Potentials and Challenges. *Trends in Environmental Analytical Chemistry* **2017**, *15*, 12-23.
- **McLaughlin, M.**; Borch, T.; Blotevogel, J. *Spills of Hydraulic Fracturing Chemicals on Agricultural Topsoil: Biodegradation, Sorption, and Co-Contaminant Interactions*. *Environ. Sci. Technol.* **2016**, *50* (11), pp 6071–6078. DOI: 10.1021/acs.est.6b00240
- Cerully, K. M., Hite, Jr., J. R., **McLaughlin, M.**, and Nenes, A. *Part 1. Combined Cloud Condensation Nuclei (CCN) and Volatility Measurements - Analysis of a New Measurement Method and Model for the Analysis of Organic Aerosol Volatility*, 2013.

Presentations

- **McLaughlin, M.**; McDevitt, B.; Warner, N.; Argueso, J.L.; Blotevogel, J.; Borch, T. Toxicological and Chemical Assessment of Water Quality Downstream of NPDES Oil and Gas Produced Water Discharges. March 14, 2018. Colorado School of Mines, Golden, CO. RMSAWWA/RMWEA Joint Student Conference.
- **McLaughlin, M.**; McDevitt, B.; Warner, N.; Argueso, J.L.; Blotevogel, J.; Borch, T. "Toxicological and Chemical Assessment of Water Quality Downstream of NPDES Oil and Gas Produced Water Discharges." March 20, 2018, *American Chemical Society National Meeting*, Ernest N. Morial Convention Center, New Orleans, LA.
- McDevitt, B.; **McLaughlin, M.**; Blotevogel, J.; Borch, T.; Warner, N. "Investigating enhanced sediment radium levels at NPDES facilities in Wyoming with a comparison to Pennsylvania." March 20, 2018, *American Chemical Society National Meeting*, Ernest N. Morial Convention Center, New Orleans, LA.

- **McLaughlin, M.**; McDevitt, B.; Warner, N.; Argueso, J.L.; Blotevogel, J.; Borch, T. "Assessment of Water Quality and Genotoxicity Downstream of NPDES Oil and Gas Produced Water Discharges." April 6, 2017, *American Chemical Society National Meeting*, San Francisco Marriott Union Square, San Francisco, CA.
- **McLaughlin, M.**; Borch, T.; Blotevogel, J. "Fate of Hydraulic Fracturing Chemicals Released to Soil and Water Ecosystems." March 31, 2017, *OSHER Course CSU: Perspectives About Fracking*, Fort Collins, CO
- **McLaughlin, M.**; Argueso, J.L.; Blotevogel, J.; Borch, T. "Assessment of Water Quality and Genotoxicity Downstream of NPDES Oil and Gas Produced Water Discharges." March 22, 2017, *Hydrology Days*, Colorado State University, Fort Collins, CO.
- **McLaughlin, M.**; Borch, T.; Blotevogel, J. "Fate of Hydraulic Fracturing Chemicals Released to Soil and Water Ecosystems." November 29, 2016, *Eastern Colorado Crop Production Conference*, Fort Morgan, CO
- **McLaughlin, M.**; Borch, T.; Blotevogel, J. "Environmental Fate of Hydraulic Fracturing Fluid Additives after Spillage on Agricultural Topsoil," April 8, 2016, *Rocky Mountain Society of Environmental Toxicology and Chemistry Annual Meeting*, Fort Collins, CO.
- **McLaughlin, M.**; Borch, T.; Blotevogel, J. "Environmental Fate of Hydraulic Fracturing Fluid Additives after Spillage on Agricultural Topsoil," March 19, 2016, *Society of Environmental Toxicology and Chemistry Focus Topic Meeting on Hydraulic Fracturing*, Denton, TX.
- **McLaughlin, M.**; Borch, T.; Blotevogel, J. "Environmental Fate of Hydraulic Fracturing Fluid Additives after Spillage on Agricultural Topsoil," November 12, 2015, *Discussion Series on Hydraulic Fracturing*, Windsor-Severance Library, Windsor, CO.
- **McLaughlin, M.**; Borch, T.; Blotevogel, J. "Fate of Hydraulic Fracturing Chemicals in Agricultural Topsoil," March 23, 2015, *American Chemical Society National Meeting*, Colorado Convention Center, Denver, CO.

Posters

- **McLaughlin, M.**; Argueso, J.L.; Blotevogel, J.; Borch, T. "Assessment of Water Quality and Genotoxicity Downstream of NPDES Oil and Gas Produced Water Discharges." November 15, 2016, *CSU Graduate Student Showcase*, Colorado State University, Fort Collins, CO.
- Kanno, C.; **McLaughlin, M.**; Blotevogel, J.; Benson, D.; Borch, T.; McCray, J. "Evaluating the Risks of Surface Spills Associated with Hydraulic Fracturing Activities to Groundwater Resources: A Modeling Study in the South Platte Alluvial Aquifer." December 14-18, 2015, *AGU Fall Meeting*, San Francisco, CA.
- **McLaughlin, M.**; Borch, T.; Blotevogel, J. "Natural Degradation of Hydraulic Fracturing Chemicals in Agricultural Soils," September 24, 2014, *Natural Gas Symposium*, Grand Hyatt, Denver, CO.
- **McLaughlin, M.**; Cerully, K.; Nenes, A. "Characterization of a Thermodenuder for Volatility-CCN Activity Studies," April 5, 2011, *Air Products Undergraduate Research Symposium*, Georgia Institute of Technology
- **McLaughlin, M.**; Cerully, K.; Nenes, A. "Construction of a Thermodenuder for Volatility-CCN Activity Studies," April 22, 2010, *Air Products Undergraduate Research Symposium*, Georgia Institute of Technology

EXPERIENCE

Graduate Research Assistant, Advisers: Dr. Thomas Borch and Dr. Jens Blotevogel
 Department of Civil and Environmental Engineering, Colorado State University

Fort Collins, CO
 August 2013 - Present

PhD Research

- Researching the chemical and potential health impacts of oil and gas wastewater released to the environment for beneficial reuse (i.e. irrigation, stream augmentation, livestock watering)
- Participated in two sampling field trips for water and sediment samples
- Developed solid phase extraction (SPE) method to prepare samples for analysis of non-volatile oil and gas additives including surfactants, biocides and emulsion breakers.
- Using MZMine and R Studio to develop non-targeted analysis methods for complex environmental samples impacted by oil and gas activities
- Developing extraction methods to prepare water sample extracts for gene expression analyses.
- Assisted in development of new genotoxicity yeast bioassay for analysis of environmental water samples and soil extracts
- Applied novel genotoxicity yeast bioassay assay to surface water samples from field sites to quantify potential health impacts downstream of produced water beneficial reuse.

Master's Research

- Studied the environmental fate and transport of hydraulic fracturing additives and oil and gas wastewater constituents including biocides (glutaraldehyde), surfactants (polyethylene glycols), friction reducers (polyacrylamide) and salt
- Simulated spills of hydraulic fracturing fluid and produced water on agricultural topsoil to understand how chemical mixtures affected fate and transport of other chemicals in the mixture
- **Results:** Chemicals influenced removal rates of other chemicals in the mixture. Salts and biocides prevented or slowed degradation rates of other chemicals. Polyacrylamide reacted abiotically with glutaraldehyde to remove it from the mixture, thereby reducing its efficacy. Polyacrylamide removal was not observed over the course of the experiment (6 months).

Energy Efficiency Organizer and Researcher

Naoma, WV

Energy Efficient West Virginia /Coal River Mountain Watch

November 2011 - March 2013

- Collaborated with the WV Department of Education to analyze public data, determining that the Public School System could achieve a savings of \$20 million per year through energy efficiency improvements. Developed and executed a strategy to engage energy auditors, train facilities personnel to use energy management programs and educate staff about funding opportunities for energy savings and improvements.
- Lobbied on behalf of two energy efficiency bills during the WV State Legislative Session, resulting in one of the few environmentally-related bills to make it to a full committee vote.
- Instrumental in campaign to increase WV utility companies' investments in energy efficiency, including holding public educational meetings, phone-banking, writing editorial pieces and meeting with the President of Appalachian Power.
- Presented at and participated in numerous conferences and education events including: the WV Association of Counties Annual Meeting; the Habitat for Humanity of WV Mid-Atlantic Energy Efficient Building Conference; Environmental Day at the WV State Capitol and more.

Undergraduate Research Assistant, Supervising Professor: Dr. Martial Taillefert

Atlanta, GA

School of Earth and Atmospheric Sciences, Georgia Institute of Technology

January 2011 – August 2011

Lab Work

- Studied the effect of pH on the kinetics of reductive dissolution of iron(III) hydroxides by cysteine to explore possible microbial iron reduction mechanisms
- Conducted kinetic experiments at various pH in an anoxic glove box and measured iron(II), total dissolved iron and cysteine over time using spectrophotometry and electrochemistry
- **Results:** Iron(II) timeseries were fit with a first-order rate law which showed that the reduction rate of iron(III) hydroxides by cysteine is highest at pH 6-8
- Participated in group meetings and presented research findings twice at group meeting

Field Work

- Participated in a two-week field trip off the coast of Cape Hatteras aboard the R/V Savannah to investigate benthic iron fluxes along the continental shelf
- Collected benthic sediment cores along the continental shelf.
- Helped successfully deploy and troubleshoot an autonomous benthic lander at ocean depths up to 80 m
- Sectioned benthic sediment cores, extracted pore water, and analyzed samples for iron(II) and total dissolved iron using the ferrozine technique

Research Assistant, Supervisors: Dr. Kristiina Iisa (NREL) & Dr. Pradeep Agrawal (Georgia Tech)

Atlanta, GA

National Renewable Energy Lab (NREL), Golden, CO

Summer 2010

- Studied the effects of temperature and pressure on the kinetics of biomass gasification and devolatilization
- Biomass char was created by pyrolyzing switchgrass biomass and three types of pine biomass in a pressurized entrained flow reactor (PEFR)
- Conducted experiments in a pressurized thermogravimetric analyzer (PTGA).
- **Results:** Switchgrass and pine char gasification timeseries were fit with a first-order rate law which showed that the gasification rate of these chars increases with increasing temperature in the PTGA; increases with increasing pressure in the PTGA; and increases for chars prepared at higher temperatures in the PEFR.

Undergraduate Research Assistant, Supervising Professor: Dr. Athanasios Nenes

Atlanta, GA

School of Chemical & Biomolecular Engineering, Georgia Institute of Technology

June 2009 – December 2010

Instrument Design & Construction

- Designed and built a field instrument – a thermodenuder

- Characterized the thermodenuder by conducting temperature stability and profile characterization tests, condensation particle counter (CPC) inter-comparison tests, particle transmission efficiency tests, and succinic acid tests.
 - Thermodenuder will be used in field experiments to study the link between organic aerosol volatility and cloud condensation nuclei (CCN) activity
 - Wrote research proposal to receive Georgia Tech President's Undergraduate Research Award to fund research
- Field Work & Data Analysis**
- Participated in the Nucleation and Cloud Condensation Nuclei (NCCN) field experiment in Atlanta, Georgia
 - Corrected CCN timeseries data for discrepancies between instruments using IGOR Pro

Lab Technician, Charles Parkos, MD, PhD, and Asma Nusrat, MD Laboratories
School of Medicine, Emory University

Atlanta, GA

Summer 2006, 2007, 2009

- Assisted with daily maintenance and clean-up of the lab including: preparing gels for Western Blot experiments; creating buffers and other stock solutions; organizing lab materials and chemicals; ensuring that all necessary items were in stock; cleaning glassware
- Assisted researchers by performing Western Blot experiments and analyzing the data

ANALYTICAL SKILLS

- Basic wet laboratory skills
- Liquid Chromatography
- Gas Chromatography
- Size Exclusion Chromatography (SEC)
- Mass Spectrometry: Quadrupole Time of Flight, Triple Quadrupole
- Spectrophotometry
- Extraction techniques for analysis of environmental samples: liquid-liquid extraction, solid-phase extraction
- Genotoxicity bioassays: Ames test, yeast growth bioassays, yeast point mutation bioassays, yeast copy number variation bioassays
- Field experience
 - Freshwater and seawater sampling techniques
 - Sediment sampling techniques
- Anaerobic laboratory techniques
- Experimental Design and Execution
- Instrument Design, Construction and Characterization
- Experience with EPA laboratory protocols: 8260, 8270, 8021, 8015, 415.1 and 415.1
- **Software:** Microsoft Office, R Studio
- Ability to analyze large data sets in Excel and R Studio
- Proposal Writing
- Strong written and verbal communication skills

LEADERSHIP

Member, Fort Collins Climate Action Plan Community Advisory Committee

January 2018 - Present

President, Northern Colorado Graduate Women in Science (GWIS)

May 2017-Present

Participant, Student Water Dialog, Colorado Water Institute

Fall 2015

Secretary, Northern Colorado Graduate Women in Science (GWIS)

August 2014-May 2017

President, Georgia Tech Students Organizing for Sustainability (SOS)

April 2010-May 2011