

Florence T. Ling, Ph.D.

La Salle University
Environmental Science Program
Department of Chemistry and Biochemistry
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Research Interests

Low-temperature environmental geochemistry, environmental mineralogy, mineral-fluid reactions, soil geochemistry, water contamination, energy and climate change

Techniques: X-ray diffraction (bulk analysis, mapping, and time-resolved reactions), synchrotron X-ray absorption spectroscopy, X-ray fluorescence (bulk analysis & mapping), reactive transport modeling, scanning electron microscopy, electron microprobe analysis, Fourier transform infrared spectroscopy, Rietveld analysis, inductively coupled mass spectrometry

Education

Pennsylvania State University *Ph.D.* – Department of Geosciences, GPA 3.95/4.00
State College, PA *Dissertation:* Mineralogical and Geochemical Analyses of Synthetic and Natural
Aug. 2011 – Dec. 2016 Birnessites, Advisors: Peter J. Heaney, Jeffrey E. Post

Dartmouth College *Bachelor of Arts* – Environmental Earth Science Major, GPA 3.66/4.00
Hanover, NH Graduated with a degree Cum Laude and with Honors in Environmental Earth
Sept. 2007 – June 2011 Science.
Senior Honors Thesis: Bioaccumulation and Trophic Transfer of Engineered Ag-
Nanoparticles

Professional Employment

La Salle University *Assistant Professor*
Philadelphia, PA Established the Environmental Geochemistry Research group at La Salle
Aug. 2018 - present University. Taught 9 credits per semester. Courses include Intro to
Environmental Science, Environmental Air Pollution, Fundamentals of Soil
Science, Energy & Natural Resources, Intro to Earth Science.

Princeton University *Postdoctoral Research Associate*
Princeton, NJ Conducted research with Prof. Catherine Peters and Dr. Jeffrey Fitts on barite
Sept. 2016 – July 2018 co-precipitation to remediate Marcellus shale flowback waters. A second
project examined carbonation reactions in porous media to seal leaks during
geologic CO₂ sequestration in collaboration with the University of Virginia.

EQT *Geologist Intern*
Pittsburgh, PA Conducted research on the Marcellus and Genesee shales, relating the emission
May 2013 – Aug. 2013 of spectral gamma ray data to mineralogy, and understanding differences during
pyrolysis of hydrocarbon-rich rock samples from the Huron and Kentucky
formations. Obtained experience geosteering, using Geographix, and a better
understanding of the natural gas and oil industry.

Previous Courses

ISBT 421 Natural Resource Management, La Salle University (Fall 2020)
CHM 161 Chemistry of Life Sciences, La Salle University (Spring 2020)
ENV 402 Environmental Air Quality, La Salle University (Fall 2019)
ENV 401 Fundamentals of Soil Science, La Salle University (Spring 2019)
ENV 155 Intro to Earth Science, La Salle University (Spring 2019)
ISBT 321 Energy and Natural Resources, La Salle University (Fall 2018, Fall 2019)
ENV 153 Intro to Environmental Science, La Salle University (Fall 2018, Fall 2019, Fall 2020)
Senior Thesis Seminar, Civil and Environmental Engineering, Princeton University (2016 – 2017)

Additional Teaching Experience

Prison Teaching Initiative

Princeton, NJ
May 2017 – present

Instructor

Taught college-level math and science classes to inmates in classes of 5 to 30 students at Ft. Dix Prison, accredited through Mercer County Community College.

Princeton University

Princeton, NJ
Sept. 2017 – present

Instructor

Taught an undergraduate research seminar for senior thesis students on conducting research, writing research proposals, presenting posters and oral presentations, and writing their senior theses.

May 2017

Guest Lecturer

Designed and conducted undergraduate lab module on advanced materials imaging and analysis, including X-ray computed tomography (xCT), X-ray diffraction (XRD), and scanning electron microscopy (SEM).

Pennsylvania State University

State College, PA
June 2014 – Aug. 2016

Teacher Assistant

GEOSC 40P: *The Sea Around Us*. Prepared experiments and gave lectures for three weekly laboratory sections of undergraduate students on oceanography. EARTH 100: *The Environmental Earth*. Led classroom discussions, graded, prepared test materials, and proctored examinations for undergraduates.

Upward Bound

State College, PA
June 2015 – July 2015

Instructor

Planned and taught two 5-week introductory college Geology classes to high school students from underserved communities across Pennsylvania. Lectures, labs, and field trips covered topics such as rock and mineral identification, basic geologic mapping, natural disasters, climate change, and water quality.

Project Northstar

Washington, D.C.
Oct. 2014 – May 2015

Tutor/Mentor

Tutored and mentored elementary to high school students from underserved communities in the District of Columbia.

The Roving Nature Center

Yardley, PA
June 2011 – Aug. 2011

Science Naturalist/Teacher Assistant

Aided teachers in outdoor environmental educational activities at Five Mile Woods with lessons on dinosaurs, environmental conservation, and safe environmental practices to children ages 4 to 10. Learned behavior management in outdoor settings for children and practiced hands-on science education techniques.

The Franklin Institute

Philadelphia, PA
Dec. 2009 – March 2010

Communities of Learning for Urban Environments & Science (CLUES) Assistant and Partnership for Achieving Careers in Science & Technology (PACTS) Intern

As a CLUES Assistant, researched and planned family workshops on environmental science to be presented to minority communities in the Philadelphia area. As a PACTS Intern, planned activities on different science topics for a 6-week middle school science summer camp.

**Howard Hughes Medical
Institute**
Hanover, NH
Jan. 2009 – March 2009

Science Mentor

Taught science to a class of fifth graders, with a focus on heat and energy, by designing experiments, leading discussions, and guiding students to construct their own understanding of scientific concepts. Attended weekly training sessions on science education to prepare for lessons.

Montshire Museum of Science
Norwich, VT
Sept. 2008 – Dec. 2008

Science Education Intern

Prepared materials for pre-school science classes, explained museum exhibits, helped arrange exhibits for display, and led interactive and entertaining workshops for young children to explore basic scientific concepts.

Awards, Grants, & Proposals

Co-Principal Investigator. "Single particle X-ray nanospectroscopy imaging to determine growth history of barite and calcite solid solutions". Brookhaven National Laboratory, NSLS-II Beamtime Proposal. Accepted. 2016 – 2017.

American Chemical Society Geochemistry Division Student Travel Grant – Fall 2016

Committee on Institutional Cooperation/Smithsonian Graduate Research Fellowship – 2014 – 2015

National Science Foundation Graduate Research Fellowship Honorable Mention – 2012, 2013

Hiroshi and Koya Ohmoto Scholarship – 2013

Dartmouth College Kaminsky Family Fund Grant – 2010

James O. Freedman Presidential Scholar – 2009 – 2010

Women In Science Project Research Scholarship – 2008

Publications

Ling, FT, Plattenberger, DA, Peters, CA, Clarens, AF. "Sealing porous media via calcium silicate reactions with CO₂ to enhance the security of geologic carbon sequestration". *Environmental Engineering Science Special Issue: Addressing Society's Water and Energy Challenges with Reactive Transport Modeling*. In review.

Hunter, HA, **Ling, FT**, Peters, CA. "Coprecipitation of Heavy Metals in Calcium Carbonate from Coal Fly Ash Leachate". *Environmental Science & Technology: Water*. Nov. 4, 2020.

Ling, FT, Post, JE, Heaney, PJ, Santelli, CM, Ilton, ES, Burgos, WD, Rose, AW. "A multi-method characterization of natural terrestrial birnessites". *American Mineralogist*. 105. 6. June 1, 2020.

Plattenberger, DA, Brown, T, **Ling, FT**, Lyu, X, Fitts, J, Peters, CA, Clarens, AF. "Feasibility of using reactive silicate particles with temperature-responsive coatings to enhance the security of geologic carbon storage". *International Journal of Greenhouse Gas Control*. 95. 102976. April 2020.

Hunter, HA, **Ling, FT**, Peters, CA. "Metals Coprecipitation with Barite: Nano-XRF Observation of Enhanced Strontium Incorporation". *Environmental Engineering Science*. 37. 4. Nov. 11, 2019.

Plattenberger, DA, **Ling, FT**, Peters, CA, Clarens, AF. "Targeted Permeability Control in the Subsurface via Calcium Silicate Carbonation". *Environmental Science & Technology*. May 28, 2019.

Plattenberger, DA, **Ling, FT**, Tao, Z, Peters, CA, Clarens, AF. "Calcium Silicate Crystal Structure Impacts Reactivity with CO₂ and Precipitate Chemistry". *Environmental Science & Technology Letters*. 5(9). 558 - 563. Aug. 24, 2018.

Ling, FT, Hunter, HA, Fitts, JP, Peters, CA, Acerbo, AS, Huang, X, Yan, H, Nazaretski, E, Chu, YS. "Nanospectroscopy Captures Nanoscale Compositional Zonation in Barite Solid Solutions". *Scientific Reports*. 1 - 11. 8:13041. Aug. 29, 2018.

Ling, FT, Post, JE, Heaney, PJ, Ilton, ES. "The relationship between Mn oxidation state and structure in triclinic and hexagonal birnessites". *Chemical Geology*. 216 - 217. Feb. 20, 2018.

Ling, FT, Post, JE, Heaney, PJ, Kubicki, JD, Santelli, CM. "Fourier-transform infrared spectroscopy (FTIR) analysis of triclinic and hexagonal birnessites". *Spectrochimica Acta Part A*. 178. 32 – 46. Jan. 17, 2017.

Ilton, E., Post, JE, Heaney, PJ, **Ling, FT**, Kerisit, SN. "XPS Determination of Mn Oxidation States in Mn(Hydr)oxides". *Applied Surface Science*. 366. Jan. 11, 2016.

Ling, FT, Heaney, PJ, Post, JE, Gao, X. "Transformations from triclinic to hexagonal birnessite at circumneutral pH induced through pH control by common biological buffers". *Chemical Geology*. 416. Oct. 9, 2015.

Research Students

Barite Co-precipitation for Fracking Wastewater Treatment Project

Kendra Schlitzer (Environmental Science major, La Salle Class of 2021): Fall 2020 – present

Amber O'Connor (Biochemistry major, La Salle Class of 2020): 2019 – 2020, Ph.D. student at University of Florida

Sarah Tse (Chemistry major, La Salle Class of 2021): Summer 2019

Lead Contamination in Philadelphia Soils Project

Kathleen Cody (Environmental Science major, La Salle Class of 2021): Summer 2020 – present

Olivia Weber (Environmental Science major, La Salle Class of 2021): Summer 2019 – Spring 2020

Fungal Biomineralization Project (in collaboration with Prof. James Church)

Maeve Gimbert (Environmental Science major, La Salle Class of 2023): Fall 2020 – present

Kaila Rhodes (Biology major, La Salle Class of 2021): Spring 2020

Giselle Burrell (Geology major, La Salle Class of 2020): Fall 2019 – Spring 2020

Other Undergraduate Projects

Megan Bentrewicz (Environmental Science major, La Salle Class of 2021) – Soil microbial diversity at Penllyn Field station in collaboration with Prof. James Church: Fall 2020 - present

Joyce Kimojino (Environmental Engineering major, Princeton Class of 2020) – Reactive transport modeling of CaSiO₃ dissolution and precipitation with CO₂ in a porous medium: Fall 2017 – Spring 2018

Angela Bertagni (Geoscience major, Penn State Class of 2016) – Transformation of triclinic to hexagonal birnessites in water: Fall – Spring 2016

Tongzhang Qu (Geoscience major, Penn State Class of 2016) – Titration of birnessite as a solid-state buffer: Fall – Spring 2016

Graduate Student Mentorships

Julie Kim (Ph.D. student in Environmental Engineering, Princeton University) – Application of machine learning for mineral identification using micron-scale synchrotron X-ray diffraction mapping: August 2017 – July 2018

Heather A. Hunter (Ph.D. in Environmental Engineering, Princeton University, defended 2020) – Co-precipitation of Sr into BaSO₄ from aqueous solution for the treatment of produced waters: September 2016 – July 2018

Invited Talks

Ling, FT. “The environmental injustice of urban lead: Are we being poisoned in our own neighborhoods?”. La Salle University Explorer Café. February 5, 2020. Philadelphia, PA.

Ling, FT. “Engineering Crystals for Contaminant Treatment: Tales of manganese oxides and calcium silicates”. Drexel University Biodiversity Earth & Environmental Science (BEES) Seminar. May 16, 2019. Philadelphia, PA.

Ling, FT. “Minerals: A Solid Solution to Environmental Problems”. La Salle University Biology Club Seminar. October 23, 2018. Philadelphia, PA.

Ling, FT, Peters, CA, Fitts, JP, Heaney, PE, Post, JE. “Mineral-Solid Solutions as Environmental Solutions: Understanding the formation of barite, manganese oxide, and calcium silicate hydrate minerals to tackle environmental problems”. Lamont-Doherty Earth Observatory, Columbia University – Sept. 2017, Palisades, NY

Ling, FT, Heaney, PJ, Post, JE, Santelli, CM, Burgos, WD, Rose, AW. “Treating acid mine drainage with biomineral engineering”. Princeton American Chemical Society Meeting – April 2017, Princeton, NJ.

Ling, FT, Heaney, PJ, Post, JE, Ilton, ES, Santelli, CM, Burgos, WD, Rose, AW. “Natural Mn oxides: a solution to removing contaminant lead”. Environmental Geology & Geochemistry Seminar, Princeton University – March 2017, Princeton, NJ

Ling, FT, Heaney, PJ, Post, JE. “The uptake of contaminant lead with layered Mn oxides”. Rice University – February 2017, Houston, TX

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- Ling, FT.** “Manganese is the New Black: Tailoring black manganese oxide precipitation for the remediation of acid mine drainage”. Juniata College – November 2016, Huntingdon, PA
- Ling, FT.** “A time-resolved X-ray diffraction study on the uptake of contaminant lead to layered Mn oxides”. University of Virginia – October 2016, Charlottesville, VA
- Ling, FT, Heaney, PJ, Post, JE, Ilton, ES, Santelli, CM, Burgos, WD, Rose, AW.** “Influences of structure and chemistry on the reactivity of terrestrial manganese oxides”. Civil and Environmental Engineering, Princeton University – February 2016, Princeton, NJ
- Ling, FT, Post, JE, Heaney, PJ, Santelli, C.** “Structures and behaviors of manganese oxides in terrestrial environments”. Smithsonian Institution, Department of Mineral Sciences – May 2015, Washington, DC
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Conference Presentations

- Peters, CA, Kim, JK, **Ling, FT**, Plattenberger, DA, Clarens, AF, Lanzirotti, A, Newville, M. “Machine learning for SMART mineral mapping using coupled XRF-XRD”. Goldschmidt Conference – Oral Presentation, August 2020 Virtual Symposium.
- Ling, FT**, Plattenberger, DA, Peters, CA, Clarens, AF. “Modeling mineral precipitation and permeability evolution from calcium silicate reactions with CO₂”. American Chemical Society Meeting Spring 2020, Oral Presentation – Accepted but not presented because of Covid-19.
- O’Connor, AL, **Ling, FT.** “Barite co-precipitation of arsenic and chromium anions for the treatment of fracking wastewater”. American Chemical Society Meeting Spring 2020, Poster Presentation – Accepted but not presented because of Covid-19.
- Hinkle, MA, Rosenfeld, CE, **Ling, FT**, Santelli, CM, Heaney, PJ, Post, JE. “Heavy metal uptake by biogenic manganese oxides with structural variability: connecting lessons from coal mine drainage remediation and the laboratory”. American Chemical Society Meeting Spring 2020, Oral Presentation – Accepted but not presented because of Covid-19.
- Tse, S, **Ling, FT.** “Treatment of Fracking Wastewater with Barite Co-precipitation”. MICRONET Symposium, Poster Presentation - August 2019, Philadelphia, PA.
- Ling, FT**, Plattenberger, DA, Peters, CA, Clarens, AF. “A Reactive Transport Model of CaSiO₃ Reactions for Targeted Mineral Precipitation in Porous Media”. American Geophysical Union Meeting 2019, Poster Presentation – December 2018, Washington, DC.
- Ling, FT**, Hunter, HA, Fitts, JP, Lanzirotti, A, Acerbo, AS, Peters, CA. “Geochemical Modeling of Arsenic Co-precipitation and Compositional Zonation in Barite”. American Chemical Society Meeting Fall 2018, Oral Presentation – August 2018, Boston, MA.
- Ling, FT**, Hunter, HA, Fitts, JP, Lanzirotti, A, Acerbo, AS, Peters, CA. “Arsenic removal from high salinity wastewater through barite co-precipitation”. Geological Society of America 2017, Oral Presentation – October 2017, Seattle, WA
- Plattenberger, D, Tao, Z, **Ling, FT**, Peters, CA, Clarens, AF. “Pseudowollastonite Carbonation Could Enable New Frontiers in Carbon Storage”. American Geophysical Union 2017, Oral Presentation – December 2017, New Orleans, LA
- Ling, FT**, Tao, Z, Plattenberger, D, Fitts, JP, Peters, CA, Clarens, A. “Wollastonite hydration, dissolution, and calcite precipitation for targeted mineral carbonation”. Goldschmidt Conference 2017, Oral Presentation – August 2017, Paris, France
- Hunter, HA, **Ling, FT**, Fitts, JP, Peters, CA. “Barite Particle Precipitation Kinetics and Trace Metal Uptake”. Goldschmidt Conference 2017, Poster Presentation – August 2017, Paris, France
- Ling, FT**, Hunter, HA, Fitts, JP, Lanzirotti, A, Acerbo, AS, Peters, CA. “Synchrotron Nano-X-ray Fluorescence Mapping and Geochemical Modeling of Arsenic Co-precipitation in Barite”. NSLS-II/CFN Users’ Meeting 2017, Poster Presentation – May 2017, Shirley, NY
- Ling, FT**, Hunter, HA, Fitts, JP, Lanzirotti, A, Acerbo, AS, Peters, CA. “Geochemical modeling of Arsenic incorporation during barite precipitation”. American Chemical Society Conference Spring 2017, Oral Presentation – April 2017, San Francisco, CA
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- Ling, FT**, Heaney, PJ, Post, JE, Ilton, ES, Santelli, CM, Burgos, WD, Rose, AW. “A time-resolved X-ray diffraction study on the uptake of contaminant Pb to triclinic and hexagonal birnessites”. American Chemical Society Conference Fall 2016, Best Student Talk Geochemistry Division – August 2016, Philadelphia, PA
- Ling, FT**, Post, JE, Heaney, PJ, Ilton, ES, Santelli, CM, Burgos, WD, Rose, AW. “A characterization of synthetic and natural birnessites”. Geological Society of America Conference 2015, Oral Presentation – November 2015, Baltimore, MD
- Ling, FT**, Post, JE, Heaney, PJ, Ilton, ES, Santelli, CM, Burgos, WD, Rose, AW. “A comparison of synthetic triclinic and hexagonal birnessites with natural birnessites”. Goldschmidt Conference 2015, Poster Presentation – August 2015, Prague, Czech Republic
- Ling, FT**, Heaney, PJ, Post, JE, Gao, X. “Transformations from triclinic to hexagonal birnessite at circumneutral pH induced by common biological buffers”. American Chemical Society National Meeting, Oral Presentation – March 2015, Denver, CO
- Ling, FT**, Heaney, PJ, Post, JE. “Sorption of contaminant lead (Pb) with triclinic and hexagonal birnessite”. Environmental Chemistry and Microbiology Student Symposium, 2nd Place Oral Presentation – March 2014, University Park, PA
- Ling, FT**, Heaney, PJ, Post, JE. “Sorption of contaminant lead (Pb) with triclinic and hexagonal birnessite”. Clay Minerals Society Poster Presentation, 2nd Place Poster Presentation – October 2013, Urbana-Champaign, IL
- Ling, FT**, Jackson, B, Chen, C. “Bioaccumulation of Ag-nanoparticles in an aquatic food chain”. Dartmouth College Earth Sciences Department Senior Theses Night, Oral Presentation – June 2011, Hanover, NH
- Ling, FT**, Jackson, B, Chen, C. “Bioaccumulation of Ag-nanoparticles in an aquatic food chain”. Karen E. Wetterhahn Science Symposium, Poster Presentation – May 2011, Hanover, NH
- Ling, FT**, Saalfeld, S., Bostick, B. “Arsenic removal from drinking water”. Karen E. Wetterhahn Science Symposium, Poster Presentation – May 2008, Hanover, NH
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Service & Activities

La Salle University, Philadelphia, PA (Aug. 2018 – present)

Environmental Science Program Service (Aug. 2018 – present)

Advise students in the Environmental Science Major and Minor. Involved in the development and approval of the Environmental Science major and minor. Developed new courses in the Environmental Science Program. Developing assessment strategies for courses. Help coordinate course offerings. Involved in program recruitment, including reaching out to prospective students, developing advertising materials for the admissions office, and attendance to open houses. Manage program communication with students, including the development and maintenance of a Canvas page to advertise internship, career, and graduate school opportunities.

Diversity, Inclusion, Equity, and Respect Committee Member, Department of Chemistry and Biochemistry (September 2020 – present)

Working with students to improve diversity and inclusion in the Department of Chemistry and Biochemistry, and the Environmental Science Program. Work has involved surveying students, identifying new resources to provide to students, and advertising current available resources. Also involved in initiatives for incorporating social justice into the curriculum.

Project Compass, Initiative Owner (February 2020 – present)

Leading the initiative to increase informal interactions between students and faculty. Developed resources for departments and administrative assistants to hold virtual and in-person events. Connected School of Nursing and Health Sciences, the School of Business, and the School of Arts and Sciences to student programming in advertising virtual events. Worked with the De La Salle Institute to survey and encourage faculty teaching first-year seminars on best practices for community building in the virtual classroom.

La Salle High School Education Initiative Mentor (Spring 2020)

Mentored a high school student interested in majoring in Environmental Science.

Pre-Health Committee Member (Sept. 2019 – present)

Advised students seeking to attend health professional schools on personal statements and extracurricular activities.

Fishes and Loaves (October 2019)

Volunteered with La Salle University students at a soup kitchen, *Fishes and Loaves*, in Trenton, NJ.

Philadelphia Science Festival (April 2019)

Coordinated service learning opportunity for students with Prof. Rhonda Hazell, in which students developed environmental science activities for children to be displayed at events during the Philadelphia Science Festival, Science After Hours, and Clark Park Science Day. Our activity won “Best to Visit for Children to Learn and Interact 2019”.

Mineralogical Society of America, Early Career Reviewer

Chemical Geology, Co-Referee with Catherine A. Peters

Argonne National Laboratory User Proposals, Referee

Crystals, Referee

International Journal of Experimental Spectroscopic Techniques, Referee

Professional Development

Early Career Geoscience Faculty Workshop (August 2020)

La Salle University Summer Institute Workshops (June 2019, June 2020)

La Salle University Winter Institute Workshops (December 2018, December 2019)

Professional Affiliations

American Chemical Society
Geochemical Society
Mineralogical Society of America
Geological Society of America
American Geophysical Union

Languages

Spanish (fluent), Cantonese (conversational), Matlab