

# Emily C. First

Postdoctoral Associate

Department of Earth & Atmospheric Sciences (EAS)  
Cornell University - Ithaca, NY

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## Education

- 2017      PhD in Geology & Geophysics, University of Hawai‘i at Mānoa  
            **TITLE:** Magmatic environments and timescales: Experimental studies on  
            martian basalt and terrestrial dacite. **COMMITTEE:** Julia Hammer (chair),  
            Bruce Houghton, Jeff Taylor, Thomas Shea, John Allen
- 2015      M.S.-en-route in Geology & Geophysics, University of Hawai‘i at Mānoa
- 2011      B.A. in French, University of Georgia  
            B.S. in Geology, University of Georgia  
            — *summa cum laude* with highest honors
- 2010      Exchange semester at Institut d’études politiques de Paris (SciencesPo)

## Positions Held

- 12/2020 – present    **51 Pegasi b Postdoctoral Fellow**  
                          *Cornell University Dept. of Earth & Atmospheric Sciences*  
                          Faculty mentor – Esteban Gazel  
                          — chemical and textural analysis of a wide swath of igneous materials, to  
                          create a database relevant to exoplanet research
- hemispherical MIR reflectance spectra using FTIR spectrometer  
with integrating sphere
  - (de)convolution of acquired spectra for methodological  
assessment and comparison to exoplanet signals
- 04/2018 – 11/2020    **Postdoctoral Research Associate**  
                          *Brown University Dept. of Earth, Environ. & Planet. Sciences*  
                          Supervisor – Malcolm Rutherford
- experimental lab work: TZM, capsule welding, thin section prep
  - analytical work: EDS and WDS spot analyses and imaging (EPMA),  
SIMS volatile analyses, MATLAB modeling
  - data analysis and interpretation
  - manuscript and proposal drafting (writing, editing, preparing figures in  
Photoshop and Illustrator)
- 01/2018 – 02/2018    **Postdoctoral Fellow**  
                          *University of Hawaii Dept. of Geology & Geophysics (now Earth Sciences)*  
                          Supervisor – Julia Hammer

- data analysis and interpretation
- manuscript drafting (writing, editing, preparing figures in Illustrator)

01/2012 – 12/2017

**Research Assistant**

*University of Hawaii Dept. of Geology & Geophysics (now Earth Sciences)*

Supervisor – Julia Hammer

- experimental lab work: 1-atm gas-mixing furnace (CO<sub>2</sub>+H<sub>2</sub>), water-medium cold-seal pressure line, thin section preparation, capsule welding
- analytical work: EDS and WDS spot analyses and maps (on SEM and EPMA), electron backscatter diffraction, MATLAB coding
- data analysis and interpretation
- manuscript drafting (writing, editing, preparing figures in Illustrator)

08/2011 – 12/2011

**Teaching Assistant**

*University of Hawaii Dept. Geology & Geophysics (now Earth Sciences)*

Supervisor – Scott Rowland

- taught 2 sections of introductory Geology lab, including pre-labs, in-class activities, local field trips, developing rubrics, and grading assignments

07/2011 – 08/2011

**Teaching Assistant**

*University of Georgia Dept. of Geology Honors Interdisciplinary Field Program*

Supervisor – Paul Schroeder

- helped teach latter half of an 8-week field program in Geology, Anthropology, and Ecology, while camping across the country, including short lectures, grading, aid with field-based research projects
- locations included Mount St. Helens, Medicine Lake, Glacier NP, Dinosaur NM, Valles Caldera, Snake River Plain, Yellowstone
- drove daily and helped manage task rotations

05/2011 – 06/2011

**Teaching Assistant**

*University of Georgia Dept. of Geology Field School*

Supervisor – Doug Crowe

- helped teach 6-week capstone field course for Geology majors, based in Cañon City, CO, including assistance in the field, short lectures, grading maps and written assignments, GIS work
- managed daily scheduling, shopping, driving, assigned tasks, organized week-long field excursions
- in charge of budget, cash, bookkeeping for the group of ~50 people

10/2018 – present

**Coordinator, Science Teaching and Education Program (volunteer)**

*Brown University Dept. of Earth, Environ. & Planet. Sciences*

Program head – Olga Prilipko Huber

- conceiving, writing, and implementing inquiry-based, quarter-long science modules from scratch for elementary school teachers in

- Providence, RI with a core group of coordinators
- grades 2, 3, and 4 finished or in process so far
  - Earth changes over time (gr2); weather and climate (gr3); erosion and natural hazards (gr4)
- classroom teaching (the first time a lesson is brought to the classroom)
- teacher support (after lesson has been taught at least once)

## Peer-Reviewed Publications

\* indicates undergraduate mentee of E. First

**First, E.**, Hammer, J., Ruprecht, P., Rutherford, M. (2021) Experimental constraints on dacite magma storage beneath Volcán Quizapu, Chile. *Journal of Petrology*, egab027. <https://doi.org/10.1093/petrology/egab027>

**First, E.**, Leonhardi, T.\*, Hammer, J. (2020) Effects of superheating magnitude on olivine growth. *Contributions to Mineralogy and Petrology*, 175: 13. <https://doi.org/10.1007/s00410-019-1638-7>

Shea, T., Hammer, J., Hellebrand, E., Mourey, A., Costa, F., **First, E.**, Lynn, K., Melnik, O. (2019) Phosphorous and aluminum zoning in olivine: Contrasting behavior of two nominally incompatible trace elements. *Contributions to Mineralogy and Petrology*, 174: 85. <https://doi.org/10.1007/s00410-019-1618-y>

**First, E.**, Hammer, J. (2016) Igneous cooling history of olivine-phyric shergottite Yamato 980459 constrained by dynamic crystallization experiments. *Meteoritics and Planetary Science*, 51, 1233-1255. <https://doi.org/10.1111/maps.12659>

Brachfeld, S., Shah, D., **First, E.**, Hammer, J., Bowles, J. (2015) Influence of redox conditions on the intensity of Mars crustal magnetic anomalies. *Meteoritics and Planetary Science*, 50, 1703-1717. <https://doi.org/10.1111/maps.12505>

Shea, T., Hammer, J., **First, E.** (2013) Magma balloons or bombs? *Nature Geoscience*, 6, 802–803. <https://doi.org/10.1038/ngeo1971>

## Conference Abstracts

**First, E.**, Rutherford, M. (2019) Immiscibility in evolved lunar magmas. *LPSC 2019*, abstract#2117. TALK.

**First, E.**, Rutherford, M. (2018) Phase equilibria and conditions of silicate liquid immiscibility in silicic lunar magmas at mid-lower crustal pressures and various H<sub>2</sub>O contents. *AGU 2018*, abstract#P23E-3494. POSTER.

**First, E.**, Hammer, J., Shea, T., Hellebrand, E., Tachera, D.\* (2018) Magnesium diffusion in labradorite at hydrous magmatic conditions. *Goldschmidt 2018*, abstract#2018003038. TALK.

Hammer, J., **First, E.**, Shea, T., Leonhardi, T.\*, Brachfeld, S. (2018) Nucleation: an existential problem in an extreme environment. *Goldschmidt 2018*, abstract. TALK.

Shea, T., Hammer, J., Hellebrand, E., Mourey, A., **First, E.**, Lynn, K., Costa, F. (2018) Phosphorous and aluminum partitioning during olivine growth: both sides of the story. *Goldschmidt 2018*, abstract. POSTER.

**First, E.**, Hammer, J., Ruprecht, P. (2017) Experimental constraints on dacite magma storage beneath Volcán Quizapu, Chile. *IAVCEI Scientific Assembly 2017*, abstract #917. TALK.

Brachfeld, S., **First, E.**, Hammer, J., Stewart, S., Hankin, M., Spaulding, D., Bowles, J., Strauss, E., Withers, A., Feinberg, J. (2016) Magnetic properties of synthetic Gusev Crater basalts: Implications for remanence acquisition and impact demagnetization of the martian crust. *AGU 2016*, abstract# GP13A-04. TALK.

Leonhardi, T., Hammer, J., **First, E.** (2015) Effect of superheating on olivine nucleation and growth in a silica-undersaturated melt: An experimental study. *AGU 2015*, abstract #V41B-3071. POSTER.

**First, E.**, Hammer, J. (2014) Extrusive history of martian meteorite Yamato 980459: An experimental study. *Goldschmidt 2014*, abstract #698. POSTER.

**First, E.**, Hammer, J., Welsch, B. (2013) Thermal history of Yamato 980459- Constraints from mineralogy, crystal morphology, and dynamic cooling experiments. *LPSC XLIV*, abstract #2943. TALK.

**First, E.**, Hammer, J. (2012) Laboratory studies of crystallization kinetics in magma-Elucidating the crystallization history of a martian meteorite. *10<sup>th</sup> International Symposium on Crystallization in Glasses and Liquids*. POSTER.

**First, E.**, Summerlin, E.S., Patiño Douce, A., Roden, M.F. (2011) Mineral probes of magmatic processes at Valles caldera, northern New Mexico. *GSA Southeastern Section 60<sup>th</sup> Annual Meeting*, abstract #184984. POSTER.

## Invited Talks

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|------|--|
| 2021 | ANDES Seminar (Cornell): <i>Experimental constraints on dacite magma storage at Volcán Quizapu, Chile</i>                              |
| 2020 | GMP Lunch Bunch Talk (Brown): <i>Hidden gems: New petrologic possibilities for the Apollo 17 orange glass magma</i>                    |
| 2019 | Geochemistry & Geophysics seminar (Woods Hole Oceanographic Institution): <i>Silicate liquid immiscibility in evolved lunar magmas</i> |
| 2018 | GMP Lunch Bunch Talk (Brown): <i>Silicate liquid immiscibility in evolved lunar</i>  |

- 2017 *magmas: Preliminary experimental findings and relevance to red spots*  
ARCS Foundation public pau hana (Honolulu, HI): *Cooking magma: Research in the experimental petrology lab and beyond*
- 2017 REU Seminar Series (U. Hawaii): *Between a rock and a hot place: Phase equilibrium experiments on a dacite magma from the southern Andes*
- 2013 HIGP Seminar (U. Hawaii): *Methods in the Madness* (experimental/methodological conundrums and study of martian meteorite Y-980459)
- 2013 TGIF Bullard Fellowship Talk (U. Hawaii): *Petrology of martian meteorite Yamato 980459: Mineralogy, crystal morphology, and laboratory experiments*

## Honors and Awards

- 2020 51 Pegasi b Postdoctoral Fellowship
- 2016 ARCS Honolulu Scholar - Toby Lee award in Geology & Geophysics
- 2015 U. Hawaii Geology & Geophysics achievement award
- 2013 ARCS Honolulu Scholar
- 2011-2013 Fred M. Bullard Graduate Fellowship, U. Hawaii Geology & Geophysics
- 2011-present Member of Phi Beta Kappa
- 2011 U. Georgia First Honor Graduate, a distinction for graduates with 4.00 GPA
- 2011 U. Georgia Honors Program Joy P. Williams Science Award
- 2011 Undergraduate Student of the Year, U. Georgia Geology
- 2010 Vernon Hurst Undergraduate Research Award, U. Georgia Geology
- 2009 Field School Student of the Year, U. Georgia Geology
- 2007-2011 Honors Program student at U. Georgia
- 2007-2011 HOPE scholarship, a state of Georgia merit-based scholarship
- 2007-2011 National Merit Scholarship

## Funding

- 2020 *proposed* PI of NASA proposed research “Apollo 17 picritic magmas: New perspectives on crystallization and ascent processes”
- 2019 awarded Co-I of NSF grant entitled “Experimental Study of Clinopyroxene Growth and Sector Zoning” (PI Benoit Welsch - \$379,864)
- 2017 awarded Lipman Research Award from the GSA (\$2650)
- 2017 awarded GSA MGPV Division Student Award (\$2000)
- 2017 awarded UH Graduate Student Organization Travel Grant (\$732.40)

## Additional Teaching and Outreach Activities

- 2021 Skype-a-Scientist with New York high school science classes
- 2021 Skype-a-Scientist with Connecticut elementary school

2020, 2019	Geosciences Congressional Visit Day (Geo-CVD) / Virtual CVD (2020) — selected as a Geo-CVD participant to represent AGU on Capitol Hill — workshop on communication; met with Congressional offices to advocate for STEM education, funding, and bills supporting diversity in science
2019, 2018	Skype-a-Scientist with New Jersey 4 <sup>th</sup> grade class
2018	Completed Certificate I course through Sheridan Center at Brown University — semester-long; prepares early career academics for college teaching — topics included reflective teaching, inclusive classrooms, backward design
2017	Guest lectured for Geology101 class at U. Hawaii
2017	Co-leader of GSA Cordilleran section field trip to Kilauea Volcano — covered historical and active flows, explosive deposits, caldera history
2012-2016	Ran a weekly reading/discussion group for Volcanology, Geochemistry & Petrology (VGP) group at U. Hawaii
2017,-15, -13, -11	2-day Open House explosive eruptions demonstration for schools and public
2016, 2012	Head of new graduate student welcoming committee
2016,-15,-14	Reviewer of mini-grant proposals for K-12 teachers in Hawaii
2015	Taught mini-workshop on using the MELTS and alphaMELTS programs
2015, 2014	Traveling seismic lab activity at local Hawaii middle schools
2014	Day of mineralogy experiments with local 6 <sup>th</sup> graders
2014	Think Tech Hawaii “Petrological Puzzles” interview hour
2014, 2013	Middle School Research Conference at U. Hawaii
2012	Guest lectured for a week, plus designed and taught an in-class lab on viscosity for Volcanology undergraduate course at U. Hawaii
2013	Hawaii Ocean Science Bowl volunteer
2012	Ocean and Earth Science Day at U. Hawaii
2012	Ocean Science Career Night at Kailua Intermediate School (HI)
2010-2011	Outreach Coordinator for Geology Club at U. Georgia
2008-2009	Homework Helpers program volunteer, Clarke County (GA) Libraries
2007-2008	Clarke County (GA) Mentor Program mentor for middle schooler

## Additional Field Experience

2017	Research cruise aboard R.V. Kilo Moana; mapping, dredging east of Molokai
2016	Mapped a recent explosive deposit on the rim of Halema’uma’u Crater, Kilauea Volcano, with a group from U. Hawaii and USGS HVO
2016	Field campaign in Maule region of Chile, to sample dacite lava flows of Volcán Quizapu, along with geology of nearby mafic volcanic centers
2014	Participant in Goldschmidt conference field trip around Yosemite National

- Park – pluton emplacement, recrystallization features, megacryst formation
- 2011-2014 Volcanology/petrology activities and classwork research in Hawaii – Ko’olau, Wai’anae, Kilauea, West Maui, Haleakala; and New Zealand – Ruapehu, Ngauruhoe, Tongariro, Taupo, White Island
- 2009 UGA Field School student participant  
— Six-week field camp for geology majors, based in Cañon City, CO with trips to Utah and southern Colorado; four mapping projects; GIS short course; other field work in the Uinta and Paradise basins, Great Sand Dunes NP, Summitville Mine Superfund site, Valles caldera
- 2008 UGA Honors Interdisciplinary Field Program student participant  
— Summer program of coursework in geology, anthropology, and ecology while camping across the country; locations include Sapelo Island, Mesa Verde, Crater Lake, Mount St. Helens, Yellowstone, Grand Tetons, Denver ice core lab; activities include geologic mapping, soil coring, assessment of stream remediation, research papers

## Coursework Highlights

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|---------------|---|
| Graduate      | Theoretical Petrology (Julia Hammer)  |
| Graduate      | Explosive Volcanism (Bruce Houghton)  |
| Graduate      | Volcanology (Bruce Houghton)  |
| Graduate      | Petrology of the Moon and Mars (Jeff Taylor)                                |
| Graduate      | Hawaiian Geology (John Sinton)  |
| Graduate      | Numerical Methods (Robert Dunn)   |
| Graduate      | Mechanics of Fluids (John Allen)  |
| Graduate      | Geomathematics (Janet Becker)   |
| Undergraduate | Advanced Igneous & Metamorphic Petrology (Mike Roden, Alberto Patiño-Douce) |
| Undergraduate | Geology Field School (Mike Roden, Doug Crowe)                               |

## Professional Service Activities

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|------------|--|
| 2021       | Reviewer for <i>Lithos</i>                                     |
| 2020, 2019 | Reviewer for <i>Journal of Petrology</i>                       |
| 2019       | Reviewer for <i>JGR: Solid Earth</i>                           |
| 2019       | Dwornik Award judge for LPSC meeting                           |
| 2018       | Outstanding Student Presenter Award judge for AGU Fall Meeting |
| 2018       | Proposal reviewer for NSF EAR division                         |

## **Professional Society Memberships**

2017-present	Internat'l Assoc. of Volcanology and Chem. of the Earth's Interior (IAVCEI)
2013-present	American Geophysical Union (AGU)
2013-present	Geological Society of America (GSA)
2013-present	Mineralogical Society of America (MSA)

## **Additional Skills**

MATLAB  
Adobe Photoshop  
Adobe Illustrator  
ImageJ  
French (proficient reading, writing, and oral communication)