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Emily C. First

51 Pegasi b Postdoctoral Fellow

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

Education

2017 Ph.D. in Geology & Geophysics, University of Hawai'i at Mānoa (Honolulu, HI)
"Magmatic environments and timescales: Experimental studies on martian basalt and terrestrial dacite" – advisor Julia Hammer

2011 B.S. in Geology, *summa cum laude*, University of Georgia (Athens, GA)
A.B. in French, *summa cum laude*, University of Georgia (Athens, GA)

Professional Appointments

Beginning 12/ 2022 **Assistant Professor**
Macalester College Dept. of Geology

2020 – present **51 Pegasi b Postdoctoral Fellow**
Cornell University Dept. of Earth & Atmospheric Sciences
- Characterization and comparison of igneous rocks of widely varying texture and composition, via infrared reflectance/emission spectroscopy
- Collaboration with students and professors of Astronomy to model laboratory-acquired spectra for a database tailored to exoplanet research
- Initiated a collaboration with NIST to optimize and standardize measurement procedures

2018 – 2020 **Postdoctoral Research Associate, Laboratory of Malcolm Rutherford**
Brown University Dept. of Earth, Environ. & Planet. Sciences
- Designed experiments to investigate the development of immiscible silicate liquids in evolved lunar magmas
- Initiated new petrologic analyses and chemical mapping of Apollo 17 orange soil drill core samples
- Authored or contributed to multiple NASA and NSF proposals

2018 **Postdoctoral Fellow, Laboratory of Julia Hammer**
University of Hawaii Dept. of Geology & Geophysics (now Earth Sciences)
- Data analysis and interpretation for experiments on elemental diffusion in feldspar and equilibrium crystallization of silicic magmas

Peer-Reviewed Publications

* indicates undergraduate mentee

2021 Pineda, C., Hammer, J., **First, E.**, Morata, D. (2021) Storage conditions of a caldera-forming volcanic eruption: Insights from the Pudahuel rhyolitic ignimbrite in central Chile (32º 10′S). *Lithos*, 106382. https://doi.org/10.1016/j.lithos.2021.106382

2021 **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

2020 **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

2019 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

2016 **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

2015 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

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

Grants, Fellowships, and Awards

2020 – present 51 Pegasi b Fellowship in Planetary Astronomy, "Solid Ground – Developing a Spectral Database for Exoplanet Research" ($375,000)

2019 Co-I of NSF grant, "Experimental Study of Clinopyroxene Growth and Sector Zoning" (PI Benoit Welsch - $379,864)

2017 Lipman Research Award from the GSA ($2650)

2017	GSA MGPV Division Student Award ($2000)
2016	ARCS Honolulu Scholar - Toby Lee award in Geology & Geophysics ($5000)
2015	U. Hawaii Geology & Geophysics achievement award
2013	ARCS Honolulu Scholar ($5000)
2011– 2013	Fred M. Bullard Graduate Fellowship, U. Hawaii
2010	Vernon Hurst Undergraduate Research Award, U. Georgia

Teaching and Mentoring Experience

Leadership Positions

2018 – 2021 **Coordinator, Science Teaching and Education Program (STEP)**
Brown University Dept. of Earth, Environ. & Planet. Sciences
— Conception, writing, and classroom implementation of inquiry-based science curriculum for elementary grade levels
— Design of lessons and hands-on activities with NGSS-based Earth science focus (e.g., gr2 Earth Changes Over Time; gr4 Erosion and Energy)
— Collaboration with core group of 3-5 coordinators, local teachers, and program head Olga Prilipko-Huber

2017 **Co-leader, GSA Cordilleran section field trip to Kīlauea Volcano**
— Developed and gave field lecture on eruption of Kīlauea Iki, contributed to other topics on caldera formation, explosive eruptions, general Hawaiian volcanology; coordinated transportation and supplies for full day hike, managed safety and accessibility issues while on active lava flows

2015 **Facilitator, mini-workshop on MELTS and alphaMELTS**
University of Hawaii Dept. of Geology & Geophysics (now Earth Sciences)
— After attending MELTS workshop at Caltech, single-handedly re-created a shorter version of the workshop to share new skills and knowledge with the department, including short lectures and relevant problem sets

Teaching Assistantships

2011 Fall **Introductory Geology Lab** *University of Hawaii*
— (2 sections) Engaged students with pre-lab lectures, guided in-class activities, led local field trips, developed grading rubrics

2011 Summer **Honors Interdisciplinary Field Program (Western US)** *University of Georgia*
— Developed lectures, devised grading rubrics, guided field-based research projects incorporating geology, anthropology, and ecology
— Managed camp logistics and task rotations (tent camping for weeks)

Field School (based in Cañon City, CO) *University of Georgia*
— Supervised undergraduates in their capstone field course, graded maps and written assignments, developed lectures, tutored students in GIS

— Managed daily scheduling, shopping, and driving; assigned tasks; organized week-long field excursions for ~50 people
— Tracked and managed budget, cash, and bookkeeping for the program

Guest Lectures

2022	Earth Materials course – Felsic minerals optical mineralogy lab; Cornell
2021	Volcanology course – Explosive eruptions soda+candy lab (in person); Cornell
2021	How to Build a Habitable Planet course – Exoplanets (in person); Cornell
2021	Earth Materials course – Minerals and Rocks (remote); Cornell
2020	Earth Systems course – Weathering and Erosion; Furman University
2015	Dynamic Earth course – Evolution and Earth History; University of Hawaii
2012	Volcanology course – Viscosity; University of Hawaii *(taught class for one week, including design and implementation of lab activities)*

Mentoring Experience

2021-present **Mentoring of undergraduate researcher,** *Cornell University*
— theoretical physics major interested in geology; taught billet grinding and polishing methods, microscopy, FTIR spectroscopy, lab safety, petrology; discussions about career / grad school; learning XRD together

2021 **Mentored an undergraduate summer lab assistant,** *Cornell University*
— taught billet grinding and polishing methods, lab safety; discussed planetary science and her career thoughts, options

2018 – present **Informal mentoring of grad students and postdocs,** *Brown, Cornell*
— listen and discuss career aspirations; give feedback on talks, applications, and abstracts; act as liaison between students and dept. higher-ups; facilitate meetings with ombudsperson; help with research and computational issues; encourage positive group dynamics

2015 – 2016 **Mentored undergraduate researcher D. Tachera**, *University of Hawaii*
— part of a university-wide effort to engage undergraduates from historically underrepresented groups in their chosen areas of research
— mentee collaborated on feldspar diffusion project and presented findings twice (one poster, one talk) to the university community
— mentee went on to graduate school in groundwater geochemistry, is current UCAR Next Generation Fellow

2014 – 2015 **Co-advised senior thesis project of T. Leonhardi**, *University of Hawaii*
— conceived of the project; trained and supervised mentee in complex laboratory techniques, safety, and experimental analysis; offered constructive feedback on myriad written drafts of thesis; encouraged professional pursuits, discussed academic career options, provided a sounding board for dealing with departmental issues
— collaborated with mentee on national conference presentations and eventually a published paper

Professional Development (Teaching and Mentoring)

2021 **Course Design**, *Cornell University*
— 4-part workshop series on: crafting learning outcomes, tailoring syllabi, creating activities for active learning, designing effective assessments

2021 **Essentials of Teaching**, *Cornell University*
— 4-part workshop series on: inclusive teaching strategies, student engagement, creating grading rubrics

2021 **Building Mentorship Skills for Academic Careers**, *Cornell University*
— 5-part intensive workshop on: mentoring compacts, expectations and boundaries, devising appropriate research projects, giving constructive feedback, fostering inclusion, writing recommendation letters

2018 **Certificate I course through Sheridan Center**, *Brown University*
— Semester-long; prepares early career academics for college teaching
— Designed and revised a mini lesson on magma differentiation, using the concepts of reflective teaching, inclusive classrooms, and backward design

Research and Field Experience

2012 – 2017 **Research Assistant, Laboratory of Julia Hammer**
University of Hawaii Dept. of Geology & Geophysics (now Earth Sciences)
— experimental lab work: 1-atm gas-mixing furnace (CO_2+H_2), 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, interpretation, and communication (Photoshop, Illustrator)

2017 Research cruise aboard R.V. Kilo Moana; mapping, dredging east of Molokai
2016 Mapped explosive deposit at Halema'uma'u Crater, Kīlauea, with USGS
2016 Field campaign in Maule region of Chile
2014 Goldschmidt conference field trip around Yosemite National Park
2011 – 2014 Volcanology/petrology class research in Hawaii and New Zealand
2009 UGA Field School capstone course in Cañon City, CO with trips to Utah and southern Colorado; four mapping projects; GIS short course
2008 UGA Honors Interdisciplinary Field Program with courses, mapping, and research in geology, anthropology, and ecology while camping across the US

Conference Abstracts

* indicates undergraduate mentee

2022 **First, E. C.**, Gazel, E., Mishra, I., Lewis, N. K., Letai, J.*, Gustafson, J.* (2022). What's in a (rock) name? Infrared laboratory spectra of terrestrial "basalts" can inform interpretations of rocky exoplanet surfaces. *LPSC 2022*, abstract#2879. POSTER.

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

2018 **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_2O contents. *AGU 2018*, abstract#P23E-3494. POSTER.

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

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

2018 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.

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

2016 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.

2015 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.

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

2013 **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.

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

2011 **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 60th Annual Meeting*, abstract #184984. POSTER.

Seminar and Colloquium Talks

2021 Geology Seminar (Macalester): *Fresh from the oven: Exploring volcanoes with high-temperature experiments on terrestrial and extraterrestrial magmas*

2021 ANDES Seminar (Cornell): *Experimental constraints on dacite magma storage at Volcán Quizapu, Chile*

2020 Earth & Environmental Sciences seminar (Furman): *Volcanic plumbing systems at Volcán Quizapu (Chile) and beyond: Complementary insights from phase equilibrium and diffusion studies*

2020 GMP Lunch Bunch Talk (Brown): *Hidden gems: New petrologic possibilities for the Apollo 17 orange glass magma*

2019 Geochemistry & Geophysics seminar (Woods Hole Oceanographic Institution): *Silicate liquid immiscibility in evolved lunar magmas*

2018 GMP Lunch Bunch Talk (Brown): *Silicate liquid immiscibility in evolved lunar magmas: Preliminary experimental findings and relevance to red spots*

2017 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*

Outreach and Advocacy

2018 – 2021	Coordinator for departmental group designing and implementing elementary science curriculum for local schools, based on Next-Gen. Science Standards
2021	Skype-a-Scientist with Minnesota middle school science classes
2021	Skype-a-Scientist with New York high school science classes
2021	Skype-a-Scientist with Connecticut and Iowa elementary school classes
2020	Drafted and sent a letter to department higher-ups on behalf of graduate students concerned about infringements on their rights to protest
2020	Helped craft a letter from the Dept. of Earth and Environmental Sciences to Brown University regarding social justice concerns; partly as a result of this letter, the university made Election Day a paid holiday
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 — led a group including several graduate students in virtual meetings and calls with representatives and senators; in one instance our meeting convinced a senator to co-sponsor the STEM Opportunities Act
2019, 2018	Skype-a-Scientist with New Jersey 4th grade class
2017,-15, -13, -11	2-day Open House explosive eruptions demonstration for schools and public
2016,-15,-14	Reviewer of mini-grant proposals for K-12 teachers in Hawaii
2015, 2014	Traveling seismic lab activity at local Hawaii middle schools
2014	Day of mineralogy experiments with local 6th graders
2014	Think Tech Hawaii “Petrological Puzzles” interview hour
2014, 2013	Middle School Research Conference at University of 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

Departmental and Professional Service Activities

ongoing	Guest Editor for upcoming issue of *Elements* (2023 publication)
2022, 2019	Dwornik Award judge for LPSC meeting
2021	Reviewer for *Lithos*
2021	Lab tour and Q&A session for incoming Cornell University undergraduates from historically underrepresented groups
2020	Facilitated an invited talk for the Diversity Working Group series at Brown

2020, 2019	Reviewer for *Journal of Petrology*
2019	Planned and facilitated a full-day visit to Brown Earth, Environ. and Planet. Sciences Dept. by a *Nature Communications* editor
2019	Reviewer for *JGR: Solid Earth*
2018	Outstanding Student Presenter Award judge for AGU Fall Meeting
2018	Proposal reviewer for NSF EAR division
2012 – 2016	Ran a weekly reading/discussion group for Volcanology, Geochemistry & Petrology (VGP) group at University of Hawaii
2016, 2012	Head of new graduate student welcoming committee (U. Hawaii dept.)

Professional Society Memberships

2021 – present	SACNAS *Society for Advancement of Chicanos/Hispanics and Native Americans in Science*
2017 – present	IAVCEI *International Association of Volcanology and Chemistry of the Earth's Interior*
2013 – present	AGU *American Geophysical Union*
2013 – present	GSA *Geological Society of America*
2013 – present	MSA *Mineralogical Society of America*

Languages

English – native speaker
French – proficient reading, writing, and oral communication