

AN EXPERIMENTAL AND ANALYTICAL INVESTIGATION OF CLINOPYROXENE SECTOR ZONING IN TWO HAWAIIAN MAGMAS

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I received this grant to fund a conference trip for the annual *Geological Society of America* conference, held in Indianapolis, Indiana last Fall. This project, titled “An experimental and analytical investigation of clinopyroxene sector zoning in two Hawaiian magmas”, was completed at the University of Hawaii – Manoa through a research internship with the University of Hawaii and the National Science Foundation. While the bulk of this project was completed away from Bowdoin College, I arrived on campus for the Fall semester needing to complete a number of tasks to prepare for the Fall conference and was able to get guidance from Professor Emily M. Peterman of the Earth and Oceanographic Science department.

This project studies volcanic samples from the Hawaiian Island Chain. These volcanic rocks contain clinopyroxene crystals, a type of volcanic mineral, that preserve sector-zoned growth. This growth style is a hallmark of growth conditions away from equilibrium, and it manifests in different crystal faces of one mineral having a distinct chemical composition. To study this, I was able to replicate sector zoning from a powdered rock sample using a one-atmosphere, hydrogen-oxygen mixing furnace and compare it to a nature sample. Both the experimental sample and the natural sample originate from Hawaii. We were able to establish a chemical sector enrichment trend for the natural sample's clinopyroxene crystals, where major ions substitute in for one another in the chemical formula. We observed ion replacement of magnesium for silica and titanium for aluminum. The experimental sample, a replica of the natural sample, did not yield a strong chemical sector enrichment trend due to complications from experimental runs. The bulk of the experimental work was carried out at the University of Hawaii – Manoa. At Bowdoin College, I was able to corroborate the findings previously established by selecting additional crystal grains to analyze. I also was able to complete a preliminary electron backscattered diffraction (EBSD) get gain a sense of crystal orientation.

This grant has been instrumental in providing me a number of remarkable experiences in my junior year at Bowdoin. The research project was selected for an oral presentation at the Fall 2019 *Geological Society of America* conference. Having this experience showed me the process of completing unique research and showcasing it. In addition to the findings in the Fall, this project will continue on for my Honors project, to be completed in the Earth and Oceanographic Science (EOS) department. Emily M. Peterman was my initial advisor for this project during the time of my application for the Grua/O'Connell grant, but Rachel Beane of the EOS department will serve as my advisor and collaborator for this project. Additionally, the completion of this project will only be possible through ongoing collaboration with the University of Hawaii – Manoa; I will continue work on this project by facilitating regular video calls to accomplish this. The research project will aim to establish a catalogue of chemical sector enrichment trends and aim to establish a manuscript that characterizes these unique crystals for future work to decipher how they formed in the volcanic edifice on the island of Kaua'i, HI.

Faculty Mentor: Emily M. Peterman

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