Spotlight on... Emily Cunningham

written by Maya Pincus (USSSP)

Credit: Emily Cunningham

How does a self-proclaimed "feral child" end up as a 2022-2023 Schlanger Fellow? If you ask Emily Cunningham, be prepared for a fast-paced ride that is just as emotional as it is scientifically captivating.

Emily grew up in rural East Tennessee, where the only opportunity for an Earth science education could be found roaming through the fields and forests on her father's property. Some of her earliest memories are geological ones, fond recollections of time spent exploring the nature around her. At first, she begged her dad for answers, wondering if the rocks she saw had fallen out of the sky. Then, as her understanding of the world matured, she was able to marvel at the vertically dipping beds of the ancient mountain ranges in the area. At the time she had no mechanism to explain these striking phenomena, but the natural curiosity those experiences inspired would be the driving force that shaped the rest of her life.

It wasn't until Emily got to college that she discovered that science was something she liked and was good at. When she made it to her first geology class in the summer after her second year, she knew she found her fit. Her dedication and work ethic were immediately obvious to her professors, and as a result, she was invited to do her first fieldwork, a research trip to volcanic centers in the Cascade Range of the Pacific Northwest. Finally able to apply her passion for the natural world and love of problem-solving, Emily's path was set.

Charmingly humble, Emily gives a lot of credit to her undergraduate advisor, who mentored her through this first research project, and encouraged her to apply for a masters program at the University of Missouri. There, she studied a felsic rhyolite obsidian unit, focusing on melt and volatile interactions during magmatic processes and crystallization. As she wrapped up her degree and contemplated the rest of her life, she thought that moving to Salt Lake City was a "pipe dream," inspired by her love of hiking, rock climbing, and being outside. But when she saw an opening at the University of Utah she arranged a call with her now advisor Dr. Sarah Lambart. They "really hit it off," allowing Emily to move to that "wonderful place" to begin her doctorate degree.

In her free time, Emily combines her loves of geology and being outside when she rock climbs. In this photo, she is bouldering at Lily Boulders near the Obed Wild & Scenic River on the Cumberland Plateau in Tennessee (Credit: Emily Cunningham).

Though still driven by geologic mystery, Emily has come a long way since those first years wondering if rocks fell out of the sky. She is now working with Expedition 396 cores from the north Atlantic, a region known for the excess magmatism that occurred during the continental rifting of Pangaea. Despite being the subject of investigation for decades (including Ocean Drilling Program Leg 104), scientists still have not been able to pinpoint a definitive explanation for the unusual geology. There are three leading hypotheses about mantle conditions and behavior, which Emily can describe in terms simple enough for anyone to understand. But if the solution was that simple, Emily says, "it would have been figured out by now."

Emily and her lab group, including an undergraduate student whom she mentors, are using novel techniques to constrain the relative influence of each of the three hypothetical end members. For one, she has been studying first row transition elements (FRTEs)—specifically how they partition into and out of different mantle phases—as geologic tracers to understand lithologic heterogeneities in the mantle.

As if this impressive bit of geochemistry wasn't enough, Emily has also been teaching herself methods of statistical analysis, including developing monte carlo simulations in MATLAB. She is analyzing the probability of possible mantle behaviors given different mineralogical conditions. By modeling different bulk rock mineralogies, these experiments will help her determine what exactly is going on in the mantle to cause the distribution of FRTEs she observed in her bulk rock analyses.

For those of you who have not yet met Emily, this piece would be incomplete without acknowledging her modest gratitude for the people and experiences that helped her reach where she is today. She is not free of the self-confessed imposter syndrome that so often comes with being a first generation college student, going so far as to say of herself "a hillbilly talking about numerical modeling is kind of funny." But endearing self-deprecation aside, Emily is using her experiences to pay it forward. When asked about her favorite part of it all, she was quick to bring up her desire to help others, especially undergraduate students, through the big jump "from first gen to PhD."

TOP: Emily prepares starting materials for experimental runs using a high temperature furnace (Credit: Emily Cunningham). BOTTOM: Emily and her dog explore the salt flats (Credit: Emily Cunningham).

And what's next? If you run into Emily before August, be sure to wish her success in her upcoming qualifying exams (she doesn't need luck). After that, wish her bon voyage. This winter, Emily will sail as an igneous geochemist on Expedition 402: Tyrrhenian Continent-Ocean Transition. Having previously focused on the excess magmatism of the Mid-Norwegian margin, she will now have the opportunity to apply the same techniques to an amagmatic margin. What is different, as far as mantle processes go? What is driving the difference between these two different but both rifted margins? "It fits together really nicely, I think."