An interview with Melodie French

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WE WANT TO KNOW

Before we get down to buisness, I have to ask. Before you got to Rice much of your research focused on the San Andres Fault. So, is California going to be broken off by a major earthquake and float away soon?!

Probably, which is another reason Houston is a great place to live! Seriously though, no. The San Andreas Fault system occurs along the boundary between the North American and Pacific tectonic plates. Most of California is on the North American Plate, but south of San Francisco the fault trends inland and many coastal cities are on the Pacific Plate. In a sense, the region of California on the Pacific Plate is already floating away from the rest of North America, just very slowly and inefficiently. It is slow because the relative plate velocity is only about 50 mm per year and inefficient because the plates are moving nearly parallel to the plate boundary. The reason earthquakes do not influence this process is that tectonic plates consist of the entire lithosphere, which is on the order of 100 km thick, but along transform fault systems like the San Andreas, earthquakes only occur in the upper 15 km of the lithosphere. Only the very top of the plate boundary is fracturing and sliding during an earthquake.

TELL ME ABOUT YOUR MOTHER

My mom works in low-income property management, a career that requires equal parts grit and heart, not unlike academics. My mom was very supportive of me when I was young, but I didn't have access to science camps or enriched learning programs in the small town where I grew up. In normal school, I was really drawn towards math, more than anything else. I remember when I first learned long division. I set up a chair in my closet and solved long division problems with a pencil on the wall. The numbers stretched from the ceiling to the floor. For high school, I attended a state funded boarding school for math and science in a remote part of northern Maine. When I got to college, since I had liked math for so long, I thought I would major in it. And for my first year it was great, but before long I didn't relate to the problems we were solving anymore. It was learning about numbers for numbers sake. By the end of my first year I switched my major to physics. I had taken some physics classes in high school and really enjoyed them. And I thought physics was the place where I could use math but keep solving problems. But before long, physics started to feel a little too obscure for me too.

I added a minor in geology after starting to take geology classes later on in my undergrad. That was the first time I got exposed to earth science. I was lucky to have a research opportunity with a structural geologist. That was fun for me -- it was a way to integrate several fields to solve complex problems. When I decided to get a Master's, it was this topic that I decided to pursue.

What's funny about being a geologist now is that I grew up in a really geologically interesting area in Maine, but I didn't care about trying to understand the rocks. They just looked messy to me, a bunch of jumbled up features with no pattern or any rules. I did like nature (I spent a lot of time hiking around and exploring in the woods) but the earth wasn't something I felt drawn to study. Even until I started my graduate degree, I didn't fully realize that I could use math and physics to understand rocks. What I learned and keep learning is that every rock records a story. And I can back-solve the story like a complex math problem (even though it might not look exactly like long division).

And after all, it turns out that I am doing the same things I liked to do when I was little. I really like being in the lab and working with my hands to build equipment and run experiments. And I really like making physical models to fit the data I collect. Those are my two favorite parts. The only part I don't like at all about what I do is the part where I have to organize data. Spreadsheets? Nope. I hate them.

ONE THING LEADS TO ANOTHER

Even though many of my interests have stayed the same over the years, my path certainly wasn't straight and narrow and, as a result, I have been influenced by lots of people. When I finished my bachelors, I got a job at a shop fixing bicycles for half a year. Then I worked for half a year in a national park installing piezometers for education-outreach programs. That was before I started my Masters. In between my Masters and Ph.D, I worked for a while as a laboratory technician (getting paid more, and with less stress than I would have as a grad student! It didn't seem quite fair).

In my first year of grad school, after being a physics major, I had a weaker geology background than my peers and I was insecure about this. I learned a lot though, from my peers and professors, and my time with that group still influences what I do today. Slowly I made my place among the geologists, especially as I realized that I really only had to understand the system I was working on to contribute immediately, and that I could build breadth over time. I suppose the lessons I learned from my early graduate career are that it is important to see a project through carefully and rigorously, even if it becomes clear that this work will not be your life's work, and that is equally important to follow your interests to new fields and methods, even if it means losing the advantage of expertise.

I didn't commit to a career in academics until a couple years through my Ph.D, I really enjoyed the intellectual freedom I had as a Ph.D student, and the projects I had started -- researching fault deformation and the role of fluids – were rewarding, but I tried to keep my career options open. Giving up research was never an option, and I like to teach quite a bit. I began to realize that an academic career might be really satisfying for me. But I held off committing to professor-ship as long as possible and followed my interests rather than a prescribed career path.

NEW ADVENTURES

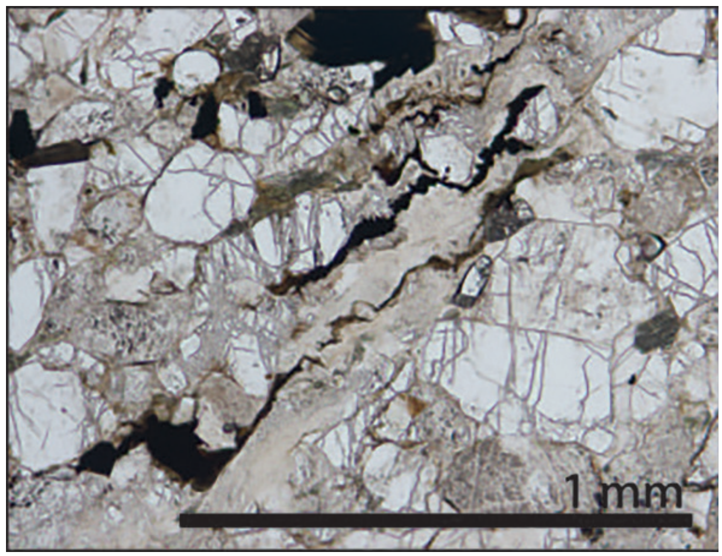
I am excited to build a lab of my own and to facilitate a group of people interested in fault mechanics. And I'm also excited to use the time I have before I start teaching to write and start new projects. I am also both eager and nervous to start teaching and contributing to the curriculum here at Rice. Recruiting graduate students is a little bit nerve-wracking. I've never questioned before whether the work I do is work that other people would care about doing, too. It's scary and exciting to have that ahead of me.

Interview by Larisa LaMere

DO WHAT YOU LOVE AND LOVE WHAT YOU DO

I like knowing that my work is relevant to society. Earthquakes affect people. I study the physical processes that cause earthquakes to begin, grow, and arrest. The relative importance of these three stages determines whether an earthquake occurs at all and how big it may become. Here at Rice I plan to conduct experiments and study natural faults to look at two variables in particular that control these stages: (1) fluids in the pore space and (2) physical heterogeneity in fault structure. Right now scientists are realizing how much more we have to learn about faults in general. Our models don't always predict what happens in the natural systems. We are often taught to think of faulting as occurring along planes, and in many cases a planar fault is an appropriate and powerful model. But fault zones are actually tabular – zones or regions where physical and chemical processes accommodate faulting – and the structure and composition of these tabular zones can have a great effect on the three stages of earthquake development.

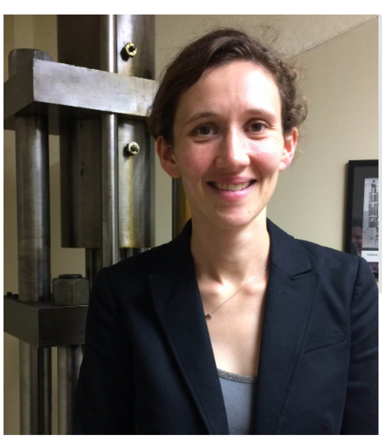
When people ask me what I do I usually talk about seismic hazards in general and I don't volunteer many details, because I work at a very small scale and most people must more easily visualize large scales. See, though, I love the details of what I do. And in hindsight I can see that I have always been drawn to the details. As a kid I was a problem solver. I took apart and rebuilt broken bikes and did complicated long division. And now I am a problem solver. I start from all the individual pieces to build equipment and experiments and models, to fit to data. My advice to anybody is to enjoy how you spend your time, surround yourself with good people, and let that lead you.



Fractured low-porosity (7 %) and low permeability (~10-19 m^2) arkosic sandstone. Photo credit Melody French

HOUSTON MATTERS

I really like to bike. I'm hoping to get to continue that because my new house is close to one of Houston's bike trails. My new yard is great for gardening. Also my spouse and a few of our friends live in Houston and work in Oil and Gas, so I'm sure they will show me around town and help me find things to do!



Melodie French will begin her professorship in the Spring of 2017

Interview by Larisa LaMere