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No-Recipe Math: Rosa Orellana's Mathematical Journey

Brought up in an Hispanic community in Los Angeles, Rosa Orellana discovered her love of mathematics in her first math class when she was only in first grade. Unfortunately, in her community, education for women was valued only to a certain degree – it was thought that after high school women should marry and have children. Women usually didn't pursue their studies, and Orellana's family wasn't very supportive of her. Only her passion for math and desire to do what people thought was difficult led her to become a math professor at Dartmouth College, a prestigious Ivy League school.

In Orellana's first math class, she was fascinated by the material: sets of numbers and functions. As a first grader, she didn't completely understand exactly what was being taught, though she instantly sensed that there was something about it that she adored. It turned out that this gut instinct would impact her life very much, for today she studies a field of mathematics called algebraic combinatorics. This uses sets of numbers and functions, which was what was taught in her first math class.

Orellana's father died when she was only seven years old, so her brother-in-law became a fatherly figure for her. Her sister was much older than her, so her brother in law was an adult at the time. When Orellana was in second grade, he was the first person to tell her that she could be a mathematician even though she was female. Also, he said that if she wanted to break out of a normal married life after high school, she could study, because knowledge is something that no one can take away from you. This inspired Orellana to keep on studying in a difficult environment.

The only occasion when Orellana disliked math was when the teachers didn't explain why they were studying it. In fifth grade, she had trouble with long division, because she couldn't understand why they were learning it, and couldn't remember where the numbers and the lines were supposed to go. She ended up having to memorize parts of the process, and this made learning painful.

Orellana realized, "When you memorize things without understanding, it's awful because you hate it. I think that's why a lot of people hate math, because it's taught like a recipe, and you don't understand why you have to follow that recipe. I think if people were to understand math more, than they would enjoy it more." With this knowledge, Rosa succeeded through high school as a very good student, and decided to continue her education in college.

Orellana went to California State University, Los Angeles. Because her mother had died, her sisters were her only relations. They didn't

understand why she wanted to continue her education, so they didn't help her financially. Orellana had to work three jobs through college to pay for the education alone, and she believes this was the greatest obstacle for her when she was pursuing her math career. Her love of math was the only thing that kept her going, because she felt that she had to do it. She said, "Math is a bit like art; someone who paints has to paint, someone who composes has to compose, because it's inside of them. It's inside of you that you feel that you have to do it. I always felt like that with math, I loved it."

Next Orellana went to graduate school to pursue a Ph.D. at UCSD, which she never had imagined herself going to before. Graduate school was dominated by white males, and in her first conference where she presented her research, there were only two or three other women amongst a hundred other participants! Orellana realized that the stereotype was that math majors were "hard" and you had to be "super smart" to be a mathematician. Even though this was not the reality, it discouraged women. Many people would say "I never liked it" or "I was really bad". But in reality, there were many areas of mathematics that were more tangible and more reachable, but people didn't know about these areas because they weren't introduced to them. She thought that if only people were exposed to different types of math, then more women would pursue mathematics.

Orellana has wanted to expose more women to mathematics all her life. From a young age Orellana aspired to become a high school math teacher, though because she kept on pursuing mathematics, she ended up becoming a math professor at Dartmouth College. She showed that she didn't worry too much about planning exactly what path she would take when she said, "I thought for a job I may need to be a waitress, but that doesn't matter, because I'm studying math and I love it. As long as I can get a job and live, I will do math." She advises young women pursuing a math career to relax and do what they love most, for opportunities present themselves if you study.

Orellana's interest in math has sparked an interest in running, because she gains a different perspective about math when she runs. When she began running marathons, and she said, "When you run a marathon, you don't run it with your body, you run it with your mind, because you have to trick your mind into believing that you can do it. At some point the body gives up, but you have to keep trying. I find this in math too, you can't ever stop trying."

Orellana hasn't stopped trying, and works every day to try to solve problems in math that haven't been solved in over eighty years. Even though she had little help herself, she drops the seed for others. She has started the Epsilon Club at Crossroads Academy for elementary school children, and the Sonia Kovalevsky Math Day at Dartmouth for middle and high school students. This seed will grow and bloom to unearth new passions and new discoveries.

About the Student

Sophie Usherwood is an 8th grader at the Richmond Middle School at Hanover, NH. Her favorite subjects are math, which she takes at Hanover High School, and english. Her writing was published in The Valley News via Young Writers Project and in Creative Communication's Anthologies. She loves playing the flute in The Vermont Youth Philharmonic, and has attended New Hampshire Honors Band every year since 6th grade. Sophie also enjoys playing the piano, performing in Young Artist Recital Series and at many other venues. She is an avid origami artist, and she teaches origami in workshops and in retirement homes. Her work was selected by OrigamiUSA for a touring exhibition the last two years, and her work was displayed at the Howe Library. When Sophie grows up, she hopes to be an engineer, a writer, or a musician.