

[Women in Math: The Limit Does Not Exist
Episode 38 - An Interview with Eva Loeser (by Eleanor Quirk)]

Eleanor: OK we are recording. So alright!

Hello, my name is Eleanor, I'm a second year chemical change major at the University of California San Diego, which is where we are right now. I'm here with a wonderful woman in math, and would you like to introduce yourself?

Eva: Hi, I'm Eva Loeser, I'm a second year PhD here at UCSD in math.

Eleanor: This is an interview with you about math and you and everything like that. Would you like to talk about your relationship with math and how it evolved over time?

Eva: Sure. I've always loved math. I'm lucky that way; that I've had this passion that's been constant for as long as I can remember. My dad is pretty math focused, too. He does applied math sorts of things in a government contracted research group very close to UCSD, actually, at a company called Leidos. He was always giving me math problems and that was a real way we bonded when I was growing up. I also wondered if I was just so curious and obnoxious that it was the best way for my parents to shut me up!

[Laughing.]

Sometimes my mom, my dad, or even a camp counselor would just give me long, computations to do when they needed to get work done. I was always interested in finding patterns. I remember being 5 or 6 and playing in my mind with these diagrams of squares and putting them in different formations to try to figure out patterns.

The first thing I realized from that time, drawing different grids, was that the N th square was the sum of the first N odd numbers.

Eleanor: You just figured that out yourself?

Eva: That was from imagining putting a square down that's the first odd number. And then if you want to fill in to another square, you have to fill in one on the top, one on the bottom, and then add one. Then you have three.

Then if you want to get the next odd number, you have to fill in two on the top, two on the bottom, and add one. I guess, two on the top, two on the side, then add one so you get five.

This is probably not something I should be saying over a podcast. [Joke/joking.]

Eleanor: But your hand diagrams are very helpful. Good job on the visuals! [Joke/joking.]

Eva: Anyways. I was always very interested and enthralled in these small mathematical problems or patterns that I'd try to find that sort of grew and evolved until I was sure that I wanted to do math research as my career.

Eleanor: That's so cool!

Eva: Thanks!

Eleanor: It's really interesting. It's kind of similar to what I did with my dad. He's an electrical engineer.

Eva: Oh cool!

Eleanor: When I was in 6th grade or something, we were learning about circuits in class. I was like, "hey dad, do we have any extra batteries?" And he was like, "yes!"

[Laughing.]

He pulled out this whole pack of extra batteries and wires and stuff and he says, "go to town!" And I start making light bulbs and learning about resistances and stuff like that. Pretty close! It's interesting how that works.

Eva: Yeah, that sounds very familiar.

Eleanor: So you talked about having decided to study math because it was something you were always interested in. Did you take advanced classes in highschool and stuff like that and start college in super advanced math and stuff like that?

Eva: So I did take advanced classes in highschool. I was lucky that my highschool offered some pretty advanced classes. When I got to college, I was very well prepared. I got to take some very cool classes in college.

Eleanor: What was your favorite? I'm curious.

Eva: So my favorite class, or a pivotal class for me, was our more difficult real analysis sequence. The class was in measure theory which is a higher level real analysis, it was the second semester of real analysis where I was.

The reason I loved it so much was that it was so difficult. I remember the professor would give us three problem sets a week instead of one. The class became a little bit consuming, probably one of the more consuming classes of my time in undergrad. When Thanksgiving break came, the Wednesday

that we were let out for break we had a class in the morning. He gave us a take home exam for our midterm.

Eleanor: Oh no!

Eva: It was due the Monday after break! I ended up basically locking myself in my room for Thanksgiving break staring at this exam. The fact that I enjoyed locking myself in my room and staring at this exam and that I enjoyed the opportunity to have something so difficult that I'd think about it for four days made me realize that I should be a mathematician.

Eleanor: Yeah, that says a lot. Was that the turning point? Did you start as a math major?

Eva: I started as a math major. I wasn't sure if I was going to go into math or something related to math. I knew I really liked math, I have lots of other interests that I could have gone into. I think that I-- it took me a long time to get the confidence to say that I was going to go into math. I think it was around that time that, first, I realized I really loved math enough to do it. Second, over and over again, I'd enrolled in classes being worried that I wouldn't be able to do it. Over and over again I was able to do it and that was the hardest class that I'd enrolled in up to that time. The fact that I was able to do it and I did perfectly fine in the class added to that data set that said, "this is going to be fine, you can just keep going."

Eleanor: Yeah, being able to pass a class that hard! Wow!

Eva: It was hard for me at the time, based on where I was. That's the other thing. I do believe that math gets hard at a certain point for everyone. I've had a lot of women ask me, "I'm in this class and it's really hard for me, should I not keep going in math?" I think that most people who do math, part of the drive is

that it's really hard.

If it's not really hard, that's more a reflection that you're not pushing yourself, rather than of the fact that you're meant to be a mathematician or something like that.

It's important to remember that math is hard, it's supposed to be hard, it just depends whether you like doing things that are hard like this. You'll keep doing more hard things and you'll keep getting smarter and you'll be able to do more hard things.

Eleanor: What do you do when things get hard? When I do something hard, I look at it, I look away, I look at it, I look away, and I ask someone for help. When you're doing your research and there's no answer and no one knows, what do you do?

Eva: There are a few options. One of the things that I have is a lot of hobbies outside of math. So I'll stare at a problem really seriously, and I'll work on it. Luckily, or unluckily, I have a spitfire brain that will come up with a bunch of different ideas, most of which are wrong. Other people in math are much more "this comes after this, comes after this." I will follow all the different pathways in my head until I run out and then I'll take a break.

In undergrad, I'd go do the dishes because my problems were shorter. I could look at the problem, think about it, think about it as much as I could, realize I'd hit a stopping point, go do the dishes. There's something about getting up and doing something very different that was much more mindless and maybe somehow moving my body or something like that used a different part of my brain which allowed it to simmer in the back of my mind and then I'd come back to it.

That's still usually what I do. I have these work sessions that I try to do 45 minutes on, 15 minutes off. I'm really focused then I'm

not focused, I take a break, then I'm really focused. After getting through a few of those sessions, I'll probably stop or my brain would be fried. Then I will go surfing or read a book or go for a run or something like that which is completely different, that I'm really excited about, that will totally involve me and take me away from the problem.

Eleanor: That's a good way to do stuff!

Eva: Thanks! It's OK to ask for help, though, as a PhD student, you have an advisor so if you get really stuck, you have someone to ask.

[Laughing.]

Eleanor: What kind of things do you ask your advisor?

Eva: So I should be completely clear that because I don't have advocande candidacy yet, I don't have an advisor. The potential advisor I'm working with now, what I've realized is that everything you're working on gets very complex. In your head it's like you're in this whole space of your problem and you know the ins and outs of the space and you can write something down on the paper that isn't exactly what you meant but when you look at it you know what you meant.

The thing that I'm realizing is more and more important when I talk with my potential advisor is that she's a real expert and what I need to do is boil down what I'm thinking about into a sort of intuitive picture of the problem that I have and explain why I think things are happening and then ask here where to go from there.

Because she can look at things and know immediately something that might take me years to figure out, probably.

[Laughing.]

It's difficult to describe. You have to come up with a way to give someone who's really an expert an idea of the ins and outs of your problem so they can give you a direction to go in.

Eleanor: That's hard!

Eva: Yeah! You can show an equation but you have to have an understanding of where the terms came from and stuff.

Eleanor: What's the research that you're doing?

Eva: Right now I'm doing research in stochastic processing networks. Stochastic processing networks are I guess kind of an exciting field of probability or applied probability. I sometimes feel like I'm between theoretical and applied math, that's why I say that. Stochastic processing networks are used to model congestion.

Problems I've looked at or problems I've read about have been loosely modeling things like if there are too many people on the WiFi. If too many people are calling into a call center and they need to be directed to the right place or are put on hold or something like that. Right now I'm looking at how an enzyme would process proteins if they all show up and it can only process, it takes so long to process each one and they show up at each--.

The thing that makes it really interesting for me is that without randomness, there are a lot of situations that congestion doesn't even happen. Like if you have some help desk and people show up, on average, once every minute and it takes, on average, one minute to help each person, then if you were trying to make a completely deterministic system when at the beginning of every minute someone shows up and it takes exactly one minute to

serve that person, there won't be a line.

Eleanor: Interesting.

Eva: But if you add just a little bit of randomness, like 50% of the time, two people show up and 50% of the time no people show up, and it takes one minute to serve each person. . .

Eleanor: There will be a line.

Eva: There will be a long line!

[Laughing.]

There's a result that shows that in that case, the line will tend to infinity.

Eleanor: Really?

Eva: Yes.

Eleanor: That's kind of scary, actually!

[Laughing.]

So a lot of what's happening when you see long lines and you see a lot of congestion, wouldn't be happening if we could predict when people would show up. That's an obvious way to say it. There wouldn't be congestion if we could predict exactly what people were going to do.

Eleanor: That's randomness [Can't hear/can't understand.]

Eva: That's what makes it a really cool probability problem.

Eleanor: Interesting. What do you want to do with that in the future?

Eva: I'm not sure. I do know that I want to be a research mathematician, probably doing things that are similar to what I'm doing now. I don't know where that job will pop up for me, whether it be in academia or at a company, I just know I want to continue to do math research.

Eleanor: Would you ever want to be a professor?

Eva: I think probably, yeah. That'd be good. I really like teaching.

Eleanor: You were a really good TA when I had you last quarter.

Eva: Thanks! Your section was really fun.

Eleanor: We tried! It was late at night!

Eva: Yeah. Anyways.

[Laughing.]

Eleanor: I assume if you become a professor you won't choose to teach a class that late.

[Laughing.]

Eva: Absolutely!

[Laughing.]

If I had any control over-- if I was picking the time, that wouldn't be the time I picked.

Eleanor: So jumping to a different topic, when you were our TA, you told us you were part of Women in Math. Was that as a grad student or was that the overall organization [Can't hear/can't understand.]

Eva: I am currently the president of UCSD's student chapter of EWM. Just because it's the student chapter doesn't mean that we don't have a lot of faculty and post-docs involved. A good portion of our involvement is from faculty and post-docs. However, right now, since we just restarted the group, we don't have a huge undergraduate component to the group.

Our specific goals for this chapter this year are to build community for our department and for women in our mathematics in our department, to build a mentorship for younger women who are coming through the university and, hopefully, eventually outside the university, and to attract more diverse groups to come to our graduate program.

Eleanor: Those are good goals!

Eva: Thanks!

What that has actually involved has been organizing lots of events in which women and allies can come and talk about issues related to women or women can meet people in the department or undergraduates can get some advice from graduate student women in a space that is sort of woman to woman. Organizing some general social events in the department to build a sense of community and talking a little bit to women who come to our department and try to give them an honest picture of what it's like to be here and what it's like for us.

Eleanor: What's your experience as a woman in the math

department?

Eva: I like being here a lot. One of the coolest things about UCSD is that we have more women on faculty than most other universities. We used to have more women on faculty in any department in the entire U.S. but the University of Washington beat us out recently.

Eleanor: Good for them, I guess [laughing.]

Eva: Good for them! We still have a lot of women in math. One thing that I noticed when we were having our visit day for prospective students and they were asking about our time here and our relationships were like with our advisors and everyone in the conversation that I was with, even though not everyone was a woman, everyone had a female advisor.

Eleanor: Interesting!

Eva: I think that's a powerful thing, to have so many strong female role models around you during your graduate career. That's a really nice thing.

Eleanor: That's amazing!

Eva: That said, I sometimes wish that we had more women in my program. I'm finally getting to know more of the women because of AWM but when I first got here, we were sufficiently outnumbered that I felt a little starved for contact with other women.

Eleanor: Oh really?

Eva: But now that we've started having social events to meet other women, and I've joined the Y and joined a book club and

done some other things with my life, it's much less overwhelming.

[Laughing.]

Eleanor: That's good!

Eva: I think because we're in California and because people at this university are pretty conscious of issues like this, I feel like I experience the smallest amount of discrimination I've ever experienced.

Eleanor: Really? That's awesome.

Eva: Yeah, I feel very comfortable in our department which is a very nice thing.

Eleanor: That's wonderful, oh my gosh. Did you not feel that way at your other universities?

Eva: I did my undergrad at Brown University. I also had a wonderful time there, and it was very different. We had an applied math department which was very large and very well known. We also had the peer math department which was also well regarded but very small. The department was in this little yellow house that was donated to the university and the sense of community was so much more immediate because the department was so small. We were in this house, hanging out in the living room and talking about our problems and things tend to be a little more relaxed there because it's a smaller university and a smaller department so the professors would sometimes have their whole class over for a BBQ.

[Laughing.]

Eleanor: Oh my gosh!

Eva: In that way it was very welcoming. However, because it was so small, it was much more likely that there just wouldn't be other women at an event. I think that when I first started going to the department and getting involved with the department I would see very few women.

The first time one of my friends who is also a woman in the department, she asked me, "would you please come to math tea with me, there are no women there, it's awful. Will you come?"
No, I don't want to go!

[Laughing.]

I mean, she didn't say it was awful, she said "there aren't any other women, will you please come with me, it will make it better."

I think that we sort of broke into the group, me and some other women and then it sort of snowballed and then there were a lot more women around.

Eleanor: Oh good!

Eva: So there were two different situations.

Eleanor: I can't imagine going to that and there are no women!
That's horrible!

Eva: I had gotten kind of used to it. However, that is one of the drawbacks. For example, one year I was there, they had 6 people in their incoming graduate class. They had no women! Because women are like 1 in 10 or 1 in 6 so chances are there are going to be years that there are no women or just one woman.

Eleanor: Oh gosh! We have to change that!

Eva: Yeah!

[Laughing.]

Eleanor: I think the weirdest class I ever had in terms of women to men ratio, I took an AP chem class and there were 5 girls in the beginning, 2 ended up going to early college because they were so smart it was amazing, but then there were only 3 women in the class by the end! That was a lot of masculine energy! It was a bit much, but you get through!

[Laughing.]

Eva: Yeah! I do!

Eleanor: I want to go back to the AWM, that stands for . . . ?

Eva: Sorry! That's the Association of Women in Mathematics.

Eleanor: Very nice! You said you're restarting it, does that mean that it didn't exist last year?

Eva: It was sort of on hold. There was a chapter up until about 5 years ago or so here at UCSD and then our numbers of women dropped to the point where there weren't enough people to want to have a student chapter. Now we're restarting it.

Eleanor: That's a good sign! Are you the one who did the restart? Or was it a team effort?

Eva: I would say it was both. I would say I spearheaded a team effort to reestablish AWM. We got a ton of support from our graduate chair at the time, we got a lot of support from the student success center, and we've got a lot of success from a lot of

faculty members in the department.

Eleanor: That's really cool.

Eva: Yeah!

Eleanor: Where do you see it going in the future? Is it going to go on the way it has been or do you think it will change?

Eva: I think there's no way it won't change because it's so new, I think it's changed since last quarter. I think that what it becomes and how it changes will be a response to what people in the department want from it and what people need from it in the group.

Eleanor: That's good!

Eva: I aspire for it to change to reflect the needs of women in the department.

Eleanor: Are you open to getting more undergrads in it too?

Eva: Yes. So far we've been in contact with Society for Undergrads in Mathematics, SUMs, here which is an undergraduate group in the math department on campus and they are really cool. You should look them up if you are a math major here. I think that by working with them, we'll be able to start reaching out to undergraduates and make our Mentorship for Women program a little bit bigger and things like this.

Eleanor: That's really cool!

Eva: Thanks!

Eleanor: Are you open to having the mentorship program

between faculty and student or student to student or what's your imagination for that?

Eva: So far we've had a graduate student panel answer questions of a group of undergraduate students. After that, a lot of our awesome faculty and post-docs came out and talked to the undergraduate women about the things that were going on with them. Hopefully, what will happen is that it will be graduate student women talking to undergraduate women, post-doc women talking to graduate student women, faculty women talking to post-doc women, with a little bit of maybe one person on the undergraduate panel is a faculty or a post-doc and the rest are graduate students. For a little bit mixed in.

Eleanor: That sounds really cool! That's really exciting to think about how it might change and grow.

Eva: Yeah!

[Laughing.]

Eleanor: I wanted to ask, do you have a favorite story about women in math, either your story or someone else's?

Eva: One really good story came from a very talented mathematician at my undergraduate institution. She told us, when we were talking about inclusion issues and being a woman in math, that during her time as a graduate student, she had received one or two awards and she told her advisor that she felt like a fake. This is before people talked so much about Imposter Syndrome. I think a lot of women think this way, that they're just faking it and someone's going to find out that they really don't belong here. What her advisor said was, "just keep faking it, then! It's going great!"

[Laughing.]

I think she took that to heart! If this is what faking it looks like, just keep going! Just keep doing it!

[Laughing.]

To hear that someone who was so incredibly successful that we all looked up to so much had felt this way! To hear that advice of "just keep going! If you don't feel good enough, just keep doing it then you'll have done it!" I think that's the thought. I think it was powerful for a lot of us undergraduate women when she told the story.

Eleanor: Oh my gosh! That's awesome! It's actually so useful, too!

[Laughing.]

Eva: I try to take that forward. "When math gets hard, just keep going."

Eleanor: Just keep going! I feel that way when I'm in my chemical engineering classes. "I don't understand this, I can't get it into my head, I'll just take this test and if it works out it works out! I don't know if I should be here, but I'll just keep taking it!"

Eva: Yeah!

[Laughing.]

Like if you can just try to understand this little bit, then this next little bit, then this next little bit, then after enough time . . .

Eleanor: Give it enough time it'll work out.

Do you have any advice you'd give to women?

Eva: The big thing is, be patient with yourself. It's OK if you don't get it right away. You're going to keep getting smarter. A lot of people think you have to be born a certain way to do mathematics. But if you were born knowing how to be a mathematician, then all of this university stuff would be a little pricey!

[Laughing.]

Basically, it's OK if you don't feel like you're smart enough because the point of being here is trying to get smarter and trying to understand more. You'll just keep getting smarter and get better at understanding things.

This is for people in general who are studying math: If you get to that point at the end of the semester where your brain is foggy and it's like you're walking through molasses when you're trying to think, it's a signal that you need to take care of yourself. There are a lot of things that I didn't do in undergrad that I do now that keep the brain fog at bay. They include eating vegetables, exercising, getting enough sleep and taking breaks when I need to and the basic stuff that people tell you to do that people don't tend to do in college.

Eleanor: I find myself forgetting to do that stuff, too!

[Laughing.]

[Can't hear/can't understand.]

Eva: Seriously! Just put it down, go for a run, eat a healthy meal that includes . . .

Eleanor: Something green.

Eva: Something green, healthy fats . . . healthy fats apparently make your brain work. I shouldn't be quoting this without some sort of citation.

[Laughing.]

Eleanor: We'll roll with it! It's not bio!

That's good advice as we come up on finals week.

Eva: In undergraduate, I'll admit that there were times that I'd have a pint of Ben & Jerry's for dinner.

[Laughing.]

That did not help anything!

[Laughing.]

Eleanor: Well now I know!

Well I think we're about out of time, thank you for listening to this. Is there anything you'd like to say?

Eva: Just keep going!

Eleanor: Have a good day!

Eva: Bye!

[End podcast.]