

- Evelyn Lamb: [00:11](#) Hello, and welcome to The Lathisms Podcast, I'm Evelyn Lamb. In each episode we invite a Hispanic or Latinx mathematician to share their journey in mathematics. Today I'm very happy to welcome Cynthia Flores to the show. Thanks so much for taking the time to talk with me. Can you tell us a little bit about yourself?
- Cynthia Flores: [00:29](#) Sure. Thank you for having me, I'm really honored for being featured in this podcast series. I always follow the ... Now I'm not sure I'm pronouncing it correctly, but I always said it to myself, Lathisms, all of the latest news. So a little bit about myself, I consider myself to be an American Latina mathematician, my parents migrated from El Salvador in the '80s and I grew up in urban setting in Los Angeles in the Pico Union community.
- Cynthia Flores: [00:59](#) Since I was a very little girl, my family worked at the local swap-meets every weekend, and it was in this setting that I was first validated as a mathematician. Looking back I realized now that going to work with my parents every weekend at these outdoor swap-meets and flea market-like settings, my parents assigned me the role of cashier from as early as being eight years old. It was always as ... I had mixed feelings about it, I would say, "Why can't my sister be the cashier?" They would always tell me, especially my dad would tell me, "Well you always get the change correctly and we don't wanna lose money, so we think you should do it."
- Cynthia Flores: [01:45](#) In his own way he was validating that I was good at mathematics, so I was inspired by their hardworking nature, my sister was also very motivational. I managed to get through little moments of tension where someone might've called into question my ability to do math, and reflect back on this validation from my parents and family that I was good at mathematics. So I wanted to be a high school math teacher, and I enrolled in California State University Northridge where I received a bachelors degree with the help and support of mentorship program called PUMP, Preparing Undergraduates through Mentoring for PhDs. With their support I made it to the PhD level at University of California in Santa Barbara and obtained my PhD in the area of dispersive partial differential equations.
- Cynthia Flores: [02:38](#) Now I'm a faculty member at California State University Channel Islands. Here I'm an assistant professor going on my fifth year, and I love my job, I love teaching ordinary and partial differential equations, supervising my undergraduate and masters researchers. I continue to work in dispersive PDEs, I collaborate with community partners, such as the Ventura County Public Health Division in our county, doing data science projects with students and overall working towards my work-life

balance. I have a husband and two kids and I enjoy my line of work, so I'm really happy to be here.

Evelyn Lamb: [03:18](#)

Did you also feel supported by teachers and people in education both early on and later in college?

Cynthia Flores: [03:27](#)

I definitely felt supported early on. I was fortunate to be identified as a GATE student in early elementary. GATE is a Gifted And Talented Education program offered through the public school system, and once you've been identified as belonging to this program, you do get extra support, you're introduced to mathematics concepts earlier than you would have. My middle school teachers were also very good at extending additional work that I found interesting. In retrospect, I was a really bright child and I needed to be challenged in order to maintain my engagement with my education and I think in elementary and middle school I had really good memories of that happening.

Cynthia Flores: [04:14](#)

In high school I started moving around a lot and somehow going through different high schools I encountered people that didn't know my background or didn't know my abilities and made assumptions. Actually the most difficult moments were in high school where I would be confronted by my high school teachers and in one occasion actually my high school teacher accused me of cheating because it was not possible that I was doing so well according to this person. This really upset me and I remembered getting into a confrontation with this teacher where I tried to defend myself and just ended up getting kicked out of his class. Because it was the middle of the school year, I couldn't find someone that could really be my advocate at that moment, and I didn't want to bring this to my parents attention because I thought they're busy enough and I don't wanna bother them.

Cynthia Flores: [05:07](#)

So I actually couldn't take 10th grade math. The teachers, their classes were full, the only class I could be in, that teacher didn't want me in his class, and the following year I moved high schools again, and actually my ... That high school, there's one high school counselor from this school who asked me, "What's going on, why didn't you take math?" I told them I have to take math, I wanna go to college, I wanna have a better life, and I'm concerned that I didn't have this final semester of math. He told me, "Here's what we're going to do, I'll enroll you in the next math class, I see how you've been going through the rest of your education. You seem to be a strong student, and in order to make up that class so that you're still college bound, you should take it at a nearby community college and we'll count it for high school credit."

- Cynthia Flores: [06:04](#) That's what I did, I took college Algebra at a nearby community college. My parents, they never knew that I was actually kicked out of that math class, I told them that the high school found that I should be in college already, taking math, and that worked as a story to keep my parents calm about my schooling and I loved my community college Algebra experience. It was just so different from the high school environment and I'm really grateful to that counselor who found this solution because I was starting to feel like my ... I wasn't gonna go to college anymore and that was scary because I knew that my parents, my family, we all believed that this was a path to a stable life in the United States, reaching an American dream and I wanted to be a part of that, so I really enjoyed that. I really appreciate that high school counselor who gave me this solution.
- Cynthia Flores: [07:02](#) In the university setting, I was just so supported. My parents taught me to be very positive, any smaller comments that were made didn't hold me back. My parents taught me to see them in a positive light and try to capture what the hopeful parts of the comment to keep moving forward.
- Evelyn Lamb: [07:22](#) It sounds like especially that counselor really made a situation that could've led to you not persisting in math, turned it into something that was really positive in your life.
- Cynthia Flores: [07:34](#) Absolutely. I just can't thank him enough 'cause I was already feeling like I was ... As a developing teenager I was feeling like I was falling into stereotype delinquent, not good at anything except focus on looking a certain way. I was also a cheerleader in high school so I had a lot of pressure to look a certain way, and the fact that I was looking like I wasn't good at mathematics fit certain stereotypes and as a teenager you start to think well maybe there's a reason why they're stereotypes, but this person, this counselor, he just ... In retrospect, he didn't prescribe to these stereotypes and honestly if it wasn't for him, like you say, I think I would've prescribed to these stereotypes. There's a reason why they're there, but I'm really glad that I didn't. I had to take the bus from where I live to the nearby community college, but it was worth it. I felt independent, I felt confident, I got an A in the class. It just reaffirmed what my previous view of myself was, which was I am good at mathematics.
- Evelyn Lamb: [08:48](#) So how did you decide to do the math major and then go on the academic math career path because being good in math of course, you have a lot of different options, engineering, physics, accounting, all of these different things, so what led you to the academic path?

- Cynthia Flores: [09:05](#) Well interestingly the high school experience led me to want to be a high school math teacher. I wanted to influence positive change in the public school system and at this point in my life, I thought that this was the highest achievement I could have in my career. I wasn't aware really what an engineer was nor an accountant, or any of those other careers. Now that I've had the opportunity to reflect on that, I only ever seen my parents who worked hard in the swap-meets. My mom actually, her aspiration was also to be a teacher, and the teachers from my public school were my role models, and I had a positive view of them for the most part. Then of course the medical doctors that I saw in dental, doctors that I saw, and I didn't see myself as someone who could be a practicing medical doctor, but I could see myself as a high school math teacher.
- Cynthia Flores: [10:11](#) Actually in the university, through the PUMP program, my closest mentor is Maria Helena Noronha, she said, "Why don't you consider a career in academics? You're very strong in mathematics." I told her, "Well I thought the path to becoming a university professor would start with being a high school math teacher." She asked me, "What do you mean?" I told her, "Don't really good high school math teachers then become promoted to being college professors, and if they're really good at that, don't they then become promoted to becoming university professors?"
- Cynthia Flores: [10:48](#) She told me, "No, that's not how it works actually. Is that what you ... " She asked me, "Is that the path you think that I took?" I told her, "Well of course. I don't know how somebody becomes a university professor." I told her, "Actually, in your case ... " since I knew her title was Doctor, I told her, "I actually thought that you were a retired medical doctor." I had never heard of a philosophical doctorate, and I told her, "I thought you were a retired medical doctor who ... I thought medical doctors must be the smartest people so wouldn't you be qualified to be a university math professor if you chose to." She smiled, and she told me, "No, you've got a lot to learn about how things work, but you've got a lot of math talent, so we'll worry about all those things."
- Cynthia Flores: [11:38](#) She encouraged me to pursue my masters degree in mathematics from California State University Northridge. She told me it would be a stepping stone to succeeding in a PhD program and she was right on with that advice. It really was the stepping stone that I needed to fill in all the gaps that I had during those two years in the masters program. I think I recovered and built a strong foundation in mathematics, filled in any gaps that might've been there just because as an undergraduate, you can't learn all of mathematics and be good at it at the same time, so

that masters program really helped build a foundation that I needed to succeed in the PhD program.

- Cynthia Flores: [12:20](#) In retrospect, I think I went through that PhD program with relative ease compared to some of my peers who didn't have that stepping stone experience. So Helena was a really influential person in me reaching this career goal 'cause I was set out to be a high school math teacher.
- Evelyn Lamb: [12:41](#) So moving on to your research, you mentioned that you work in differential equations. Can you tell us a little bit more about what that field is, what kind of problems you work on?
- Cynthia Flores: [12:52](#) Absolutely. I consider myself to be a mathematical physicist and my field of research interests really lie at the intersection of partial differential equations, harmonic analysis, and mathematical physics. Specifically in partial differential equations, I study dispersive partial differential equations and lately I've been studying peridynamic partial differential equations and these are different kinds of models for, specifically I've been interested in, wave propagation. I've also studied a specific model called the Benjamin Ono Equation, which is particularly interesting for modeling long internal waves at the interface of two fluids, one of which should be of infinite depth. These are waves that might be introduced to the system due to like a magnetic field influences the medium and a wave begins to propagate along the medium, and the Benjamin Ono Equation presents challenges due to the presence of a non local and singular integral operator called a Hilbert Transform, this is the link also to peridynamic equations which are non local equations.
- Cynthia Flores: [14:21](#) Lately, I've been interested in the control and stability problems related to these kinds of equations, and what this is, is specifically that for prescribed initial and a prescribed final state, I aim to answer the question, can one construct a control input to apply to the system in a way that the solution trajectory is identical to the given conditions at the initial and final time? Additionally, if a control input is found, what are the related asymptotic stability properties of the corresponding solutions?
- Cynthia Flores: [15:02](#) A lot of this work is highly theoretical, but it's what I was trained in. I love physics and geometry, so I really found something that has kept me fully engaged for almost 10 years.
- Evelyn Lamb: [15:19](#) Maybe not looking at exact real world situations, but maybe inspired by real world problems?

- Cynthia Flores: [15:29](#) Yes, these are definitely inspired by real world problems. I think the first documented observation of a dispersive wave happened at Edinburgh Canal some time in the 1800s when an architect of ... What is it called? Naval architect observed some huge ships unloading and one ship in particular stopped abruptly along the canal and a heap of water formed. What caught this architect's attention is that when a heap of water forms, the expectation is that it's a wave, that it will topple on itself, and crash like a wave does, or that it'll ripple and dissolve, or just dissipate and disappear.
- Cynthia Flores: [16:27](#) But in this case, he noticed that the heap of water continued to propagate along the canal and it didn't lose speed and it didn't lose its height either so he watched it long enough that he was intrigued. So he got on his horseback and he followed this heap of water for miles and it didn't change its speed, and it didn't change its height and he just thought this is ... This goes against what was known about fluid dynamics at the time and he recreated the experiment in his backyard, he'd built several troughs of water, and he ... With different chambers and he wrote about this and he was told by the experts at the time that his theories were not valid.
- Cynthia Flores: [17:13](#) It wasn't until around 1950s that mathematicians were able to validate his theories and mathematically this phenomenon exists. This is possibly the main physical motivation, then the interest lies in how do we capture this phenomenon numerically so that computers can recreate the experiment as well and then study this from a purely mathematics perspective which is where along the spectrum I lie. So you're right, I don't have a lab with troughs of water where I can recreate this experiment, but from a purely mathematical, theoretical perspective, I have the opportunity to study.
- Evelyn Lamb: [17:59](#) That is such a neat story. I know what I'm Googling the moment we get off. Well thank you so much for joining me. It's been really a pleasure to talk with you and I hope that we get to talk again some time.
- Cynthia Flores: [18:13](#) Thank you so much, Evelyn. This means a lot to me and it's been such a pleasure.
- Evelyn Lamb: [18:18](#) Thank you for listening to the Lathisms Podcast. It's produced by me, Evelyn Lamb, and made possible by Tensor SUMMA Grant from the Mathematical Association of America. Our music is Volveré by La Floresta. Lathisms is an initiative to celebrate the accomplishments of Hispanic and Latinx mathematicians. It was founded in 2016 by Alexander Diaz-Lopez, Pamela Harris, Alicia Prieto Langarica, and Gabriel Sosa. You can find more information about the project at Lathisms.org. that's L-A-

T-H-I-S-M-S.O-R-G. Join us next time to hear from another inspiring mathematician.