

Evelyn Lamb: [00:09](#) Hello. Welcome to the Lathisms podcast. I'm your host, Evelyn Lamb. In each episode, we ask a Hispanic or Latinx mathematician to talk about their journey in mathematics. Today I'm delighted to welcome Federico Ardila to the show.

Evelyn Lamb: [00:22](#) Hi! Can you tell us a little bit about yourself?

Federico Ardila: [00:25](#) Hi, Evelyn. Thank you so much for having me. My name is Federico Ardila. I am a math professor at San Francisco State University. I'm originally from Colombia but I've now spent more than half of my life in the US. Yeah, looking forward to talking to you.

Evelyn Lamb: [00:44](#) Maybe we can start by talking about some of your early experiences in mathematics.

Federico Ardila: [00:50](#) Sure. I guess they say that everything starts with your parents. So maybe I can tell you that I am the kid of an engineer and a sociologist. So, my dad is an engineer who was always really obsessed with people and love thinking about how people could work together, and thought a lot about people systems. My mom was a sociologist who did a lot of ... she ran her own NGO and did a lot of community work, and at the same time she was very aware of the power of statistics actually. She found that even though that was not what her training was originally in that very often when they are in the humanities, people don't listen to you until you show up with numbers to back up things that she said you already knew anyway.

Federico Ardila: [01:38](#) I think that they were a big influence. One, my dad loved mathematics. I think that was ... even though that's not what he did, I think that he shaped my love for mathematics. I think my mom was really influential in me thinking very hard about what is the role that math has in society, and what is the role that math could have in society as a tool for equity and social justice.

Federico Ardila: [02:05](#) So, I've reached the point recently ... I think we all reached this point at some point in our lives where we start asking our parents a lot of questions. For me, it had to do with the passing of my mother. I've been asking more questions of my elders than I used to in the past. Actually, I was just visiting my dad about two months ago and we were talking about things that we had never really talked before. He shared the story that seems to be one of my earliest math experiences that I actually had never heard before.

- Federico Ardila: [02:38](#) That apparently when I was a child and I was learning addition in school, I really loved adding numbers and so we were kind of talking and then he asked me, "Hey, Federico. Can you do one plus two, plus three, plus four, plus five, plus six, plus seven, plus eight, plus nine?" And then, I just went back and I said, "Well, let's see. So, one plus nine is 10, two plus eight is 10, three plus seven is 10, four plus six is 10, and five, that's 45." This is a story that I think they tell different people that have discovered this method.
- Evelyn Lamb: [03:19](#) Yeah, that was like a little Gauss moment for you.
- Federico Ardila: [03:24](#) But I think the reason that I wanted to share this story is just that I think it's really unusual for a dad to ask his son to add up all these numbers or ask questions like that. I think that speaks to how even though my dad wasn't a mathematician, I think it was clear that he loved and kind of nurtured my mathematics. I also found this note that my mom used to keep when I was a baby and she was writing down my weight, how much did he weigh when he was one-month old, two-months old, three-months old, and so on.
- Federico Ardila: [04:03](#) And then I guess when I was reaching the point of adding in school, I got ahold of this notebook and I just saw this column of numbers of my weight at one month, I weighed at two months, I weighed at three months, and so on. And then, I just had to add all these numbers. When you get to the bottom of the list, you can see the sum of my weight for the first 12 numbers which, of course, is just a totally weird thing to do and not a very useful thing to do but I guess I was just obsessed with addition.
- Federico Ardila: [04:33](#) Anyway, these are just kind of new stories that made me understand that I guess I liked math from when I was a very young kid. But I think that when it really clicked into place was actually when I became involved with the math Olympiads. The math Olympiads where these math competitions that actually ... I first learned about them because my sister, Natalia, and my cousin, Anna Maria, did really, really well. This is something that comes back to me a lot, that I'm always very aware that it's not them who are talking to you, it's me who is talking to you even though I was just a little brother.
- Federico Ardila: [05:11](#) They were the ones that were great mathematicians. I started participating in the math Olympiads when I was very young. Again, thanks to my sister and my cousin. I just loved it, I just found that math in school felt much more routine. But in the

math Olympiads, they found this much more creative side of mathematics, just much more about thinking outside of the box. I feel like when I mentioned this, I have to mention that when I joined the math Olympiads I felt very much at home whereas my sister, Natalia, my cousin, Anna Maria, they went to the same camp where we had all these kids from all over the country come to do math together, and they hated it. It was a very male dominated camp and I think there was this kind of very macho style of doing mathematics that they didn't enjoy.

Federico Ardila: [06:05](#) I have to say that it felt like it was very comfortable for me, that was a very nurturing place for me. That always makes me think of how different places can feel very different to different people. But for me, it's clear that this was the start of my mathematical career, and really kind of got me on the path to being a mathematician.

Evelyn Lamb: [06:27](#) Can we talk a little bit about how mentoring has been important in your career both as a mentee and a mentor?

Federico Ardila: [06:36](#) Sure. One thing that I often think about is, is that I don't always think that the mathematical society acknowledges us, our humanity, as much as it should. I think that when we follow a mathematical career, we need math mentors and we need life mentors, career mentors. One thing that I've realized is that they are often not the same people. I was always best to have amazing math mentors. It started in the math Olympiads when this program was founded by Mary Falk de Losada. She was an American woman who moved to Colombia, and started math Olympiads, and I think that she was a massive influence in Colombian mathematics, and I think that a lot of the Colombian mathematicians of my generation are mathematicians thanks to her.

Federico Ardila: [07:31](#) When I got to the US and I got to MIT, of course, I was blessed with a lot of amazing math mentors, and I think two who really stand out are Richard Stanley, who was my PhD advisor but he was also the first person that I took a math class from at MIT and I just loved his taste in mathematics, and I loved the elegance that he had mathematics with. Eventually, I ended up doing combinatorics which is what he did. I think I learned from him, just how math is interconnected in such a deep way. I think he is somebody who really kind of led the effort to connect combinatorics with other fields, and show that very new things were possible when you connect things that were known to be connected.

Federico Ardila: [08:20](#) Another excellent math mentor for me was Gian-Carlo Rota who actually was Richard Stanley's advisor, and I got to learn combinatorics from him, and he's also one of the founders of modern combinatorics. I think another thing that I really appreciated from him is that for him mathematics was a part of human culture in a very clear way. He was always sharing mathematics but also the human stories behind mathematics, and the cultural stories behind mathematics, and he is somebody who thought very deeply about the history of mathematics, and the philosophy of mathematics.

Federico Ardila: [08:55](#) I'm not a philosopher nor a historian but I think it helped me to understand how math can really not be separated from who does math. I think that was a very important lesson. I have to say that while I was at MIT, I really don't want to sound ungrateful but I didn't really have what I would call life mentors while I was at MIT. I think that I often ask myself what that was about but one thing that I do know is that I felt very different from my peers and from my professors. Even though they were supportive mathematically, I just felt like I was not part of what I would call a mathematics community. I kind of isolated myself because I didn't feel at home and so I would say that I didn't have the kind of life mentorship that I now realize that would have been very valuable.

Federico Ardila: [09:58](#) Since then I think once I got more involved in the wider mathematical society, I found a lot of mentors and a lot of wonderful people that I really look up to. Maybe just to mention a few of them, I've had the opportunity to work with this MSRI-Up Summer program which is a summer research program for students from underrepresented groups in mathematics. I'm one of the directors of the program now and I have learned a lot from the people who started this program, Ivelisse Rubio, Herbert Medina, Duane Cooper, Ricardo Cortez, and Suzanne Weekes, I've had the opportunity to learn a lot from people like Carlos Castillo-Chavez, Richard Tapia, Erika Camacho, Bill Vélez, Rochelle Gutiérrez, just a lot of people that when you look at the current generation of Black and Brown mathematicians, you can find that there is a handful of mentors that have mentored essentially all of us.

Federico Ardila: [10:59](#) I think that's been really inspiring. And then I have to say that actually I like that you asked me about receiving mentorship and giving mentorship because I find that some of the people that I have learned the most from is the students and younger people that I have had the luxury to mentor. I really strongly believe that students and young people understand things

much better than those who are older than them. And so, I try to listen very closely to what students are doing, thinking, and learn from them. I've had the opportunity to work with Amanda Ruiz, at SF State, who started the *Mathematistas* group in support of women and other gender minorities.

Federico Ardila: [11:47](#)

I have had the luxury to work with Pamela Harris, she's been involved in many initiatives like getting mathematics more represented, conferences like SACNAS, and things like this, have had the luxury to work with the Colombian combinatorics community. Even though many of these people were my students originally, I really feel like I learn incredibly from seeing how they work and to making the mathematical society be accessible to a very wide group of people. I wanna mention Carolina Benedetti, Rafael González, Felipe Rincón, Cesar Ceballos. My student, Nicole Yangzon, she started the mathematics circle at San Quentin Prison. Just people that are ... I think younger people just have much more original ideas than some of us who have been in the water for very long.

Federico Ardila: [12:42](#)

Yeah, I think one thing that I've learned about mentorship is that it's just really important to just listen to the young people, and learn from them. I think I also want to mention that for me, a lot of my inspiration both in mathematics and in initiatives to kind of broaden who does mathematics, actually come from outside of mathematics. I mentioned how my mother ... she ran her NGO and was just tireless in a lot of initiatives that on the surface sound very different. She did a lot of things that are on the prevention of domestic violence around local systems of justice that didn't necessarily involve the authorities so that communities could kind of make justice for themselves. My wife, May-Li, the designer who also thinks a lot about the power of design that's kind of an equalizing tool. Maybe to summarize, I think one thing that I've also learned is that a lot of your closest mentors don't necessarily come from your field but come from talking to what people are doing very well in other fields and finding points where things are similar and also points where things are different than learning from similarity and from difference.

Evelyn Lamb: [13:59](#)

You've mentioned that your research is in combinatorics. Can you talk a little about the problems that you're most interested in?

Federico Ardila: [14:06](#)

Sure. My field is combinatorics. I am most interested with how combinatorics interacts with other fields. One thing that I love doing is talking to people in other fields and just finding what

are the little combinatorics pictures that are coming up in what they do, or what are the kind of issues that come up that have a discrete flavor that they're encountering because I often find that many mathematicians need a combinatorialist. So, I love talking to people who work in Algebraic Enumerative Geometry.

Federico Ardila: [14:51](#)

One recent direction that has been discovered is how you can use this technique of tropicalization to turn questions in algebraic geometry into questions in polyhedral geometry which is something that I like a lot, and that I am very familiar with. Sometimes, through combinatorics we're able to prove theorems in a world of geometry.

Federico Ardila: [15:17](#)

I love talking to topologists who ... one thing that I like a lot that comes up in algebraic topology is these sub-complexes known as associahedra, cyclohedra, and these are spaces that come from topology but that are very deeply combinatorial, and I like thinking a lot about those. I like talking to algebraists who, when you look at representation theory, so much of it comes down to the combinatorics of permutations, Coxeter groups, and that kind of thing.

Federico Ardila: [15:49](#)

I also try to talk to people who do more applied things. For example, phylogenetics which I would crudely say that is the question of figuring out what is the tree of evolution that led to the current species? They have a lot of very interesting combinatorics. I found that some ideas that haven't felt very pure are actually very applicable to things like phylogenetics. Or robotics is another thing that I've been thinking about lately.

Federico Ardila: [16:23](#)

I would say that a lot of what I do is just trying to build bridges between what we call combinatorics and fields that are very pure, fields that are very applied, and just trying to disrespect that frontier that I think is artificial between pure and applied math, and just try to draw bridges.

Evelyn Lamb: [16:43](#)

I think that's about the time that we have for the podcast. Is there any final words of wisdom you'd like to share?

Federico Ardila: [16:51](#)

I think the main thing that I would like to say is just to really thank the people behind the Lathisms initiative which I think is fantastic to celebrate and highlight the contributions of Latinx people in mathematics. I think that we're reaching a point in US history, and I don't know if we're reaching a point or we're always in this point, where there's a lot of divide of opinions, and there's a lot of very strong messages trying to tell Black and Brown people that we are not American or that we are less

American. I think that when that happens, it's really important for us to regroup and really remember to celebrate, and highlight our contributions.

- Federico Ardila: [17:37](#) I think a lot about this talk that Chimamanda Ngozi Adichie gave, she's a Nigerian novelist. She talks about the danger of a single story where very often that we learn history is through the lens of whoever won that history. When we learn about a war, we usually learn about it from the point of view of who won that war and that's a very one-sided point of view, but it's very dangerous when that's the only point of view that we see. So, I think it's really important that we don't just have one story. I think it's really important for us to tell our own stories and so I think that that's why an initiative like this is really valuable, and I think that it's really important and really wonderful also to have the support of people like you, Evelyn, to help us bring these stories into light.
- Federico Ardila: [18:30](#) Thank you for that.
- Evelyn Lamb: [18:33](#) Well, thank you for the kind words. It's really a privilege to be able to hear and share all these different stories. Thanks a lot for sharing yours.
- Federico Ardila: [18:43](#) Yeah. Thank you and I agree with you that ... maybe to come back to a point that I was talking about earlier that, again, I feel like I'm reaching the age where I'm asked to participate in things like these, and to be inspiring but I always find that I am much more inspired than I am inspiring. I think it's just really fantastic to see initiatives like this and to hear the wonderful things that people are up to. So, thank you for letting me be a part of it.
- Evelyn Lamb: [19:13](#) Thank you for listening to the Lathisms podcast. It's produced by me, Evelyn Lamb, and made possible by a Tensor-SUMMA grant from the Mathematical Association of America. Our music is Volveré by La Floresta.
- Evelyn Lamb: [19:28](#) Lathisms is an initiative to celebrate the accomplishment 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.
- Evelyn Lamb: [19:51](#) Join us next time to hear from another inspiring mathematician.