Evelyn Lamb:	00:00	Hello and welcome to the Lathisms podcast. I'm your host Evelyn Lamb. In each episode, we invite a Hispanic or Latinx mathematician to share their journey in mathematics. Today I'm very happy to be talking with Juan Meza. Thanks so much for joining me.
Juan Meza:	00:25	Thank you for having me here, Evelyn. It's a real pleasure.
Evelyn Lamb:	00:27	Can you tell us a little bit about yourself?
Juan Meza:	00:30	Let's see, what can I tell you? I'm a computational mathematician. I've worked in industry, national labs, academia, and now I'm working for the National Science Foundation, and it's been quite an interesting ride so far.
Evelyn Lamb:	00:45	You just started at the NSF, right?
Juan Meza:	00:48	I started at NSF last year. It's been about 14 months now.
Evelyn Lamb:	00:51	Okay, and what is your role there?
Juan Meza:	00:55	My position here is Division Director for the Division of Mathematical Sciences. Our main goal is to support fundamental mathematics research and education in the country. This past year we had a budget of about $235 million, three quarters of which goes directly to researchers across the country. In total, we support almost 5,000 faculty, postdocs, and graduate students.
Evelyn Lamb:	01:17	And so it's been, I'm sure, quite a journey to get to that point. What were some of your early experiences in math?
Juan Meza:	01:26	That's a great question. Early experiences I'm not sure that they are so much in math as they are in science in general. I was always very curious as a kid and just have spent a lot of time reading a lot of science fiction and a lot of science type related books. And at some point I just got interested in math, probably just through puzzles. I love to do puzzles and a lot of the puzzles, as you probably know, have a lot of math content in them or they involve some sort of a math trick that you need to learn about. I think maybe that's my way to get into the mathematics.
Evelyn Lamb:	02:05	So you were drawn in by, Martin Gardner puzzles and that kind of thing?

Juan Meza:	02:13	Yeah. Martin Gardner. Scientific American used to be one of the best reads I had as a kid.
Evelyn Lamb:	02:19	And so as you continued in school, how did you end up going into mathematics as an educational and career path?
Juan Meza:	02:30	It's interesting, it wasn't something that I picked early on. I liked math, and I liked it because it helped me solve a lot of problems. But I was set to go into engineering and in particular electrical engineering. Then I got a very lucky break, and I ended up doing an internship at NASA right out of high school.
Juan Meza:	02:50	Then all of a sudden I got interested in, at that time it was the shuttle that was just starting to get off, and this whole question of the Apollo missions. Because I grew up in Houston, that was the big thing. And they got me very interested in computer science.
Juan Meza:	03:08	Then I slid into computer science as one of the things I wanted to do. It wasn't until graduate school that I really became interested in mathematics as a field in its own. It was mostly just something that I used to be able to do other things.
Evelyn Lamb:	03:21	Growing up in the shadow of NASA in Houston probably helped you find that internship.
Juan Meza:	03:30	Exactly. Yeah. It was a a lucky break. It was one of those things that you never know what's going to happen, but our high school counselor had just said, "There's some opportunities for internships. If you're interested, fill out an application and send it in." And I just happened to get one of the few students there that got chosen for an internship. It was really quite an experience, I'll have to say.
Evelyn Lamb:	03:53	It sounds like that counselor really helped you pursue your interests, but did you have other people, mentors or teachers, who encouraged or discouraged you in pursuing engineering and math?
Juan Meza:	04:07	I had a couple of people that encouraged me a lot. There was my calculus teacher, or rather I should say my pre-calculus teacher. We didn't have a calculus course in high school. But he was very, very encouraging in terms of helping me think about math as a field of its own.
Juan Meza:	04:24	Then I had other people, mostly at Rice University, where I was at as an undergraduate. Richard Tapia was the name of one of

the professors who's probably very familiar to this audience as a great mentor. Of course you went to Rice University, so you probably know of Richard as well, and you know what a great mentor he can be. He inspired me to do other things as well.

Juan Meza: 04:47 So early on I had a lot of people that gave me that motivation and inspiration to go into these fields.

Evelyn Lamb: 04:57 So you went to Rice for undergraduate, did you also go for your graduate work?

Juan Meza: 05:02 Yeah, I spent a lot of time at Rice. It's one of these things. As a Rice alum yourself, sometimes you are a little embarrassed about how much time we spent at Rice. But I did a Bachelor's and then I did what they call the fifth year as a Professional Master's in Electrical Engineering.

Juan Meza: 05:24 Then I went out and worked for a couple of years in a computer company, and at Exxon, and then I decided to go back to graduate school, where I then got a Masters and a PhD in Mathematical Sciences as it was called at the time.

Evelyn Lamb: 05:37 What are some of the research questions that motivate you?

Juan Meza: 05:40 Well, I try to keep my foot in the research arena just because I think it's important for anybody at any position to have a little bit of research. But one of the areas that I'm looking at these days is a field called derivative free optimization.

Juan Meza: 05:56 To explain that, I'm really a computational mathematician, which means I like to take problems and try to solve them on a computer. And the way to solve them on a computer is to develop mathematical models that you can put on a computer and then solve them using that computational power.

Juan Meza: 06:13 Within that particular area, there's a field called optimization, and optimization is where you try to find the best solution of something, or the what's called the minimal or the maximum of a particular function.

Juan Meza: 06:26 A good example is a problem that I worked in a little while ago, which is called the protein folding problem. In that problem, what you look at is you look at a protein, which we all, we have thousands of these in our bodies and they perform all sorts of functions.

Juan Meza:	06:41	The question then becomes is, what actual structure and what shape does a protein take? Because if it does its job correctly, it's in the right shape. But if it doesn't fold in the right shape, then bad things happen to us.
Juan Meza:	06:55	So biologists are very interested in understanding, what's the right shape? Well, it turns out that if you take that protein and you model it mathematically and then you ask the question, what's the lowest energy state? What's the minimum energy of that protein? That corresponds to supposedly the structure that it occurs in nature.
Juan Meza:	07:17	That's a way to translate what's happening in nature, or inside our bodies, into a mathematical formalism. And what we try to do is try to develop algorithms and methods that help us find those minima, because then that helps us understand the biology of proteins.
Evelyn Lamb:	07:32	And when you say derivative free, when you talk about optimization, of course my first thought is find where the derivative is zero for some quantity. Is this meaning this is a non calculus way to do this optimization?
Juan Meza:	07:49	Excellent observation. And yes, exactly. We've all been taught that in fact the best way, or the way of finding a minimum, is take the derivative, set equal to zero, and then that's where your minimum is.
Juan Meza:	08:01	Well in a lot of situations it's very difficult to find the derivative. And one of the things that I was becoming very interested in when I was working at the national labs was these optimization problems where the function evaluation rather than X squared plus three X plus two, or something like that, really the way you calculate the function is through a computer simulation. Somebody written a computer simulation, you run it for however many hours, or sometimes days, and that's your function evaluation.
Juan Meza:	08:32	Well, when you have that situation, derivatives are very hard to compute or they're non-existent. So, the question then becomes, how can I do the same thing without having to use derivatives?
Evelyn Lamb:	08:43	It's like with one hand tied behind my back, or something.
Juan Meza:	08:47	Exactly. Yes. That's exactly a good analogy.

Evelyn Lamb:	08:52	Did you start your career working on this type of problem, or have you had done a lot of different problems in applied and computational math over your career?
Juan Meza:	09:04	Worked on a lot of different problems. I've worked in linear algebra, optimization of course, but I've also worked in PDEs partial differential equations. You know, it's kind of funny, I don't know that if I had charted out my career path that I would've picked exactly this, but it just seemed to happen.
Evelyn Lamb:	09:17	Can you talk a little bit about the importance of mentorship in your career, both when you were younger, you talk about Richard Tapia, I'm sure you had some other mentors, but now of course you probably are more in the role of mentor to other people. So can you talk a little bit about that?
Juan Meza:	09:35	Sure. When I think about my career, I've always been very fortunate to have mentors at just critical points in time. But I was thinking about this a little while ago and it turns out that I've actually had a lot of mentors throughout my career. It's just some of them have been more important in some times and some of them had a greater effect. But I think role models and mentors are probably one of the single most important aspects of anybody's career and success. You know, there's this myth of this the person who does everything on their own and they're just a self-made man or self-made woman. But the reality is we've all had help along the way, and I've been very fortunate.
Juan Meza:	10:15	Richard Tapia is one, Inger Moelleken, he's a statistician actually, but he was very instrumental in helping me out when I first got out with my PhD. Margaret Wrights another mathematician. She and I talked a lot at certain points in my time when needed career advice. She was very instrumental as well.
Juan Meza:	10:37	These people are just so important in our lives and when you get so lucky as I have, I like to turn around and then turn it, like I say, pay it forward. I like to do the same thing for other folks.
Evelyn Lamb:	10:50	What kinds of mentoring work have you done?
Juan Meza:	10:53	Well throughout my career I've either had graduate students or post docs, depending on where I was at. I've also volunteered to be mentors for various types of programs. There was a program called MentorNet a while ago, I was involved with that and whenever I've been to either at the National Labs or in industry or even here at the National Science Foundation, if there's a

mentor program, I usually sign up for it. In fact just last month I entered the mentor program here and I've got two mentees that I'm working with right now, as well as being mentored by somebody else here.

Evelyn Lamb: 11:29 And have you deliberately done a lot of mentorship with people from underrepresented groups?

Juan Meza: 11:36 I try to do that. Yeah. I am a member of SACNAS. I was on the board for a long time, and I use that organization as a way of also trying to develop more mentoring relationships.

Juan Meza: 11:49 I think a lot of times just doing our job and doing it in a way that allows us to be visible is just another way of being a mentor. I've found that just for example, I get invited to give a lot of talks and so when I go to the universities, I always say, "Okay, I will do this, but I only have one requirement." And the requirement usually is I want to have lunch with the graduate students by themselves, or I want to have lunch with the undergraduates, depending on the institution. That's usually my fee, if you will, when they ask me to talk.

Evelyn Lamb: 12:23 And of course no career is completely smooth sailing. So can you talk a little bit about some challenges that you've faced and how you've overcome those?

Juan Meza: 12:34 Sure. It's funny that you phrase that so politely and nicely, but you're absolutely right. There has probably been as many failures as I've had successes. I used to give a talk to students, again it's one of these talks where I get invited and I think it was titled, "Why I Want You To Fail". And I used to get shocks from the students because they were expecting a here's how to be successful kind of thing. But my point to them was that if you're always succeeding, you're probably not pushing yourself to the ultimate. You're not trying hard enough to really expand your capabilities. And so to a certain extent, not only do we have to allow ourselves to fail, but we have to allow ourselves to really spectacularly fail sometimes.

Juan Meza: 13:22 And there've been times when I can say that that's been true. I've applied for jobs and I have done not a very good job in the interview, or I have tried to work on a project and it just didn't work. Even after we've poured a lot of money into it. It just didn't work out. But what you do is you take those problems and you go back and try to figure out what can you learn from something like that. And the point that I try to make is that

sometimes we learn a lot more from the failures than we do from the successes.

Evelyn Lamb: 13:51 Right? Yeah. Just this morning when we were, or for me morning for you afternoon, when we were trying to set up our recording, we learned from several failures, and I now have some things that I will be doing in the future to hopefully they can work better.

Juan Meza: 14:12 Yes. Well, but just to add onto that, what I find in a lot of our groups, you're talking about underrepresented minorities and women in the STEM fields, I think sometimes we're very reluctant to take those chances, because if we fail somehow or another, we feel like we're more visible or that people are just watching us more, or they're scrutinizing us more than perhaps other people.

Juan Meza: 14:40 I think that leads a lot of us to really try hard to not fail. What I try to point out is that no, in fact, if you really want to be successful, you've got to be able to handle those situations as well.

Evelyn Lamb: 14:55 But it can be a lot harder if you feel like your failure represents an entire group of people who are not treated as equals sometimes.

Juan Meza: 15:05 Absolutely. If I were to say, probably the first 15 or 20 years of my career, I felt exactly like that. And it was only after a while that I started to feel a little bit more comfortable. It never completely goes away, by the way.

Evelyn Lamb: 15:20 Yeah. I guess that's either good or bad to hear. I'm not sure which.

Juan Meza: 15:24 Well, it's normal. It's normal. You get better at it. But the point is that you will always feel like that. But that's a normal thing.

Evelyn Lamb: 15:35 Of course the Lathisms Project grew out of a Hispanic Heritage Month observance where this group of people wanted to help make Hispanic and Latinx mathematicians more visible during Hispanic Heritage Month. So have you been involved in Hispanic Heritage Month things before, and what are your thoughts on that observance or celebration?

Juan Meza: 15:59 I have been involved before. It's typically I'll get requests to give talks at around that time of the year. So, my thought is this, I

think it's important for all of us to really recognize and celebrate the successes of the people that are out there.

Juan Meza: 16:15 There are a huge number of people that are trying very hard to do things, and to improve other people's lives. And if we don't stop and recognize that, I think we're not doing our community a service.

Juan Meza: 16:28 I think it's so important to really reach out, and to really highlight those activities because it's something that we all do over and above all the other things that we have to do in our lives, in our careers.

Juan Meza: 16:41 So to have people do these things and still, people technically successful and then also some really incredibly successful as people themselves I think is so powerful a statement to everybody out there.

Juan Meza: 16:54 We sometimes have this sense that to be successful you have to have a bunch of awards and you have to have a whole bunch of different of papers or something like that. But for me, the people that I really emulate, those people that I mentioned, Richard Tapia, Inger Moelleken, and Margaret Wright, the reason I emulate them is not because they're great mathematicians and statisticians, they are, they very definitely are, but they're also wonderful people and they have done a lot to help other people. And to me that's something that we need to really celebrate. There's that balance and that willingness to go beyond ourselves and to help other people.

Evelyn Lamb: 17:32 I guess to close, do you have any advice that you give, especially for Hispanic and Latinx students who might be listening to this podcast and might be interested in a math or science career?

Juan Meza: 17:44 My advice would be a little bit similar to what I said a little while ago. Try as hard as you can. You really are going to face a lot of obstacles, but I take inspiration from something my mother taught me a long time ago, and this was actually when I was probably in elementary school and I was getting frustrated with some homework problems, or something.

Juan Meza: 18:04 What she pointed out to me was that success was a lot more about hard work and perseverance than how smart you think you are, or how smart other people think you are. So for me, a lot of times we've got to try and we're going to fail, but that's okay, because if you try hard enough and if you persevere, you will succeed.

Evelyn Lamb:	18:26	That is a wonderful thing to end on. Thanks a lot for joining me today.
Juan Meza:	18:30	Thank you so much, Evelyn.
Evelyn Lamb:	18:33	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 Volvere 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 dot O-R-G. Join us next time to hear from another inspiring mathematician.