Anastasia Halfpap

Corey is the best collaborator I have ever had. He is very open talking about math. It can be a very vulnerable process.

INTRO: Ashby Kinch

You just heard the voice of Anna Halfpap, a PhD student in UM’s Mathematics program, talking about our guest on this week’s episode, Dr. Cory Palmer. Cory’s in his 10th year as a professor here at UM, and has a fascinating background. Having spent time in Hungary as an undergrad, he returned to the Central European University for his PhD, where he tapped into that nation’s distinctive intellectual tradition in mathematics, including the quirky and charismatic figure, Paul Erdos. Every episode, we ask our guests to read a poem, or a short passage from literature, about rivers. Cory has chosen a passage from Tibor Fisher’s novel *Under the Frog*, a dark absurdist satire of life in Hungary between WWII and the 1956 revolution against Soviet power. The passage launches our conversation about his experiences in Hungary, his research interest in graph theory, his ideas about the power of collaboration, and about the importance of cultivating graduate students in the human dimensions of math. Listeners who hang around to the end will catch Cory singing a certain famous song by They Might Be Giants.

Welcome to Confluence, where we lounge on the verdant riverbanks of conversation, and the fun never diminishes!

Cory Palmer

This is a passage from Tibor Fisher’s dark comedy *Under the Frog*.

“It all started with a rowing trip down the Danube with Juri. They stopped for a bite of lunch on Sheppel Island and as they relaxed on the Verdant Riverbank, jury spotted a small container of the type that usually house grenades to their joy. It was full of grenades. They did some fishing grenades, producing unbeatable results. No wasting time with maggots bits of line hooks, waits, waiting. But after you've harvested a good hall of zapped fish, the fun diminishes.”

AK

Welcome to Confluence Corey.
Cory

It's a pleasure to be here.

AK

I'm so glad you picked that passage. So often on the show we asked people to pick passages about rivers and they picked these beautiful, flowing, lush, pastoral beauty. And this is an anti-pastoral image. And we could talk about that a little bit, but I love it. So why did you pick this particular passage?

Cory

Well, I mean, I love the book. It's one of the funniest I've ever read. It's one of those ones that funny, like dark funny. Dark funny? Yes, very dark. Among the darkest things you can joke about, frankly. It's one of those books that I read every year, and it's a one-sitting type book. You read it and you don't put it down until you're done. But it's about a city that I lived in for eight years and in locations that I've lived in, granted, 60 years before I did.

AK

Right. So it's kind of said in the post-World War Two period leading up to the uprising revolution against the Soviet backed regime of Hungary. Budapest.

Cory

Yes, exactly. So reading that reminds me of my time there, even though it was quite different, obviously, from the experience in the book. But the Danube River was a huge part of life there. You can't go a day without seeing it if you live in the city. And so it's just one of the passages from the book. There's many about rivers, actually in the book. I mean, again, life centered around the river.

AK

Yes, so many civilizations are. But then this passage captures all of the tension around that as well. In a society that's undergone a ton of war, first of all, and the danger and threat of war constantly. This box of grenades is just, it says, of the type that usually holds grenades so the people can immediately recognize it as a grenade box.

Cory

Right.

AK
The two young men. And it's kind of a coming of age novel. So there's that component to it. But it's threaded through that as the dark, looming reality of communism and the life under Communism, but then the dark, looming reality of the Soviet empire right on the border of Hungary in a country that's trying to maintain its identity so that mapping of the country's identity onto the human identity of the main character. Was that part of its appeal for you? Did you pick it up when you were in...? So just for context, you spent your study abroad time there as an undergrad. What drew you there initially anyway?

Cory

So I wanted to go abroad as an undergraduate, but I didn't really know where. But then I came across this program called Budapest Semesters in Mathematics and I was a bachelor's students. It just seemed obvious I wanted to go to Eastern Europe. Just it seemed like the out of the ordinary thing to do at the time. And this was a perfect marriage of Eastern Europe and mathematics. And that's what drew me. There no other connection beyond that.

AK

Yeah, but what a great connection. So did you encounter this book while you were there?

Cory

Yeah, exactly. I think in graduate school, not as an undergraduate. So later on I came across it. Yeah.

AK

We're going to come back to your time in graduate school because I think that's really important thing to kind of get to, but just staying on. The Fisher novel, when you read it would have not been that long after it was actually published.

Cory

That's right.

AK

Even though it goes back and tells the story, it was only published in the early 90s. So yeah, talk me through that resonating. Why did it resonate for you in that particular time of your life? And why do you read it every year? I mean, that's real commitment.

Cory

Sure. Well read it every year just because of its one of my top five and I can't... It's just... It's so funny and so I don't know, so cynical. It's a style of humor that I enjoy a great deal. I think it reminds me of the
absurdities of life anywhere. Life in Hungary often was absurd, even for me. Just living abroad is always sort of a strange thing. Right. You're this outsider and what's normal there isn't normal for you. And so it always feels a little absurd. And so, you know, the book just sort of fit that idea really well for me, I think. And that's why it resonated with me. Yeah.

AK

There's a way in which a book like that can really tumble you back to a time in your life and then because of the Benchmarks, like if you're reading it every year, you're sort of thinking it also allows you to think back in time. Hungary's history. It's a wonderful kind of telescoping effect or something like that.

Cory

That's right. Yeah. Despite it being fiction too. It takes place around real events. And so I learned a bit of history of Hungary and how not just the events, but how people thought about them.

AK

Yeah, it's artful book that way, in that it doesn't tell you history in a kind of narrative way. You get these punctuated moments where you can feel the pressure on the character's perspective. It's a very perspectival novel, big jumps in Time. It almost reads like a diary or a fragment very much. But it jumps in time and so Reader has to fill in a lot behind it. It almost induces you to do that. What's going on in between here?

Cory

Yeah, that's right.

AK

Yeah. It's an artful book. It's a really good one to talk about. Well, from standpoint of Confluence, I have to sort of say a thing about the anti-pastoral part. I don't know that Tibor Fisher would be aware of the sort of literary tradition of the pastoral at all. I think so, but I can't be sure. But part of that is based in a city urban perspective on the world and a kind of country bucolic, outdoor perspective on the world. And this is an anti-pastoral. Because of that, instead of fishing in that slow, meticulous way that a fly fisherman does, they're just blowing them all up. But then there's that. “The fun diminishes” -- that line at the end, which really is an incredible insight into that phase of late adolescent life. You do this impulsive thing, it seems, right. But then you also recognize the pleasure is not sustainable. It's got destruction related to it. That's part of this literary tradition. I think Montana's will know about Isaac Walton. Isaac Walton wrote The Complete Angler, so he's kind of fetishized in the fishing community, but he actually overlapped in time with John Donne, the great English writer and poet who is a generation older, who used to make fun of him for that obsession.
I'm just going to read this little quick passage. This is from a poem called The Bait, which is otherwise a sexual seduction poem. But right in the middle of it, it has its two stanzas. "Let others freeze with angling weeds and cut their legs with shells and weeds, or treacherously poor fish baset with strangling snare or winnowy net. Let others bold hands from slimy nets the bedded fish in banks outrest or curious traders sleeve silk flies bewitch your fish's wandering eyes." So he's mocking the kind of labor and attention, while in a weird way, also kind of acknowledging it, acknowledging how much work goes into it. So I just thought of it in terms of this fish blowing fish out of the water is like the ultimate anti-pastoral. Setting it aside is almost like an industrial operation.

Cory

That's great. That's a wonderful perspective. Yeah. I wonder if Fisher is aware of this. He's a pretty accomplished writer. I think this book in particular maybe was shortlisted for a Man Booker Prize.

AK

It was, yeah. Right out of the gate, his first book. So it's an impressive accomplishment. Well, we can kind of talk a little bit more well, we are going to talk a lot more about Hungary, because you ended up going back.

Cory

Right.

AK

So it had this strong allure and I think that's such an interesting part of your story that you decided to return there for your PhD at Central European University, which you have that choice.

Cory

Yeah, there are two parts. During the year abroad there, I met the woman that would become my wife. So that's a pretty strong draw to go back.

AK

That's a big draw. Assuming a Hungarian, of course. In other words, not she's Hungarian was living there.

Cory

Precisely. Yes, exactly. I also met who would be my advisor, too. So two pretty important individuals.
AK
Well, in some people's life, the adviser would be more important.

Cory
That's funny. So that was sort of I graduated, flew back a few days afterwards to be there with no real plan. It was sort of, let's do a gap year here, and then I'm going to go back to the US and go to graduate school, and we'll see what happens. While I was there during that year, I was meeting who'd become my advisor to talk math occasionally, and he said, “Why don't you go to graduate school here?” It was his suggestion. There's a university here, there's a math department. It's in English, you should apply. So I applied and got in, and then I was like, “Well, I'll do you here, then I'll go to the US.” But once I was there, it made no sense to go back. So it was perfect for me. Romantically, but professionally or galactically, let's say, at that time. Yeah.

AK
And that balance, of course, is hard for any academic system. You're making all these choices that had to do with your future goal, which you always kind of had your mind set on becoming a professor. And we'll kind of loop back to that, I think. But it's such an important thing, I think, for this podcast. We're always trying to elevate the narratives that drive professors' lives, no matter what their discipline, they have these interesting stories about what drives it. So that's a set of choices that's really hard for a graduate student. You're weighing out sort of prestige of your degree and the possibilities of research and your long term happiness. And so you kind of made a bold, kind of courageous decision to be outside the American system, but to throw your hat in with the university. And we're going to talk about CEU a little bit here, because I'm fascinated by it, almost obsessed with it. Right. For listeners who don't know, founded by George Soros, the huge hedge fund millionaire. Made most of his money on currency trading and has a bit of a libertarian streak and has become a little bit more controversial more recently. But at the time, Soros has this Hungarian background, and CEU was very explicitly founded to kind of counter the communist history and culture that he saw as kind of corrupting his own home country. Is that about the right account?

Cory
I believe so, yeah.

AK
And did you know that whole back story when you were making these calls?
Initially? No. No, I didn't know that. He had funded the university and so on, but within the first week of attending, it was like, oh, okay, that's the story here, and so on. He was a less well known figure at that time. He was seen as the hedge fund billionaire and philanthropist, and now his sort of role in society has transformed.

AK

But there's something about the CEU's purity of mission that actually, even if you'd start to feel icky about some aspects of tech fund billionaire, buying a university, founding a university sure. He did want to... It's open society principles. Right. He wanted to promote intellectual discourse in a part of the world that he himself was tied to and felt like had shut down its open discourse. So there is a kind of noble, high ideal behind it. And I think that's why CEU, despite later controversies, has kind of continued to have a bit of an idea. I mean, there's something about it as an ideal, you know, attempt to hold off this ideological bludgeon of the Hungarian government. Did you feel or sense that while you were there?

Cory

Yes, absolutely. Oh, totally. So maybe less so in the mathematics department, which was always sort of an odd duck in that university. It was mostly public policy type school. A lot of the students that graduated from Europe as diplomats or became even prime ministers. I think the Prime Minister of Georgia was a student there at one point. That was definitely a big part of the community there. When you interacted with other students that were pursuing those subjects, you really got to feel that type of thing. Yeah.

AK

And of course, it's falling on a little bit of hard times. Had to move out of Buddhist Pass. It's now? Mostly in Vienna, I think. Or maybe all in Vienna. I think essentially all under the Orban regime.

Cory

That's right, yeah.

AK

So we hope to hang on.

Cory

Right.
So through that experience in the CEU, you got a deeper and richer encounter with the Hungarian intellectual tradition, which includes this great giant of Hungarian math, Paul Erdos.

Cory
Yeah.

AK
Erdos, tell me a little bit about that. You sort of cite him as your intellectual hero. Why is that?

Cory
Yes, he’s a wonderful individual, a fascinating, singular person. There’s no one really else like him in academia. He was basically homeless his entire academic career. He bounced from institution to institution as a visitor, living out of two suitcases and doing mathematics as every single waking hour of his life. I know plenty of people who are workaholics and dedicated to their job, but no one even an order of magnitude close to this lifestyle.

AK
Yes, he converted the whole ideal of mathematical collaboration into a lifestyle. He just shook all institutional ties and just threw himself out there. But he kept getting received because, of course, the impact he was having on the field.

Cory
Absolutely, yeah. I mean, he’s responsible for huge advances and the popularization of the subject of combinatorics and graph theory and other subjects, too. And you said it really there with collaboration. His legacy is, to me, the idea of collaboration in mathematics, sometimes from the outside, mathematics is perceived as a sort of lone individual working by themselves at the desk, doing all the work alone.

AK
Totally. And Hollywood, when it plays into that, always tells that story of the sort of isolated genius who has these insights in a vacuum or something.

Cory
Right. Those intervals do exist, which is fascinating, and many of them are among the greatest individuals in mathematics sometimes. But most of them and most mathematicians do not work alone. It’s much more effective to work together for a variety of reasons, just like in the other disciplines, of course.
Well, I don't know. I think that's worth talking about a little bit. Maybe that's true in my neck of the woods, where people working alone is actually the norm rather than collaboration. But in STEM disciplines, the lab culture, and certainly the need to exchange technological insights and innovations, it drives a lot of this collaborative work.

That's right, absolutely. Yeah. In math, it's the same people bring different perspectives, different expertise, certainly. And for me, frankly, a lot of it, it's just more fun working with other people. I find the thing I love about it the most is sharing discovery. Right. You crack a hard problem and you share it with the people you're working with. And if you work by yourselves, there's no one to share it with. No one understands exactly what you're doing.

That's so interesting because that's like the affective... This is a big part of the podcast is we're trying to bring to the surface the inner life and feelings and emotions and psychology of being a professor and a researcher, which is not something that gets talked about a lot publicly. So that feeling of joy, I mean, that's super important. Right. And in math, when you crack a problem, you know it when you've done it, and that's a big moment. And if you can share it with people immediately, because we know when you publish it, it's going to take a year. A year, right. You're going to send it off as a written paper. It's going to go to review. It's going to be reviewed for forever. But that initial moment is incredible.

Right? Absolutely. Like most things, they're better when shared, I think, at least. But really, it's because those people understand exactly what you went through. They were sitting there in the chairs together.

What is your Erdos number? The Erdos number being the number of steps it takes, I guess, or lines that you can trace back to him himself.

Yes, it's two. My advisor wrote papers with Paul Aired.

Okay, well, there you go.
Cory
The lowest currently Achievable Erdos number.

AK
Right, exactly, right. Because he's passed away. Now, that's amazing. Two. Right. So that's a joke for
listeners, a joke within math, because 1500, I think, is the number. I saw collaborative articles that Erdos
published in his lifetime.

Cory
600 co-authors or something like that. Yeah.

AK
I don't see you cheated because you didn't know. Right, but wow, that's a direct line into the Erdos
lineage, right? The tree.

Cory
Yes. It's like Kevin Bacon number. It's the same idea, right, that people do with movies.

AK
Six degrees of Kevin Bacon. Exactly right. That's awesome. I noticed just because I have an interest in it,
an early publication with neuroscientist, how did that unfold?

Cory
Yeah, that was interesting. I think while I was still in graduate school, we had a course with some
mathematical neuroscientists, I guess you'd call them. Someone that needed some mathematical
expertise reached out to them and said, "Hey, are any of your student's knowledgeable, have some
background?" Well, I don't think we needed to have a background in neuroscience. I'll get to that. In fact,
that part was fun about it. So they just reached out to students, and me and another guy said,"Hey, we're
interested. That sounds like a fun project. Let's learn a little bit and see what we can do." And that's just
how it happened, one person to another person, and they were looking for help. And then I got involved in
that project, which lasted a few years. I was mostly doing, I would say, like, data analysis. So they had a
bunch of two-dimensional data of placement of neurons in slices of a brain of a monkey marked
somehow, and they wanted to measure density of these things, like how compact were they in certain
areas. And I came up with some tools to measure that, and we wrote a few papers based on that stuff.
Wow. And of course, the sort of next level up abstraction for listeners is that people with really high-level math skills are in great demand if you want to be involved in research projects like that and you have the set of math skills, there's kind of infinite places for you to kind of apply do applied work.

Cory

Yes. This project was such a good example of that. I wasn't a particular expert in data science. I didn't know much neuroscience. I took a few courses in college. But they wanted this measure of density, which was a general thing that was outside of neuroscience. It could be anything. And so I sort of thought about it a little bit and said, “Well, here's a measure that sort of matches the setting there.” And to me, it was sort of a natural idea to come up with. And they were blown away that this is not something that would have occurred to us, and we'd never seen this analysis. And that was a matter of my training was just different than theirs, and I've seen something they hadn't seen. And to me, it was easy, let's say. And to them, it was hard, but it wasn't a matter of cleverness, necessarily, it was a matter of background.

AK

Yeah, that's so great to pull again, pull up. And it sounds like an advertisement for our podcast. But I mean, it's kind of one of the things we really like to highlight is that interdisciplinarity, when it's really functioning well, it's allowing people to do the thing that they do really well, but in conversation with people in adjacent disciplines where they can use that expertise. So there's a really profound exchange of ideas rather than just mere technocratic or like areas that often would call themselves interdisciplinary, but are really so enmeshed in one another to begin with. But you really taught them something and they taught you something, and there was something new. A third thing emerged out of that combination.

Cory

Yes, totally. In fact, I remember the beginning. It's proof that this is interdisciplinary. We couldn't even communicate when we started. Right. They wanted this thing, and I didn't know what that meant. And then over time, oh, you want this? And it translated to my language and oh, that's the degree of the vertex or something. And they had some other term, and there's this like, funny period of time where you're feeling each other out for what's going on here. Exactly.

AK

Yes. And it is hard work too. Right. That kind of collaboration takes time. And so the joy side of it that we talked about earlier also has this other phase where it's like struggling to create common terms.

Cory

That's right, yeah. And the goals were different too. I remember I was sitting there the whole time thinking, what are we going to prove? What's the thing to prove? Well, they weren't going to prove anything. Right.
They're gathering evidence to support a hypothesis. There wasn't going to be a proof in the mathematical sense. That's interesting. That's what I was primed to do.

**AK**

So how did you kind of come to focus on graph theory, which ended up being kind of the field where you've defined most of your work?

**Cory**

Yeah, I think there are a couple periods of time that were important for that. So when I was in college, still in California, I took a course in computer science, like this Introduction to Discrete Math course. It was in the computer science department, not the math department, and there was some graph theory in that course, and I really liked it. It really clicked with me, but I just was like, oh, this isn't math, this is computer science. And so I just kind of kept that in mind. I was like, I still want to be a mathematician, even though this stuff's cool, it's just whatever. And then it was when I went to Hungary and there's sort of the world center of graph theory. And during that year abroad, I had several courses in graph theory that were ordinary mathematics courses, and it was like, oh, so this is math. After all, okay, this is what I want to do. This is a subject, for sure. There were two courses in particular that focused on that subject, were probably the two best courses I've ever taken. And so I always wonder, was it that the professors were really good? Was the subject itself very good? Was it something I was inclined to do? Of course, it's a combination.

**AK**

It is some combination of all those things.

**Cory**

Yes.

**AK**

Contingency like that -- I don't want to say luck, right? -- but, contingency like that defines a lot of our intellectual trajectories. Right. That it's just the right thing at the right time matches our interests and the people involved. You're a people person. Clearly that's important to you. So that connection to a particular teacher would kind of be a launching point. Of course, just because a podcast is an oral medium and math is hard to talk about orally, one of the things I wanted to just sort of make as an observation and hear what you think about it is the wonderful metaphors that are in basic math ideas, like the tree packing conjecture. Some of the stuff, the tree packing conjecture and the rainbows, they're very evocative to me from a language standpoint. They almost feel like tree packing conjecture, almost feels like the beginning of Grisham novel. But anyway, I mean, that's just a glib aside. But I think there's something to the idea
that math has to convert the detail of its quantitative work into these higher-level concepts that they can then package the set of ideas around. Does that make sense?

Cory
Yes, absolutely. That's a huge thing for me, especially in mathematics, is this metaphorical thinking and descriptions, because you do need to write things formally to make a fully fleshed out argument. But those are hard to read. The most perfect logical argument is for a computer to read, frankly. So when you want to communicate these ideas to a person, and that's an important thing when you write a mathematical paper, true or not, it needs to be readable by a human. Right. That's who we're writing for as other humans. And so including metaphorical language like this, that's descriptive, helps put a picture in your head that, oh, wait, this is going on because it's a treelike structure and the tree reminds you of the object you're working with. It can be very helpful. Yeah.

AK
Speaking of neuroscience, it's tapping into some cognitive structure that's a little bit more foundational to human evolution than quantitative reasoning, which is I don't say it rides on top of evolution. Right. In other words, there's not a natural course for developing mathematical ideas. They are cultural products which have incredible power right. But they're not deeply rooted the way a tree is.

Cory
Yes, indeed.

AK
That's fascinating. Well, part of what we do on the show also is sort of tell the Montana story. We've talked about Hungary. We haven't talked about Montana. How'd you end up here?

Cory
Yeah, it's a funny story. After the Hungary years, I came to the U.S. for a visiting position at University of Illinois, and that was going to be a temporary position. So I sort of, from there was applying to jobs all over the country. And with academia, you often don't know where you'll end up, but you have some control. So I applied all over the country and had a number of interviews in Texas, California, Rhode Island, Montana. And the way it worked was funny. I think that Montana was the last place I applied to and the last place I interviewed at, just the way that things worked out.

AK
The last best place.
Yeah, that's great. Yes, absolutely. That's right. I remember those ads. Before I came, Mark Kyle, who was one of my colleagues in the math department, was on the hiring committee, gave me a call while I was interviewing, I think, in San Diego and said, “Hey, Cory, we want to bring you up and do an interview and this and that.” And I said, “Sounds great. I'm in the middle of an interview, but I'll give you a call back in a few days.” And in the back of my mind, I was kind of thinking, well, if I get an offer from anywhere else, I'll give them a call and say, “Hey, I'm going to take this offer and go on to the next candidate.” Didn't want to waste their time. That didn't happen, so I flew out here and almost immediately was like: oh, my goodness, I'm glad I didn't get an offer yet. Upon arrival in the airport and driving down toward Mount Sentinel, I was like, okay, there's something.

AK

What time of year?

Cory

It was February, I think. So it was snowy, it wasn't too warm, but it was beautiful, of course. And I've been living in cornfields for the last two years, too, and I'm sort of a mountain guy. I grew up in California. We spent the summers and the Sierras all the time, and that was something that resonated with me, too, is I remember the smell of pine trees just in the city, and this reminds me of camping, and I loved that. And then the real thing that brought me here, though, was the people in the interview. We just clicked. And I've always thought that working in a department is kind of like a marriage. Sometimes you're going to be with these people maybe for your entire life or your entire professional life, and it's important to get along, I think. And you don't always know in a two-day interview, if you will, but in this case, it was like, oh, this is where I want to be. These people are fantastic. We got along immediately, I think, Mark and I. When he drove me to the hotel at the end of the interview, we kind of sat in the front seat of the car, chatting for a little bit about this and that. I think we talked for probably 2 hours or something like that in the front of the hotel. And it went back and I was like, I got to go here. This is the place I got to go.

AK

That's so amazing. I have those stories, too, about not just my visit, but about when a faculty member that we're talking to, those conversations in the parking lot right, absolutely. Are crucial. They're kind of part of something about that context. It's a transition where you get a little bit more honest, maybe a little bit more direct. And this is so great you're bringing this up because this is part of the goal of our podcast, is to talk a little bit about the granular life of the professor. And that's the job search, right. Which is such a strange dance. You referred to sort of the marriage prospect. And of course, people think about marriage. This is the meet the family combined with meet the friends combined with all of those rituals where a couple might kind of like circulate their community and find out, is this going to work? Right? It's got all that wrapped up in it and maybe some 19th century components. Yeah. Not just courting, but like, do the family estates bond together? It's multilayer. I'm so glad to hear this up because I think that is one of
those from the outside, especially for graduate students who are listening to the episodes, to know that on
the other side of that, there's a human every single time that there's you as a human and there's all the
humans around you. No matter how abstract and competitive and all of the elements, you're making a
choice that's really ultimately about people in place and you just hit on the two ones that make this place
special. Right. The beauty of our unbelievable campus in town, but then also just the people that keep it
rolling.

Cory

Absolutely.

AK

This is a great segue, actually, into your role as a mentor and advisor of graduate students. You've been
here now, you're kind of going into your 10th year, and you've got some PhD students now. One out there
in the profession and one recently graduated and then a couple in the pipeline. PhD students don't grow
on trees. You cultivate them. So tell me a little bit about your sort of philosophy of graduate education.
What are you looking for in a student and what is that relationship like?

Cory

For sure. Yeah. I mean, it's pretty organic how it happens. When I end up taking on a graduate student,
it's also itself a bit of a courtship dance as well. You know, the student wants to choose you and you want
to choose a student too. It's often mutual. It will be. Typically, I'll have students in my courses, although
even before that, when I see applications, I'll have a pretty good idea about this is a student that probably
would work great in my group or work well with me together and the things I'm looking for. Definitely our
passion for the subject is, for me, the first thing you got to want to do the math. I often lament when
people say, oh, math is hard. Math is hard. I don't love to hear that. But the truth is, it is kind of hard. It's
not easy. It continues to be hard. Even if you're good at it.

AK

And that's probably the issue of making sure passion is driving the student, of course, across all graduate
programs. That's what most graduate advisors, they want to see a work ethic. Right. And they want to see
someone who's going to the passion is going to get them through all the bumps in the road, which there
are a lot. That is this idea that we talk about in the show that most of us have more failures than success,
of course. Just a reality. Right. But grad students don't necessarily know that. In other words, going into it,
they don't realize they look at a professor and look at how this person is living the life that I want to live
and doing the things I want to do. But the road to get there is always bumpy for all of us. And so
addressing that imposter syndrome, that sense that everyone else is doing better than you are, is crucial.

Cory
Yes, absolutely. That was, for me, an important thing in graduate school was actually talking about other graduate students just be honest with each other. Like, I didn't understand the homework here. I don't know what's going on. I'm completely confused. And just admitting that, because when you did, the other students admitted it too, and then that helped everyone out. It was like, oh, okay, yeah, I'm supposed to be getting this, but if I'm not, I'm not. Like, it's not that I don't belong. It's not weird. And I didn't find that out from my professors until much later. And so I make a point now with my students of communicating that to them too. You certainly want them to have high expectations of themselves, but you also shouldn't the message shouldn't be that you can't fail, you know, doing anything in academia, and I think especially math, is constant failure. When you're trying to prove something, 99% of the time, you're coming up with ideas that don't work, and then finally one works. And so you do get sort of immunized a little bit to failure.

AK

Yeah. If something has been... thousands of people have been working on it for decades. Right. It's good to have that perspective. You kind of have referred to that. I think it's an interesting fact. I'm not sure it's true across STEM disciplines that the history of the discipline matters, but it seems to matter to you. Talk a little bit about and how you convey that to your graduate students.

Cory

Yeah, I think so. Math is like this... You mentioned culture before. It's a cultural thing that humans have been doing for perhaps longer than we've been speaking. Right. Counting, like, the first things we probably needed to do was count the number of elk out there or for doing basic training, estimate it.

AK

Because you couldn't count them.

Cory

No, you couldn't count them. Indeed. Exactly.

AK

But about a dozen.

Cory

About a dozen. A handful.

AK

A few dozen.
And in fact, you can go back and find paleolithic artifacts of, like, a deer bone with notches in it that were presumably counting enumerated, probably deer counts. Right. So I think about that a lot, just continuing this human tradition just for the sake of continuing tradition. I remember there's pieces of I don't know how to describe them, but they're art, especially, like in England, like Stonehenge and things of that nature. There's one made out of white rock that's crushed and in the shape of an antelope or something like that that you can only view from above. And it's been around for thousands of years, and humans still go and, like, clean it up and put new crush rock to continue this piece of art. And it's this, like, huge collaboration. And you ask, well, what for? There's no reason other than it's well, it's art, you know, we should continue traditions like this. And I think of mathematics that way.

That's a fantastic way to think about math, because that's, of course, not how most people think of it. They think of it as choreography. You're sort of putting it in the framework of primal civilizational structures of how we think, communicate, solve problems together.

That's right.

That's beautiful. The pointed part of that question is, I think, some empirical sciences, they have a narrative of rupture where they say the scientific revolution changed everything. When I'm joking about it, I refer to it as the we now know, which is always that now is you were correcting past flaws or past errors. And that's not wrong. Of course, there's a lot of bad knowledge that culture is passed along, but this is a different narrative. This is a narrative of continuity with problem solving. So now, no matter how much better we are at math, which is indisputable collectively, it's just also the case that if it's rooted as a primary function, that's the thing that we all share. A two-year-old kid trying to figure out how to count stuff.

Yeah, it's the same thing. Absolutely. There's work proofs done by, say, the Greeks 2,000 or 3,000 years ago that are still valid. That may not be the case in chemistry going back even 50 years. There's much chemistry that's changed and so on. I'm not an expert in the field, but those proofs remain true in mathematics, and we do have our own revolutions and discoveries that, oh, this was actually wrong, but it tends to be, we can build on the past so much.
AK
You build up rather than kind of throw the foundation away and start over. That's fascinating. There's also this concept that you've referred to which really appeals to me of mathematical maturity. Talk a little bit about that concept. I find it very appealing that there's a kind of craft way of discussing the evolution of a mathematician's mind.

Cory
Yeah, it's funny. I've never really seen a written definition of what mathematical maturity is. It's just a thing that when you hear the words, you kind of get an idea for, like, oh, what that should be. It certainly has a nice ring to it, but it sort of describes the idea of how comfortable are you with abstract concepts and thinking very, very clearly and describing your ideas to other mathematicians or other anyone. And that's something that you gradually build up. And when you think back on your career, I can remember times when, as an undergraduate, I didn't know exactly what a proof was and how to construct one.

AK
You were doing them, but you were doing them because you kind of had mastered the procedure.

Cory
Yes, precisely. Exactly. And then you slowly develop a point where, oh, now I understand why that was happening. And that's a step up in your mathematical maturity, and it's something that goes on forever. And one of my colleagues often talks about how that's how he knows what a PhD student is done. That they've reached a certain they're sort of a colleague now. And because they've reached that level of mathematical maturity that you talk to each other as a peer now. And you're no longer yes. You have more experience. But they're at this level now where. Oh. They're just like me. Essentially.

AK
That's a level at which you'd be collaborating and potentially publishing, starting to publish papers with your students. And of course, that's really common in STEM disciplines, very uncommon in the humanities. But you're kind of in this middle space where your students will get to a point where you might be working on a problem together and then end up publishing something.

Cory
That's right. Absolutely. Yeah. That's a key part. I mean, that's something. Most of my students' papers are joint work with me. One of the reasons I have PhD students is you create these mini collaborators. I like working with people, and there's a limited number of people locally that work in my field. And so you train your students to work on the stuff you want to work on. And even if I'm more experienced, they still bring new perspectives and new ideas that I don't have. Yes.
AK
And I think with a PhD student, that's really interesting, because the way that maps onto your work as a professor is you're maturing students in this sort of three-to-five-year window. It takes them a while to kind of get to that point.

Cory
That's right.

AK
And then I think in math, it's kind of similar to the humanities PhD in terms of you don't want all of them finishing necessarily at the same time. You kind of want them interlocking so that you have one that's kind of finishing and one that's starting and you're working with them at different levels.

Cory
Absolutely. Yeah. And I have them work together too. That's an important part, too. I sometimes think of it as the lab model in some of the staff and STEM fields, where you might have a big group and there's more senior, even postdocs working with the graduate students. And the way we work is a bit different, but the way that there's training at each level is important. My senior graduate students help train the junior ones both in the meetings and outside.

AK
And that's good for the older students to practice the teaching. But it's also actually, like you were referring to this earlier with graduate student culture. It creates a graduate student culture. There's some conversations graduate students are going to have more effectively one of one another than with you anyway.

Cory
Yes, absolutely. That's so huge. That's been a big part of in our department. Something I've observed is different time periods. The graduate student culture is better or worse. They push each other hard and they also support each other. And sometimes the culture isn't as good where people aren't talking to each other and everyone's sort of just hacking it out on their own and that maybe.

AK
A little competition is part of that.
Cory
That can happen too. Absolutely. So I think grad student culture is massive. For me, it was one I learned more from my fellow students as a graduate student than my professors. No question about it. The first paper I wrote was with another PhD student, not with my advisor.

AK
Yeah, that's fantastic. And you're learning the sort of sociology of the field, and you're coming up together and you're approaching that. So I think this conversation has been great because it's hit out the cross section of a lot of the issues that we really like to highlight. But that this is a subtle one. Which is you need that mesh between an advisor who is going to be a great mentor at the faculty level. But then you also need that student lateral, horizontal relationship to kind of sustain itself.

Cory
Absolutely. That's huge.

AK
Well, thank you so much for this conversation. It's been amazing. We end every episode with our quick hitters -- short answers.

Cory
Yeah, of course. Okay.

AK
Morning or night person?

Cory

AK
Like, we started this interview at eleven and maybe that was a little early.

Cory
I was late. Right.
Sunrise or sunset?

Well, see above, right? I mean, sunrises are amazing, but I was talking to one of my PhD students yesterday and this came up. Exactly. And sunrise is usually a sign that you've messed up. You've still been up? Yeah.

You stayed up all night? That's a special kind of... that is a special, actually. You're not doing it every day?

No, definitely not. No. Usually ruins the next day. Right.

Winter or summer?

Summer.

Okay. Hiking.

Yeah, hiking. For sure. Absolutely.

Yellowstone or Glacier?

Yellowstone. Yeah.
Animals? What's the appeal there?

Cory

The geology? Yeah, it's just sort of there's nowhere else like it. There's nowhere like Glacier either, but yeah, Yellowstone.

AK

Tough choice.

Cory

Right.

AK

Which baby do you love more? What's your favorite Montana river and why?

Cory

I guess the Clark Fork. I don't know. I mean, it's just like I mentioned at the beginning of the podcast. Right. I love living around rivers. I did for many years in Hungary, and same reason here. One should live on a river. That's how I think we should live. Yeah.

AK

It's our home river. It runs right through there, right in the middle.

Cory

Yes.

AK

And I think I'm sure the Danube, but maybe no less so the Danube. But this is a river that's gone through a lot of change. You talk to Missoulians about the Clark Fork, it used to be trashy.

Cory

Oh, really? Wow.
Junked up and terrible.

**Cory**

Terrible.

**AK**

And it's gone through this real evolution. And of course, we've taken the dams out recently, so it's very different now. We're naturalizing that river. What's your favorite Montana mountain range and why?

**Cory**

I couldn't name one. I don't know. Is it fair to say? The Rockies. That's ridiculous. Right? That's a big range.

**AK**

Hitlers? Bitterroots, maybe?

**Cory**

Bitterroots. I mean, that's a good one for sure. Yeah, definitely.

**AK**

What's your favorite charismatic megafauna?

**Cory**


**AK**


**Cory**

Yeah.

**AK**
What's your shadow profession? So this would be the one you kind of thought about or flirted with or maybe dabbled in or maybe still fantasize about it.

Cory

Yeah, I mean, I'm definitely living in my dream job, so I don't think about it too much. But when I was in college, in high school, I wanted to be a video game designer. That was like many teenage kids do. That was something a big part of my life. Still play video games if you like. Something you want to create. That was something I wanted to do. And when I went to college, I did computer science and thought maybe that's what I'll do. But the math just sort of I couldn't overcome that, and that was what I had to do.

AK

The intellectual passion and this lifelong dream of being a learner.

Cory

Yeah, exactly.

AK

What would your best friend say about you when they were asked what you were like?

Cory

My best friend? What would they say about me? That I'm I don't know. A people person, a nice guy. I don't know if they would say that. I'm someone who can't say no, but that's true. That's good.

AK

What's the one piece of music you'd be willing to listen to for all eternity?

Cory

One individual, one I don't know. I love the band They Might Be giants, sort of silly and irreverent. And anything from their catalog I could listen to over and over and over again, I think.

AK

And I thought you might go to something Hungarian. Famous musical tradition.

Cory
There’s great music in Hungary as well. Yeah. At least, for instance, in Bartok. I mean, their music is incredible. Probably if I had to listen to something forever, it would be something classical. Anything else would become unbearable.

AK
Probably after a while, even they might. What’s the voice you hear in your head when you go to sleep at night?

Cory
Yeah. I mean, this is sort of silly, but like the voice telling me all the stuff that's on the to do list for tomorrow.

AK
Yes, I know that. Do you have trouble sleeping?

Cory
I do, actually. I found a little hack for this is when I lay down for bed, I just write those things down and then if they're on paper, they're sort of like, okay, they're to be done. But I don't have to dwell over them in my head as much. It's a simple thing and often works.

AK
But yeah, externalize it a little bit.

Cory
Absolutely.

AK
Well, thank you so much for joining us on Influence, Corey.

Cory
My pleasure. This was great.

Cory [singing]
“New York was once New Amsterdam. Why they changed it, I can't say. People just liked it better that way.”