Podcast
Women in Math: Episode 34
Naomi Grant and Anwesha Mukherjee

[Stringed music.]

Grant: It always become instantly awkward when I turn on the microphone!   [Laughing.]

Mukherjee: Right, like should we introduce each other?   Haha.

[Music.]

Grant: [Laughing.]   Last time I kept laughing and then it would just "-bbbzzzzzz" [sound of static.]   I'll turn it down.

Mukherjee: [Laughing.]   I had a friend come in when I was using a mic like this, because I don't like my own singing voice, so I always make someone else sing something.   Whether I wrote it or not.   Especially if I wrote it, actually.   I don't want to sing my own thing.

Grant: I want to hear your songs!

Mukherjee: I mean, kind of.   Sometimes.   I had someone sing it, and we were just chilling in a classroom.   He starts singing it, and with singing it's weird.   The best way to pick up sound is if naturally the mic picks it up at like a really loud level.

Grant: Oh.

Mukherjee: Then when you transpose it down after you mess with it after production, I tweak the voice.   I'll go into MIDI and overlay something.   Then you end up seeing a bunch more happen.   So, you end up muting the voice a lot, slowly.   Then

overall the track gets muted significantly at the very end.   That gives it a "cleaner" sound.   It comes out more like the live form.

That's how my choir teacher used to talk about it.   It was weird, if you saw some little things, like the volume, they'd say "that's all wrong, gain all the way up!"   They'd run it so the tracks were hitting the top bars or even going further.   That meant the vocals were at the right volume pickup.   That was strange.

Grant: Yeah.

Mukherjee: I never expected that, I thought it would be just moderate or normal.   Since that was my first experience with a mic, I remembered it the next time I had to use a mic.   For a laptop, it was a talking thing.   I put the gain all the way up.

My teacher looked at me and he was like, "do you   . . . did you ever use a mic before this?"   And I said "yeah, for singing!"   He looked at me and said "you poor soul."   I had no clue why!   It was so bad.   If it's acapella you want it to be like talking, you don't want the gain so high.   But if you're gonna edit and put instruments, your voice becomes one of the first parts of the track lied down.

Outside of the bass and percussion, when you put together a song, even though a lot of people will record a song with all the instruments, and it's easier to sing.   But when you produce it you put the vocals down first.   Then you put percussion over it.   You are running the string sounds maybe right over, in direct comparison.   It's gonna be same key or pitches.

So when you do that, the voice is gonna naturally become more muted.   Then you compress the song so much, and turn the volume down.   But when I heard the final product of a friend's song, that he used for his senior project, I was so confused!

I had sat during lunches and listen to him work on it, for a lot of lunches.   It was so cool to watch.   I helped him with the bass track, and I was like "are you sure the bass isn't too loud?"   He said "everything's gonna be loud for now."

I would be so confused.   Then when it was done I thought it didn't seem right.   How was it that good suddenly!   It didn't hurt my ears anymore.   Which was what I expected.   I mean, it's really fun.   It's cool to watch music at my school.   We have a giant choir program.

But it's nice to know in a way that not everyone's sticking to the traditional, if that makes sense.   Our choir has been around as long as the school has.   Our teacher is much older.   So everyone who you'd imagine is involved in singing.   Once you put them in choir, it's like oh, they're involved in classical training.

They have a lot of cool backgrounds.   Our band and choir teachers are great, at helping people get to more modern sounds if they really want it.

Grant: That's cool!

Mukherjee: It's fun to watch.   I wish I was more involved in that community, I'm really not.

Grant: Well you're probably busy.

Mukherjee: Within the school, yeah.   This week's hectic.   It's club rush at our school.   Did you have a club rush in high school?

Grant: I feel like we did.   I did theater.

Mukherjee: My theater people are some of my favorite people.

I'm tutoring special ed. kids this year, which is so nice.   I'm seeing them be able to assimilate into natural classes.   A lot of times they are segregated off, and not even given one class with everyone else.   So the peer tutors are there to help them.

I get to see everyone interacting.   It's actually in Acting I class.   It's super fun.   They're doing a monologues unit now.   It's the funniest thing.   One girl is doing Alice in Wonderland.   They even got her a costume with the cute little bonnet, and it's so funny how everyone's like, we're probably gonna have trouble with communication.   But they really don't.   They're great at acting.   Definitely a lot more confidence than me, too.   Because I can't do acting, I'll sit behind the scenes.   Last time I was on the stage, I had to do a monologue as King Gilgamesh while my beard fell off.

Grant: [laughing.]   Ah!   They should get better beard glue I guess.

Mukherjee: Well it didn't have glue, it was two loops that went around my ear.   It was uncomfortable and scruffy, I'm glad I'm not doing it again.

Grant: Scruffy.   Haha.

Mukherjee: Did you do theater all four years?   Kind of?

Grant: Kind of.   I did every theater class offered, tech design and acting, and a filmmaking class.   I wish I had done more of the plays.   But I did most of the musicals.   Which is not a good idea.   I've gotten better at singing, but back then I was not very good.

You don't get very good roles in musicals if you can't really wow 'em with singing.   So I wish I'd done more plays.   But, it was

really fun.

Mukherjee: At my school it's interesting, a lot of my friends were actresses.   One of my best friends is really involved in theater.   She is one of the co-presidents at theater, it's super cool to see what she does.   The guy in there is insanely talented, in choir and theater and all of that.   He has perfect pitch.

Grant: Oh man.

Mukherjee: Listening to him is such a fun thing.   He'll identify it [snap] like that.   It's so cool.   He only realized he had perfect pitch a while ago.   So over the last couple summers, he's developed it so well.   It's been amazing to see how fast he's progressed.

They both specialize in a certain realm of acting.   One of them is almost entirely a comedic actress.   That's her route.   She's always been a part of that.   He get leads, but he's also like a fairytale actor.   A lot of people call him that.   He has a great ability for trying the Prince-like role, or the protagonist role.

He's also really good in the idea of the anti-hero, where there's a lot for his character to learn.   I've noticed with this school, a lot of the theater department kid have a specialization.   Did you have that?

Grant: Um, I feel like it would have been comedy, because I love it.   Most shows I watch are comedy.   But I also did a lot of filmmaking stuff in high school.   So I made my own short films.   They were terrible.   [Laughing.]   I would compete at the Oregon State Thespians festival every year, I would always lose.   But I ended up learning a lot, and I'm glad I did lose.   Maybe it led me to a better path.   Blah blah blah.   But it was fun.   I'm glad to be out of high school.   There's a lot less drama and hormones in

college.

Mukherjee: That's really nice to hear.

Grant: Yeah, I kind of had an epiphany when high school was over.   I just had my work friends and then there was college.

Mukherjee: Yeah, I feel like I'm surrounded by hormones everywhere.   I don't know what to do with it.

Grant: It's so nice when high school is over.   It's like "wow, the world is not that crazy!"   Everyone's just calmer.

Mukherjee: Mellow?

Grant: Yeah.   There's a lot of gossip and it gets toxic in high school.

Mukherjee: Did the academic expectations lay off a little bit?   Or is it more the social sphere?

Grant: When I was in high school I didn't really start caring about education until junior or senior year.   I'm the opposite of what I was then.   I got D's and C's, then I started on AP classes and got A's.

Now I'm majoring in math and computer science, getting almost straight A's.   The GPA is at a lower expectation than high school.

Mukherjee: Right, and also the environment just differs.   The first class I took with PCC was factor calculus.   I didn't connect with my professor.   I was the only female in the class, and he wasn't fond of me and other females.   I had a conversation with Damien about it, because I ended up talking with members of the department and counselors.   It was a mess.

But one thing is as a professor, and this was true in Damien's class, there are higher expectations.   Even compared to AP classes.   There was a class in my sophomore year, I think it was my AP psychology class.   It was AP and was supposed to be dual credit with Western Oregon University.   But it ended up being one of the easiest classes.

That was kind of unfortunate, because I wanted to improve on my habit of procrastination.   I've been a member of that nation for a long time.   That's a running joke in my friend group.   Is that all of us are dual citizens of the US and "procrasti-nation."   I thought OK, AP psych is AP and dual, so that's gotta be the final straw.

Grant: It depends on the teacher and the syllabus.

Mukherjee: Yes.   Dual classes I am taking may be more demanding than AP classes at my school.   I'm taking Survey Lit which does English 254 with PCC, and then Writing 122.   It's a really cool program.   This class has always been demanding. But it's one of my favorite teachers in existence, I love her to pieces.

Part of that is because I got to have a three hour conversation with her, before my freshman year.   Because my sister had her. It was super cool and she was really open and fun to get to know. It was a lot easier then, to go in with a positive attitude.   She molds it very easily.   It was easy to feel ready.

But that class, we read almost a book a week.   It's insanely fast. I'm already done with three books for that class.   One of the books was only assigned two weeks ago.   We are reading two or three books for a final project, due in December.   And we'll finish two more before that.

So it's a "you better get going" class.   You have to write response papers for every other book.   There's a lot to it in terms of the workload.   I feel like I already didn't have that in my AP language class.   Maybe in my AP Lit.   But that was based on the teacher.   The other 50% who had the other teacher, didn't have it then either.

So I think that's a really interesting thing for me.   I almost feel that's true in a lot of schools now, which is unfortunate.   The norm is trying to get as many students as possible in AP, but they're also kind of taking out that standard of what APs are meant to be.   I was allowed   . . . not that I'm complaining.   I liked the challenge but I was allowed to take two APs my freshman year.   And the only reason I couldn't take a third is because they did a lottery to pick who got it.   Some students took three APs in their freshman year.

That seems absurd.   But when you look at how easily they came out unscathed, after coming out of a normal public middle school, that's when you realize something seems off with the AP standards, you know?

Grant: Wow.

Mukherjee: It's been weird.   Unless you offer so many APs, it's like considered this big school.   Most of my AP classes have over 30 kids.   There are multiple periods of almost every AP class at the school.   We have a full class of an AP music theory even.   I think last year there were even two full periods of AP studio art.   People are AP-everything.

Grant: Wow.

Mukherjee: It sucks honestly.   I'm thinking about it.   Laying it out and hearing myself, I'm thinking it's absurd.

Grant: I've only done two AP classes before.   That was AP Econ and AP Lit.

Mukherjee: AP Econ is a weird one though, because it's micro- and macro-.

Grant: I enjoyed it.   We had a great teacher.

Mukherjee: So did I.   I liked my teacher.   He had funny stories about family members, including one who was a recorded criminal for growing shrooms, aka mushroom drugs, in his basement. Also crashing a plane at one point.   [Laughing.]

Grant: I love when teachers just tell crazy stories during class. It's like "oh!"

Mukherjee: That brings up my favorite first big math teachers for me.   I was in the Suma program in 7th grade.   If you have really high standard test scores, they try to challenge you and give preparation for accelerated high school, starting in middle school. That's how I got earlier involved in math, and how you do advanced math ahead of time.

7th grade for me was geometry.   Sorry, thinking about this teacher is the funniest thing.   I felt bad.   There was a running joke.   We had three bald white men as our core teachers, for humanities, math, and science.   They were known as the three bald white men.

Or the "baldness trifecta."   I feel bad.   I came in at 7th grade so I didn't know this was gonna be the thing, going out of 6th grade with the other students.   When I'd listen to it in the halls, I joined in.   I'm not gonna deny it.   Everyone did it.   But it feels bad.

Grant: Yeah.

Mukherjee: Until you hear the math teacher made a theme song about it.

Grant: Yeah.

Mukherjee: He also really capitalized on his baldness to tell these wild stories of this long wavy hair he had, once upon a time.

Grant: Oh, that's funny.

Mukherjee: But he very much didn't have, he later showed us pictures where he didn't have it.   But in other pictures he did, so I'm confused.   But it would be the weirdest stories.

Grant: Maybe it was a wig?

Mukherjee: Maybe.   He was one of the coolest guys.   We had to do a book of proofs.   I don't know if you've heard of it.   It's called *Journey Through Genius*.   It has the Euclidean proof of the Pythagorean theorem, it has the standardized proof of the Pythagorean theorem, things all the way up to pre-calculus, from geometry.

He kept the textbook with us, and then he'd give us the proofs too.   For his tests, we were required to know and understand proofs.   You couldn't just memorize it.   He'd put it at a random step.   You'd have to really process and understand what was happening in the proof.   So you could re-derive something.

Even further back.   You have to derive a certain amount, and then if you memorize it you can paste the rest.   I appreciated that.   It was a huge challenge.   It was such a different book, almost like a novel.   A lot of people read it that way.   It's a lot of

writings and then the actual proofs mixed together.   The diagrams are there.   All of it is super cool.

I remember it was the first time I'd seen the Euclidean square proof of the Pythagorean theorem.   Seeing that little figure, I knew I liked this kind of reading.

Grant: This is middle school?   You were doing pre-calc in middle school?

Mukherjee: That was geometry.   But we did some algebra II proofs.   I did pre-calc the next year.   He helped me get started in algebra II, so I just wanted to get it done.   I liked it.   I ended up taking a BYU online summer course.   I took a couple finals, and then two pre-emptive tests in 8th grade.

As soon as that worked, they moved me and five other students into pre-calc.   There wasn't enough room to send us to one high school or another, that was near our middle school.   So that meant they didn't want us, they can't afford sending students to too many different schools if they're in the same class.   Keeping track becomes way too hard.   The only resource was a school bus.

Six kids on a school bus creates a situation.   Middle school is so different from high school!   I went and visited, and there was one day where teachers drove us, because we had a partial day in high school.   So we went back to my middle school at 8:30.   And I'm like   . . . school hasn't started yet!

I start at 7:45, but I used to start at 9:05.   So it's a really fun big transition.   I appreciated him as a math teacher.   I think transformation-wise, he probably is the guy who put me on that path.   To really wanting to do it.   I did math competitions with him, and tests and stuff.   He's the guy who introduced me to that

world, and put me in a lot of that stuff.   I thought that was cool.

I feel like a lot of people have a teacher where you started getting on that path.   I'm curious if you have someone like that?

Grant: Oh.   I don't think I really had a -- well, I wish I had gotten on the path earlier.

Mukherjee: It feels weird to use this term, but did you have a "Eureka" moment where you realized you liked math?   Or you really started getting into it?

Grant: It was a slow process.   It started out because I wanted to do filmmaking.   I knew in my mind I was never gonna get a job in that field.   Then it slowly transitioned from that to something more realistic.   So I chose mechanical engineering.   I knew a bunch of engineers.   I wasn't passionate about it at first.

Then slowly my classes changed and I was learning more and more about it.   I started my internship, I started to really see that this stuff is really cool.

Mukherjee: Yeah.

Grant: And that learning is really awesome.   Oh!   I changed my major to Math and Computer Science this past summer.   After Damien's linear algebra class, I suddenly realized when we were doing that project at the end, I was looking through the textbook realizing, there's so much you can do with math!

Mukherjee: Yeah.   Yes.

Grant: It's like a whole world and a language.

Mukherjee: I feel like the really common college major, a lot of

friends have gone into applied math.   That takes you to almost any route you want.   I think that's so cool.   When Damien gave us that project at the end, where you can talk about anything, I was so excited.   I've been a comp-sci nerd waiting for something like this to happen.

Suddenly I get to present on machine learning.   I was reluctant to get into that when I was younger.   Probably also because I was younger!   You don't really think of predictive analytics and computer science when you're 10 or 11.   But my parents kind of gave it to me.   They said, "you've gotta try this."

I kind of wanted to be like them, I guess.   They work with computers.   So I said let's try.   I was reluctant.   Then I actually got into it.   It became my science fair theme for 7th grade.   And I used it a little in 8th grade, and went back to it in 9th grade.

10th grade onward I've been working this ongoing research project for facial motion, speech motion, text emotion recognition, with machine learning.   Piece by piece, I've been driving myself more and more in machine learning.   I've been staying in that field.   It's been great.   Partially because I do have home resources.   I have someone who might be knowledgeable, but not always.

It's not like with all machine learning, but at the basics when I was first learning, it was nice when my parents could give me some resources to read.   When I didn't understand things, I could ask my dad for help.

Sometimes he wouldn't know.   Machine learning is such a new art form.

Grant: Right.

Mukherjee: That's not fully concrete in terms of how we teach and communicate some of the basics.   I remember my dad sometimes would look something up.   Or I would just look things up, and the most fun way to learn it was honestly going on GitHub and reading through people's code.

Grant: [Laughing.]

Mukherjee: Or Stack Overflow, or another giant platform.   When you see how other people solve their problems, that kind of takes me to math again.   It's about understanding step-by-step how to solve the problems, like how my 7th grade teacher showed me. Now I get it, I can piece it together.

I really want to take a lot of classes to solidify my understanding of machine learning.   But there's a lot of it for a certain amount that can be self-taught, which is so fun.   I know of a lot of your math stuff, but I haven't actually gotten to hear your side of computer science things.

Grant: Oh, haha.   How I got into that is, at my church I know a lot of engineers.   There's a guy at my church, ah, he's probably gonna listen to this.

Mukherjee: You should say his name!   Give him a shoutout!

Grant: Joe Longford.   He's in computer science, and he's done so much cool stuff.   He worked at DARPA for a while.

Mukherjee: Oh that's cool.

Grant: So he's discussed some of the basics.   He hasn't discussed the top-secret stuff.   But it's like, there's so much you can do with math and computer science.   And it's amazing.

Mukherjee: Yeah.   I took a Unix/Linux course for my internship. I was working for a Linux operating software.   That was brand new to me.   I've always been on a Windows platform.   I don't know anything about the command line prompter and how to get the code beneath that, so I never really got that far back in terms of code.   I'd always been like, let me do this neural network with Java or Python, or something.   I hadn't gone back to the code to run the computer, or start applications and do different operations.

When I did that it was like, a reminder that it's ever expansionary. You can go in any direction.   Something like Linux, you will use it for any and everything.   It can be extended to a lot of field. Environmental scientists like to use Linux, because they like directly coding their data.   They can get the trends from the prompt, because it's more efficient.   I think that's really cool.

I am finally taking AP comp-sci principles.   I've been looking forward to that.

Grant: What's that?

Mukherjee: AP computer science principles.   It addresses computer design and the concrete history of computer science. They said "we won't touch upon it much this course, but I want you to walk out knowing that what you learn here can be extended to nearly every field you walk into.   Not just computer science."   That's very true.

Grant: Mmhmm.

Mukherjee: It's becoming kind of revolutionary.

Grant: It is.   They always need software engineers and computer scientists.   So many companies.   I was looking at biomedical for a while.   I was like I can still work at a biomedical

company doing computer science, coding, and whatnot.

Mukherjee: Actually I'm interested in BME too. For a science project, I used something from UC Irvine. It has a cool open-source machine learning repository, just filled with data. It's stuff people think machine learning could help utilize. One data group I found was patients with coronary artery disease. That's the most prevalent form of cardiovascular disease, and the leading cause of death in the US. And particularly the leading cardiovascular disease, making it the standout.

I thought, whoa. It's not just the US, it's actually worldwide. This is the leading cause. I thought, let's see what I can do with this. I used decision trees and things like that, and you could guess with super-high accuracy, some predictions on early diagnoses. It was cool for me, because I looked at it and thought, if I could get more data from these clinics, and if I end up with the credentials to be an independent researcher, because, you know, being a minor is not great for being an independent researcher.

I could get in contact with the Cleveland Clinic, which was one of the data searches. Their original data got me up to 97% accuracy. If I could get that up, and work with that, early diagnosis of this disease is a great way to get people on an actual treatment plan.

Grant: Yeah, and you literally save lives.

Mukherjee: Yeah. It was such a cool thing to see. I didn't have to be running about, or having the scalpel in your hand, to genuinely have a way of helping people. For me that's always been important. I have had life-threatening allergies that ended up putting me in situations with kids who weren't so friendly. My "weren't so friendly" I mean they really would threaten my life.

The worst part was these kids didn't realize the severity.   But for me, it was a reminder of helplessness.   I realized a lot of people feel that in a lot of different ways.   Some people have some ways for controlling it.   I carry an Epi pen, or a Benadryl.   I'm prepared.   I tell people not to bring allergens like eggs or nuts near me.

People don't get the sense of control.   It's just something that's there.   So when you realize you don't have to run around as the doctor to help out with that, that's really cool to me.   I think the notion that doing something you're passionate about is really important.   It can be a result of personal experience.

Grant: Mmhmm.

Mukherjee: I could relate back that way.   That was super fun for me to see.   I think that project in particular was the first time I really saw that laid out in front of me.   Or maybe 8th grade actually.   Probably 8th grade.   But that one was the first time I saw it and realized I didn't have to be the person running around, or engineering a prototype.

Grant: Right.

Mukherjee: For me, that int   . . . not intrinsic.   But I guess that's my interior motive.   But in a way that's not shady.   [Laughing.] That has a connotation, literature-wise, that you have a bad or ulterior motive that's bad.   But that kind of just drives my motivation more, in comp-sci.   It's cool, it's fun.   It's a lot of math and concrete stuff.   But it also can help.

Grant: I mean, that's great you can find something you are passionate about, and it helps other people as well.

Mukherjee: Yeah.

Grant: That's one of the awesome things about biomedical engineering.   You are helping.

Mukherjee: Yes, helping a lot of people get what they need.   It's also fun to take a step out and see where math and computer science can go.   I remember looking at someone who made a graph, or a chart.   They made a cool diagram where they centered on what point, a niche thing they were doing with computer science.

Then they made a web of everything it connected to.

Grant: There's a lot of things!

Mukherjee: And then when you scroll and try to make it bigger, you can zoom out and see the next layer.   As I kept scrolling I got to a point where it was just a circle of text that said "Aren't you tired of scrolling?   You should tell by now these possibilities are endless."   I thought that was such a cool graphic, it's just so true.

You can start at a niche thing you like, but you don't have to stop there.   There are so many directions you can go in.   I really like that.   It makes me feel like I am never gonna be limited or boxed in, to this singular realm.   Which I need.   God knows I need that. I have too much energy, all the time.   With the exception of certain days or times.   I'm a little off today.

I had a teacher who nicknamed me "Electron" because I couldn't stop moving around the classroom.

Grant: It's good because you can put your energy into all these projects and things.

Mukherjee: Yeah.   I just think it's like a great way to get invested in something.   Is to find your niche, but also if you do find it, make sure your niche isn't where it stops.
Because I don't know if you're always gonna get exactly what you want.

Grant: Yeah.

Mukherjee: I think there's a lot of ways to get some of what you want.   But never completely.   Not cleanly.   Not without a lot of work getting there, too.   I think knowing that there are other places to start, you could start on another part of that web and work your way in.   You could work your way out on another route.   Then maybe come back in.   That's the cool part, to me.

Grant: So, what college are you transferring too?   I'm curious. I've heard you talk about the Ivy leagues.   [Laughing.]

Mukherjee: [Laughing.]   Oh goodness.   Since I'm still a senior, applications are right now.

Grant: Oh, that's fun.

Mukherjee: This is my stressful timing, my November 1st when things are due.   University of Washington doesn't do an early thing.   They do regular, but that's November 15.   I'm in stress mode.   If I were to tell you, that I want this one college, I'd probably be lying.   Because I feel like at this point, I don't know what college I want.

Computer science is fantastic.   With math and computer science, the number of courses I take will never stop.   I will make sure to be involved with it in some way.   It almost would feel like such a waste, to spend so many years working at it, then suddenly stop when there's no good reason.   It's not like I dislike it.   That

seems wrong to me.

I don't want to avoid it.   But I do think there are other realms I also have to explore.   There's been a lot of things involved.   I'm team captain of my debate team this year.   I'm so happy to be a member of that team.   There were four or five graduates last year from the speech and debate team, who I still probably talk to at least every other day.   One of them is in Chicago, one in Virginia, one is in Baltimore.   We are still talking very actively.   Also the couple I have in California.

Speech and debate opens up a very different directive from computer science.   My computer science internship this year, a lot of other people in the office weren't people who wanted to be communicators too.   I've seen that be common with a lot of STEM fields as a whole.

Communication, argumentation, or laying out something, aren't heavily emphasized.   I really enjoy that process.   I love debate. Going to Dallas last year for debate nationals, I loved it.   Same the year before.   Getting to compete and watch others compete at a high level, and talk about relevant news issues.   Is really important to me.   Not just for being aware.   Because also, hi, probably half of Gen Z can't even name the candidates in the democratic party.   I don't want to be part of that 50%.   I can't vote in 2020, but my voice is not nonexistent.

A friend is starting Amnesty International's chapter at West U. They work on governmental lobbying and human rights violations, they are non-partisan.   How we need to treat asylum seekers with respect, and understand they are taking refuge.   How we need to address means by which we can provide aid, and nullify the need for them to have to take refuge.

We are also talking about large scale things, including after

Parkland.   We've already hit 300 mass shootings in 2019 alone. The topic is ending gun violence.

Grant: Wow.

Mukherjee: I want to elicit that response, that wow, like you just said.   I want to hear people knowing that.   I got to go downtown for the Global Climate Strike.   I personally knew once of the organizers.   But my district is not as supportive as PSD.   Our school didn't automatically let students go, I wish it had.   But I knew some organizers.   I know someone who is part of the first ever student lawsuit suing the government, for the environmental damages they are causing.

He goes to my school.   And he inspires me because he's communicating about the need to change.   Suddenly I'm not in math or computer science at all.   Still I want to help, and I want to change.   But it's not really STEM.

That's jarring for me.   I remember when I was like two, I was already saying I was going to be a scientist.   When I was four there was a video at my private school, which was less than 200 kids.   A teacher was like "what are you going to be when you grow up?"   And the answer at that age is always "fireman, cop, princess."

I looked up and I don't know where I heard the word, I genuinely don't.   But I looked up and said "I'm gonna be a chemist."

Grant: Awww.

Mukherjee: I didn't know what chemistry was!   It's the funniest part.   I had know clue what chemistry was.   Suddenly I'm like, "I'm gonna be a chemist!"

Grant: That's so cute.

Mukherjee: But after that I actually found out what it was.   And I started experiments, and I've been doing the science fair since I was five.

My first science experiment was a sugar and salt race, for dissolving in water.

Grant: My first was with my pet bird.   I said "which cereal does he like best?"   It ended up being Rice Crispies over Cheerios.

Mukherjee: I can see that.   [Laughing.]   They almost look like bird grain.

Grant: It's very scientific.

Mukherjee: Yeah!   When you have the scientific question, you have the variables, you have the results, you have the comparative aspect, you have the constant, like the same bird and same cereal.   So you have the constants, it feels like it's an experiment.

So it's like   . . . going to high school, I hate saying it, but I know it's true.   But I also told myself I'd be that girl in high school who didn't change her mind, and wasn't that stereotype.   But suddenly I don't know!

Grant: I mean, there are so many possibilities.   You can't fixate on one thing.

Mukherjee: Yeah!   There's a level of not knowing that is so jarring.   It is fear of the unknown, I'll admit that.   I don't want to admit it but I will.   A lot of us struggle with it.   Especially the whole "I need to commit, I'm done with four years."   I can enter

into two years, or four years, or not at all.   What is my pull.
What is it supposed to be?   What's pushing me in X, Y, Z
direction?

My parents haven't pushed me, they've been great.   There is an
expectation of a four-year college, but that's my own expectation
too, so I don't feel pressure from that.   Other than to perform my
best.   If I set a standard for myself, I expect my parents will
expect me to hold that up.   I don't blame them for that.

It's interesting.   There's cultural competition problems.
Competitiveness has become a huge factor.   I don't know if you
saw this with a lot of the people who really cared when you were
in high school, but in my group there are kids who care a lot.
We're the kids who want to push themselves into as many AP's
as possible.

I will admit to it, it sounds bad, but I push myself into as many
AP's as possible.   But I didn't push them into AP's because it was
AP's.   I pushed myself based on the social studies classes I
wanted.   What's the best way for me to learn about econ?   AP
was my best opportunity.

There's no proper full-year government class unless it's AP.
Normal econ is only one semester.   With world history, I didn't
take global studies in 9th grade, because I was in AP US history.
I want AP world history to enrich that.   There was always social
studies, or literature.   It made sense for A-push people to be in
Lit 10.

And then, after that I went into AP Lang, because there's no other
way coming out of freshman year Lit 10.   You automatically get
to AP Lang, unless you withdraw from the advanced track, and go
into Lit 11.   I wanted to challenge myself.

At the time Lit and humanities were my weakest subject. I still say writing is my weakest subject. I'm also in two different advanced writing classes this year.

I don't have any other classes where I'm doubled up, except writing.

Grant: So it's because you want to get better at it?

Mukherjee: Yes, exactly. I don't think I've seen that with other students, which is unfortunate. I've seen certain other students at my school who are like me. A lot are like me. They are choosing, and sometimes they don't choose every AP. There are classes I've taken that weren't AP. If they were waited, in my opinion it was coincidence. That was not the first motivating factor, "it's gotta be lit." Because then I also wouldn't spend my time as a peer tutor, in my free period. I take my free period to do a peer tutor.

I could have had early release to work more on my classes. Or I could have petitioned the school for an extra class. But I wanted to peer-tutor. I've seen students dedicate them to other things. One of the smartest people I know is on Varsity for three different sports, she's insane. She's amazing, and ridiculously impressive. She puts herself in the AP she actually wants to take.

She doesn't give into pressure about it. There's a GPA race, to the point where my freshman year, it was the first year West U had to declare they're withdrawing class rank from the transcript, because it was becoming a toxic environment.

Grant: Wow.

Mukherjee: Yeah. I remember when class rank was a big deal, but no one attacked each other for it. Now, I've heard stories that aren't even my own school. A lot of schools in the area where other kids will accuse kids of cheating, hoping they would fail the class. So they could be ahead in GPA races.

Grant: Oh no.

Mukherjee: Teachers are prepared for it and they know that that's the situation. So they don't take it with much unless they see legitimate reasoning that the evidence is sound. It happened to me, I was just confused. I didn't even pay attention to the -

Grant: Someone accused you of cheating? Wow.

Mukherjee: Yeah. And the person who did it was someone I had been actively helping to get their grade back up to an A. If there was a test that they just needed a couple points to get up to the next grade, I would help them isolate where the problem was. I would put my test next to theirs to compare my work to their work, so they could see that I didn't get points they should have gotten. Then they accused me of cheating because they wanted the GPA over me.

Grant: Oh.

Mukherjee: And it's slimy. It feels so slimy to be a part of that, even if I'm in the wrong end. I don't even know if I'm in the wrong end, I feel like I'm on the right end, because I'm not taking action like that.

Grant: That is the high school, kind of . . .

Mukherjee: Yeah. And that's the other thing. Social interacts with academic. Which is unfortunate because, I feel like the

healthiest relationships I have are with a lot of the people who aren't driving themselves in every academic route.   Even if I'm doing that.   Because, when I'm around others who aren't focusing on that, neither I nor they have to focus on that aspect of our lives.   We can kind of push back a little bit, which is nice.   I don't have to talk about academics when I'm not in the classroom setting.   It's not like that with everyone, which is really weird.

I sincerely hope you've never had to be a part of that kind of culture, but I've heard it be culture other places too, which is weird.

Grant: I mean, I never got into the really academic competitive stuff, because I never really saw myself as the smartie type.   Now I'm feeling more confident in that.

Mukherjee: Yeah.

Grant: Then that would drive into the whole concept of "what is intelligence?"   And blah blah.   I was thinking about that this morning.

Mukherjee: I've had people tell me they're unintelligent because they don't test well.

Grant: Intelligence is a very complex thing.

Mukherjee: Yeah.   I don't want to swear on the podcast, I don't know who will listen to it, but that's bull.   I'll end it there.   Like, why?   In my world I don't know why you need to go to that place.   You can be intelligent without getting 100% on every test you can.   I feel like everyone should have an automatic presumption of intelligence, everyone just has a different way of expressing it.

Grant: Yeah.   And it's not just like "you are a smart person", you just learn things and live life.   You just build your knowledge.

Mukherjee: How else do we have different majors?!   How are some of us mathematical beings, who love the calculations and computations, or comp-sci.   Then some of us go into the medical field, or we aren't even in science at all.   We're gonna go into the humanities, or art history.   Or maybe you are an artist or a singer.

Grant: You can be multiple things at once.   You can be interested in art and math, and change your choices.

Mukherjee: That's the point at this point in time.   At my age now, it's just like: explore.   Have fun, explore.

Grant: We're all just humans, we're all equal.

Mukherjee: We're all human, and we're also bound to mistakes.

Grant: No matter how smart you are, we're all the same.

Mukherjee: Yes!   Thank you.

Grant: It's a concept that   . . . oh, Damien wants us to stop I think because math club is happening.   I've gone to the math club meeting, no rush.   We should wrap up.

Mukherjee: Yeah.   [Laughing.]

Grant: Bye listeners!

Mukherjee: Whoever you are.

[Stringed music.]   [End of episode.]