

Brea Foust:

Welcome, everyone, to the I Am WT podcast, where you'll hear stories about how attending or working at WT changed the lives of our guests and how they're paying it forward by making a difference in their community. This is Episode number 6. I am one of your hosts, Brae Foust. I am here with the queen bee of I Am WT, Tearanee' Lockhart. What's going on, T?

Tearanee' Lockhart:

Hello, guys. It's going pretty good. Ready for the end of the semester. How about you?

Brea Foust:

It's early April, starting into early April, and we're getting into crunch time, so we're busy.

Tearanee' Lockhart:

Yeah. Well, we have a great guest with us here today, so we'll let you introduce yourself.

Dr. Mukherjee:

My name is Dr. Mukherjee. I teach at Department of Life, Earth, and Environmental Sciences. I have been here since spring of 2022, so this is my second year at WT. I am very excited to be here.

Brea Foust:

Where did you grow up? Where are you from?

Dr. Mukherjee:

I grew up in India.

Brea Foust:

In India?

Dr. Mukherjee:

But I have spent most of my adult life here in the U.S.

Tearanee' Lockhart:

So how did you come from India? Where did you start off in the U.S.?

Dr. Mukherjee:

For my PhD program. After I finished my Masters in India, I was offered full tuition waiver and full scholarship to come and do a PhD in the U.S., so that's where I started.

Tearanee' Lockhart:

Wow. Which school?

Dr. Mukherjee:

Bowling Green State University. It's in Ohio.

Tearanee' Lockhart:

That's really cool.

Brea Foust:

I like that. I like that. Well, we're here also to discuss the new research based teaching program, Tiny Earth, but we're going to get to that a little bit later. Right now I'd like to ask you about teaching. You've received many teaching awards and accreditations, such as the Butch Oustalet Distinguished Professorship and Association for College and University Educators Certification. Have you wanted to teach, or be a scientist, or somewhere in the middle, both?

Dr. Mukherjee:

I always wanted a balance of both. I love teaching. I enjoy teaching a lot. I always worked with undergraduate students throughout my entire PhD career and then career after that, which were a lot of post-docs, and then I entered a primarily teaching position, which I was there for four years at Southern Miss, right on the Gulf Coast, lots of ocean and lots of birds and all of that, and lots of very nice students.

Tearanee' Lockhart:

Yeah.

Dr. Mukherjee:

I enjoyed teaching there a lot, but I always wanted a career which blended both research opportunities as well as teaching, so WT offered me that. WT offered me a position which kind of has the ability to blend both, so I came here.

Tearanee' Lockhart:

Yeah, so is it like a big culture shock? I guess you had two big culture shocks, coming from India, then going to Ohio, then coming to WT.

Dr. Mukherjee:

I think I am a very open-minded person, so I have never felt a cultural shock as a lot of other people usually do.

Tearanee' Lockhart:

Yeah.

Dr. Mukherjee:

I just keep my mind open and I accept most people as they are. It has been great for the most part, all of those experiences.

Brea Foust:

What would you say is a big difference, a very big difference between India and Texas that you've noticed, like something like wow, I can't believe that they do this here in Texas?

Dr. Mukherjee:

I have lived in the United States for so long that I don't think I can actually even answer that question very well anymore. But yeah, there's a lot of people there for sure. The number of people here is a lot less. That's one thing. You walk on the street, compared to India there is a lot less people.

Brea Foust:

Doesn't India have the highest population in the entire world?

Dr. Mukherjee:

The second highest, yes, for sure.

Brea Foust:

Oh, China's number one, I think.

Dr. Mukherjee:

China is number one, yeah.

Brea Foust:

Yeah, it's a big population for sure.

Tearanee' Lockhart:

Yeah, and here you can walk around and you'll know at least three people on the street.

Dr. Mukherjee:

Yes, three people on the street versus 300 people on the street.

Tearanee' Lockhart:

Yeah.

Dr. Mukherjee:

That's a major difference for sure. I grew up in Calcutta, which is a very big city, so that's another thing. Big city environment, lots of people versus small city, small town environments, and I actually prefer small town environments. I lived in Chicago for awhile and that was great, loved Chicago. For two years I was at the University of Chicago as a data post-doc there, but I think I enjoy visiting Chicago. I would enjoy visiting Chicago back again, but I like my small town environment a lot.

Brea Foust:

Real quick, is Chicago style pizza worth it?

Dr. Mukherjee:

I think so.

Brea Foust:

You think so?

Dr. Mukherjee:

You may want to try it.

Brea Foust:

I want to try it?

Dr. Mukherjee:

It's not bad. Yes.

Brea Foust:

All right. I'll have to get rid of my New York style.

Dr. Mukherjee:

I like New York style a lot too. Yes.

Tearanee' Lockhart:

Well, moving forward a little bit, tell us a little bit about your research and your research interest.

Dr. Mukherjee:

I am primarily very broadly an environmental microbiologist, so my lab does a lot of work in the area of environment and microorganisms, and how microorganisms play a major role in multiple functions in the environment. Our lab very specifically does a lot of different things, but we do microbial water quality a lot, so very recently our lab started, well, we're doing a whole bunch of projects, but one of the projects that we started is on Lake Meredith here, the National Park Services. They actually gave us the permit to do the project. We are going in there, collecting water samples across Lake Meredith for the next several months, and you'll hear about that story at some point as well.

Tearanee' Lockhart:

Yeah.

Dr. Mukherjee:

And we're looking at how the water quality looks like there. Our lab has also, in the past several years, done multiple projects in looking at antimicrobial resistance in drug resistance patterns, so you probably are aware that microorganisms, specifically pathogenic microorganisms, are becoming resistant to multiple drugs.

And it's becoming very difficult for us as scientists, as well as clinicians, to be able to treat those infections that are drug resistant in multiple different ways. Our lab looks at the environmental dissemination of antibiotic resistance, so we look at microorganisms which has antibiotic resistance or even resistant to multiple drugs in the environment and how that disseminates into human sources or animal sources, things like that. We have done this kind of research in multiple different environments recently, in the past several years.

Tearanee' Lockhart:

What would you say is your favorite research project that you've been a part of?

Dr. Mukherjee:

Oh, so many. My PhD project was, well, again many of them, but my primary dissertation was in the Laurentian Great Lakes, so up north, which is shared by Canada and the United States. We used to go out sampling those Great Lakes on EPA vessels, actual research vessels. We used to be on those vessels for months, and collect samples throughout all of the five Great Lakes, and then bring them back and look at microbial water quality and what kind of microbes live in those waters, and I think that was a very enjoyable one.

Very recently I'm really enjoying the Meredith project here a lot, looking into all these people going to the lake and they swim on the lake, and they boat in the lake, and it's very applicable. The research is immediately applied to human health, to animal health, and it's going to be very important for us to find out how much contamination, in terms of microbial pathogen and contamination is there on the lake, so we're very excited about that project.

Brea Foust:

Anybody have a hypothesis of how much contamination is in there?

Dr. Mukherjee:

You will know that very soon.

Brea Foust:

No spoilers?

Dr. Mukherjee:

Nothing so far.

Brea Foust:

Nothing so far?

Dr. Mukherjee:

The first set of results were really clean. The water is very clean, but it's also March.

Brea Foust:

Fair enough.

Dr. Mukherjee:

The temperatures are very low. Nobody is there on those. It was just serene and nobody was there when we collected water, so it's probably going to change over summer.

Brea Foust:

I was going to say usually summertime, the heat might be a little different with those.

Dr. Mukherjee:

Yes, absolutely. Yes, and with more people there.

Brea Foust:

Okay. Well, I'm a little scared now. Little things like this kind of freaks me out. I feel like these would be good for a good movie, a good scary movie, like microorganisms adapting.

Tearanee' Lockhart:

It goes too far. Everyone gets infested.

Brea Foust:

It goes adapting and we can't handle it. But really, I think that's cool. I think that's cool. Like I said, you're a professor here. What classes do you teach here at WT?

Dr. Mukherjee:

I teach Applied Microbiology, Immunology, and then I will be teaching an Environmental Microbiology course online over summer.

Brea Foust:

What do you hope your students take with them after your class? What do you hope that they carry with them through the rest of their life after they're done with your class?

Dr. Mukherjee:

That's a great question when you say rest of their life, because I notice a lot of students come to classes, and I don't blame them, but they come to classes just to get grades. "I'm an A student. I want to get an A in this class and I want to move on with our next chapter." But to me it feels like yes, that's a great focus, but if our focus is more on learning, rather than actually getting grades, we actually do both.

We learn and we retain that concept, and we also get good grades. I want my students to come to my class thinking that, "I'm going to learn a lot in this class and I'm going to retain all those concepts that I have learned in this class, and then that's going to anyways give me a good grade." That's one thing that in the beginning of class I always tell my students, that please focus on your learning rather than getting your grades because grades are going to come if you learn.

Tearanee' Lockhart:

Yeah.

Dr. Mukherjee:

At the end of my class, and in every single class that I teach, I think one of my most primary goal is to keep the concepts, the teaching of those concepts, as simply as possible. My classes are non-majors class. We have a majors microbiology class, but I don't teach it. I have students from all over. I have students for animal sciences. I have students from biology, but I have a lot of students for animal sciences.

So my goal is to keep my classes as simple as possible, but still teach those exact same concepts. I feel like the more simplistically any concept is taught, they are retained a lot more, so when they move on to

their next steps, or their next classes, or their next courses, they will remember because it was taught simplistically rather than making it more complex. If we try to teach something more complexly, then it ends at the end of the semester.

Tearanee' Lockhart:

Yeah.

Dr. Mukherjee:

But if I teach it simply, then it remains and they will keep it for the rest of their life. All of these science concepts, to me, whether you are a major student or whether you are a non-major student, it's important for us to retain them. Some of these are such basic and foundational concepts that it's going to help us understanding life processes as a whole, environmental processes as a whole if we can retain those concepts.

Tearanee' Lockhart:

Yeah, I really like that thought process about learning, especially with science, because I feel like science is something that's stigmatized as a really hard thing that only really smart scientists can do.

Dr. Mukherjee:

Absolutely, yes.

Tearanee' Lockhart:

But when you put it in concepts like that of yeah, this is something necessary and even if you're not going to go into the field of science, if we break it down simply you can still take it with you.

Dr. Mukherjee:

Absolutely. Real world experiences and giving examples of... Students always have this question, especially when they're taking a non-majors course. "Why am I learning this? Why is this so important to me?" If you can make this simplistically relevant to their life, then, "Oh, yeah, this is important to me. This concept is important to me to learn because here is the application of it," so that's how I try to teach my courses, that, "Here's the concept, but this is why you're learning it." I always make it this way, and then, "This is a real world application why this is so important to you." That's my goal.

Brea Foust:

I learned that advice a long time ago too. My first degree at Texas Tech, one professor told me the grade is one thing, the A or B is great, but the learning process is the most important aspect of it. If you are focused on your learning, focused on learning a trade, focused on learning a craft, then the grade's going to follow.

It really will follow, but you're learning something for the world, for your career. Learn how to work this craft of yours that you're trying to master, and the grade is just going to be a letter on a sheet of paper. But it's the real world aspect that is most important, to be honest. What would you say is your best advice? I know that was some pretty good advice, but your best advice that you would give to students, just real quick?

Dr. Mukherjee:

I think I would go back to that same thing again. When you take a class, whatever class it is, if it's your majors class or we do have to take a bunch of our non-majors class, which always we feel like, and I've done that, we feel like why am I in this class? We want to always focus on the learning process and we always want to focus on the fact that we want to find out why this is so relevant to me.

It has to be relevant to me in some way, right, even if me, as a scientist, I have done that, taking an art class. In my PhD I went and took an art class because I just wanted to do it. I audited it. I didn't take it for a grade, but I loved it. I use that as part of my life now. It's part of my life. I use that art skill that I learned, and I still remember all the things that my teacher taught me.

This past Friday we went to Lake Meredith for our first field trip, and as I'm looking into the lake water, I'm looking at the color bands, the beautiful color bands on the water and I'm remembering the things that this art teacher taught me like 15 years ago. He basically taught me to look at the color.

He's like, "It's not just blue. Are you looking at the purples in there? Are you looking at the yellows in there?" I'm also trying to look at that color based on the things that he taught me, so that's real life application. You know what I mean? I would like my students to think of those courses as that sort of learning process rather than just getting a grade and moving on.

Brea Foust:

I love that. I love that a lot. We're going to take a quick break, though, but when we come back, we are going to discuss the implementation of a new research based teaching program, Tiny Earth, and talk a little bit about the importance of STEM or chat about Vincent van Gogh. We haven't decided yet. You never know with I Am WT, so stay tuned. We'll be right back. You are listening to I Am WT.

Speaker 5:

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Brea Foust:

Welcome back to I Am WT. Hope you're all having a great, fantastic morning, afternoon, evening, wherever you're listening to this podcast. We're here with Doctor Mukherjee. Is that...?

Dr. Mukherjee:

Perfect.

Brea Foust:

Yes, I got it. I'm proud of myself. Before we got into the podcast room we were discussing that you were actually a fan of art. Can you tell us about your passion for art?

Dr. Mukherjee:

Yes, absolutely. I grew up in a family which is a music family. We all do music. Both my parents, they met because of music. They both are vocalists. Me and my brother, we both got the voice from them, the genes, and we grew up listening to music and doing music. The whole family does that all the time. That's what we do, and then I got my other arts genes from my grandma, who was, or who is, actually, she does sewing and painting and all of that. So I got into all of that as well as a kid, and then now I do



painting and I'm also a quilter, so I make quilts, all kinds of quilts. I kind of shifted my focus to quilting. You got to take one thing, right? I picked quilting. I picked quilting as my art form, and now that's the major thing I do, and then music as well.

Tearanee' Lockhart:

Yeah. What would you say is your favorite art form?

Dr. Mukherjee:

Quilting right now.

Tearanee' Lockhart:

Okay.

Dr. Mukherjee:

And vocals as well. I don't want to quit vocals.

Brea Foust:

What's your voice part?

Dr. Mukherjee:

What does that mean?

Brea Foust:

Before this, my first degree at Texas Tech was a vocal performance major.

Dr. Mukherjee:

Oh, cool.

Brea Foust:

So I know all about that, so were you a soprano or alto or anything like that?

Dr. Mukherjee:

I told you I'm from India, right, so our training in vocals is a little bit different from the Western, so I'm an Indian classical trained musician, or vocalist, but I have always done solos.

Brea Foust:

Okay.

Dr. Mukherjee:

So, very, very classically trained solo vocalist.

Brea Foust:

You happen to have a favorite composer, by any chance, or anything like that?

Dr. Mukherjee:

Oh, so many. I don't know where to start.

Brea Foust:

There's too many, I know.

Dr. Mukherjee:

Most of them are very, very Indian background, not a lot into Western yet. My brother, this is his career, so he is an independent musician and he travels around the world doing his music, and he's a solo musician, and he does Western. He does all kinds of things, but I just stuck to the Indian classical.

Brea Foust:

Hey, Indian music is actually beautiful, is a beautiful art, in my opinion. I really enjoy it. It's always fast-paced. It's really cool, in my opinion, especially a Texan to listen to an Indian, it's very unique, but it's really, really great.

Tearanee' Lockhart:

I like Bollywood movies.

Brea Foust:

I do too.

Tearanee' Lockhart:

I've seen a couple of them and every time I watch them, they're just so much fun. It's just so bright and vibrant, and I like listening to the music.

Dr. Mukherjee:

Yes, the colors and the music.

Tearanee' Lockhart:

Yeah.

Brea Foust:

Did you guys watch the Oscars, by chance?

Tearanee' Lockhart:

Oh, yeah.

Brea Foust:

I can't remember the movie, it was a Bollywood movie, but it was India's very first Oscar for original song.

Dr. Mukherjee:

Oh, the RRR.

Brea Foust:

Yes, RRR, yes. I watched the performance at the Oscars.

Tearanee' Lockhart:

I think it's on Netflix.

Dr. Mukherjee:

The performance was amazing, yes.

Tearanee' Lockhart:

It was so great.

Brea Foust:

Oh, they got the Oscar, yeah.

Tearanee' Lockhart:

Like I get it. I understand why they got it.

Brea Foust:

So fun.

Tearanee' Lockhart:

Moving back a little bit to WT and to your science stuff. You're implementing a new program at WT called Tiny Earth. Can you tell us a little bit about that?

Dr. Mukherjee:

Yes, absolutely. Tiny Earth is student-sourcing antibiotic discovery program, which is a very innovative program which basically converts traditional teaching labs into a discovery based learning platform. In this program, as we start implementing and starting in fall in all of our Applied Microbiology labs, the students will be involved in a research based lab experience, where they'll be learning a whole bunch of cutting edge lab techniques, all of which has a real world experience to it, or an application to it. The major application of this is in discovering novel antibiotics from soil samples.

The whole idea stems from the fact that, well, two-way issue that the world is facing right now. Number one is there is a lack of antibiotics, new antibiotics discovered. In the last 20 years there hasn't been a single new group of antibiotic that has been discovered across the world. However, as we don't have new antibiotics, more and more pathogenic microorganisms which cause diseases are becoming more and more resistant to antibiotics and multiples of them are resistant to multiple drugs. I told you before that our lab does this kind of research. Our lab looks at how much in the environment we find these organisms.

We did a study in the Mississippi Gulf Coast in the past three years, which we are in the process of publishing, so you'll see it soon, but we found 90%, more than 90% of all of the organisms that were isolated from those water samples where people go and swim and do all those different recreational

activities, were resistant to at least one antibiotic. And then more than 50% of everything that we got from those waters were multi-drug resistant, so more than three antibiotics. That was just an amazing discovery we made. So that's a huge issue that the entire world is facing right now. More and more microbes are becoming resistant to these antibiotics, and we have a lack of antibiotics being discovered.

Another problem is the pharmaceutical industry has kind of moved away from discovering new antibiotics, because there's not a lot of profit in the process. How do we solve this problem? One of the things that Jo Handelsman, whose brainchild is Tiny Earth, and she is at the Wisconsin Discovery Institute at the University of Wisconsin-Madison, she came up with this idea, like okay, if nobody else wants to do this, let's student-source this. Let's use our students to discover novel antibiotics. She came up with this amazing, simple idea, and I love simple ideas. I told you that. In the soil, one gram of soil has 10 billion microorganisms in an average. Those microorganisms in the soil naturally produce antibiotics.

They produce antibiotics. Most of the antibiotics that are like penicillin and streptomycin, they have been discovered from soil microorganisms. Her idea was why don't we have our students dig soil and bring that soil to our teaching labs, and have them isolate microbes from it and see if they are producing new antibiotics. In that process they are going to be learning all of the techniques that we actually teach in the microbiology lab, but from a research perspective. If the students in that semester actually get to discover any new antibiotics, it's their discovery. It's all of their discovery and everything that they have isolated from those soil samples, we're going to use Panhandle soil samples here, but all of that is going to be cataloged in the actual Tiny Earth database and their names are going to be there, the class' names are going to be there. I am excited about it.

Brea Foust:

I love that. I love that. In your opinion, why do we need more STEM? STEM, if you don't know, is science, technology, engineering and math. Why do you believe we need more STEM students? Why is that?

Dr. Mukherjee:

I believe that STEM in higher education, it teaches students to think critically, and it prepares them for careers. It creates professionals that can work across scientific disciplines, doesn't necessarily have to be in the science world. But if they have a little bit of STEM background, it helps them to work across disciplines because they know how to critically think, and it helps them to solve challenging problems. I think we need to create more STEM workforce, which is lacking currently. Even if the STEM students go out and get into jobs which are non-STEM, it's still going to help them because they have that training.

Tearanee' Lockhart:

Why do you think students aren't going into STEM?

Dr. Mukherjee:

I think it's a choice we make, and I think it's also the women in science population. We need to kind of make women and little girls in high school, or even in middle school, we need to get them excited about STEM. Traditionally women have been told that we need to be in the arts. We are better for the arts and the men have been doing both eventually, and more of the science, in the science fields.

I think we need to do more of that, and if we can bring women in science a lot more, I want to do that. I want to go into high schools here. I want to go into middle schools here and do little programs with those students and get them involved. I don't think it's only help the girls. It's going to help the boys as

well together, but together we can increase that STEM workforce to a great extent, I think, if we can motivate them.

Tearanee' Lockhart:

Sure. I guess our last question for today is what does WT mean to you?

Dr. Mukherjee:

I have enjoyed being in WT a lot. I think this place has its own feel to it, including the entire Panhandle. I think it has its own culture. I think it has its own feel to it, which I have never seen anywhere else. The campus, I was in the Texas A&M College Station. I was an Aggie for three years, so I did a post-doc there for three years. I absolutely love that campus, and that was one of the reasons when I got in A&M System, and when I got an offer from A&M System to come back to our system again. I was like yes.

Absolutely, because I loved being in the A&M system. It seems like because I've been an Aggie at some point of my career, coming here it seems like being a Buff is very similar because there they have their own culture. Here they have their own culture. It's just so amazing that it's so parallel. I think it's part being Texan. Texas is like this. It's got its own culture. It's got its own traditions. This campus has all of it. It's so vibrant, and the students are all so unique. I have really enjoyed being here since last spring, and want to continue doing this.

Brea Foust:

I do have a followup question to that. A lot of us in our lives, we always have moments that make us or help us choose the career path that we wanted to take. What is the one moment in your life that made you want to become a scientist in and of itself?

Dr. Mukherjee:

That's a great question. Well, I told you I come from a family of musicians, right? But a lot of those musicians are also scientists. My dad is an engineer, my uncle is an engineer. My grandpa, my dad's dad, he had a double Masters in economics and maths. I got training in STEM from them growing up there and seeing them do science and arts all together, I think made me want to do science as well. And then I think high school and the labs. We had biology labs. We did genetic engineering stuff and we learned about all of that, cloning and genetic engineering and how you can improve so many different fields. I got stuck to that, like I'm going to be a biologist and I want to do this. I want to do this as being a scientist.

Brea Foust:

You know science basically, it pretty much is an art form of itself.

Dr. Mukherjee:

Absolutely.

Tearanee' Lockhart:

Oh, my gosh, yeah. Tell me about it.

Brea Foust:

It just is absolutely. It's awesome.

Dr. Mukherjee:

Especially when you are in the lab. I'm teaching my students to do all of these cutting edge techniques in the lab right now. We do a whole bunch of molecular techniques in lab, which I want to implement in Tiny Earth as well for not just my research students but for all of the other students to learn all of that too. But I'm teaching them how to do that, like you said, art form. Oh, yeah. My students tell me... She ran a gel and the bands don't come out. They're lighter bands, but she's like, "When you run the gel, the bands are so thick. What's the difference? You got to teach me that art." I'm like, "Yes, Monday I'm going to teach you how the band is more thicker." Yeah, it's art.

Brea Foust:

I love it. Well, I can tell you have a passion for this, for sure, and we can't thank you enough.

Dr. Mukherjee:

Thank you.

Brea Foust:

For joining us here. Tearanee', it's always been a pleasure talking to you as well.

Tearanee' Lockhart:

Thanks.

Dr. Mukherjee:

Great talking to you guys.

Brea Foust:

Anyway, I think we're going to head on out here. We thank you so much for joining us here on this episode. Dr. Mukherjee, we can't thank you enough. Make sure to catch us next time. This has been I Am WT. We appreciate you guys for listening. See you all later.