

VIEW to the U transcribed
October 2020

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Season 6: Adventures in Podcasting; Episode #2
Professor Josh Milstein
Department of Chemical & Physical Sciences – U of T Mississauga
Physics – UofT

[intro music fades in and out]

Josh Milstein (JM):

I did a postdoc at the California Institute of technology. And so, I was there for a number of years and Caltech, which is a pretty famous school.

I'm Josh Milstein. I'm an associate professor in the Department of Chemical & Physical Sciences at UTM. And I'm in the department of Physics downtown.

So, my mom calls me one day because she was really into *The Big Bang Theory*.

Carla DeMarco (CD): Yeah.

JM: And she tells me, she's like, "Did you know that they're at Caltech?" And I'm like, "Yeah, I know that, mom." She's like, "I think it's a pretty good school."

[theme music fades in]

CD: On today's episode of VIEW to the U podcast, we continue this season of "Adventures in Research" with Professor Josh Milstein from the Department of Chemical & Physical Sciences at UofT Mississauga, and in the Department of Physics at UofT St. George.

Josh has a couple of stories to tell about his time in academia, and we also talk about podcasts he's listening to, books he's reading, and yes, how, yes, the *The Big Bang Theory* – the TV show, not the actual theory – helped Josh's mom realize that her son might have a future in science.

Hello and welcome to VIEW to the U: An eye on UTM research. I'm Carla DeMarco at U of T Mississauga. VIEW to the U is a monthly podcast that will feature UTM faculty members from a range of disciplines who will illuminate some of the inner workings of the science labs, and enlighten the social sciences and humanities hubs at UTM.

Prior to coming to UTM, Josh Milstein completed his PhD at University of Colorado at Boulder in 2004.

He has held a number of prestigious appointments including as a Royal Society Fellow at the University of Oxford from 2004-06, a Sloan-Swartz Research fellowship at the California Institute of Technology from 2006-08, and he was a Senior Research Fellow at the University of Michigan in Ann Arbor from 2008-11.

Josh Milstein joined the faculty at UTM in 2011.

JM: Biological problems that we generally focus on in my lab have to do with pathogenicity and virulence and bacteria. So a lot of our efforts goes into trying to understand how these tiny microorganisms that are often not dangerous in any way can kind of flick little genetic switches inside of themselves and all of a sudden make you sick and become lethal.

And so, a lot of this is really just unclear and a lot of the mechanisms that allow these switches to turn on involve funny sorts of behaviors that in the past were really hard to study. So for instance, the DNA which encodes the little rules of whether they're going to get you sick or not is packaged very tightly within the cell.

CD: Yeah.

JM: And so there's a lot of this information and this is the long strands of DNA that are all kind of crumbled and folded and looped inside of the cell. And the way that that DNA is actually packaged within the cell can have big consequences for whether these programs are actually turned on or are not. So if they're kind of wrapped up too tightly and the machinery that actually reads these programs can't access it. And so a lot of what we try to study in the lab is how this packaging actually affects whether these genes get read.

CD: I like how you describe your research because I think you make it more relatable because you almost involve these analogies. You talk about the population of cells and I think the last time you described it, it made me think of almost like a little city, but also the way you're talking about it now. And it's something that's more visual, which I appreciate.

JM: I mean, there's no point getting in on all the technical details. If you can't visualize something you generally don't understand what we're talking about anyway. So, I try to break it down a little bit in more digestible forms. It's sort of hard to package it all into a few sentences like I just did because as you know, from previous interviews with me, we branch off quite a bit with bacteria very much is a starting point.

CD: Yeah.

JM: And so, to be honest in the past, most of our research was really at this molecular level like I just told you. It was packaging of DNA, but we've sort of moved from there to looking at behaviors of whole individual cells of bacteria to now these colonies or populations of bacteria. So you move up from the individual molecules that are in charge of the behaviors that these cells undertake to actually how entire colonies of cells start to interact with one another.

CD: And so, this season of the podcast, I'm kind of focusing on adventures in research. There's a lot of interesting stories that happen, I think, in labs and in people's research careers. And so also with a mind to the fact that a lot of people are at home and are maybe looking for inspiration or even entertainment, but I just wondered if you had any interesting anecdotes from your time in the lab or in grad school or anything. But if you could tell me your story.

JM: Yeah. You were mentioning that before. So, I was scouring the recesses of my mind to see if I could think of one and I'm going to have a number. Well, it's one that I think anyone else would think was interesting. And so you're looking for something that's maybe like a motivation. I think I have a fairly decent one to share. At least I think it's kind of entertaining. So my path to actually becoming a faculty member, I think is a little different than many other people's. And that when I was younger in college, I would not say I was focused in any way. I was much more focused in playing in my band and whatnot. And then it took a bit for me to actually want to go and pursue physics. And so, my undergrad is actually in psychology.

CD: Oh, wow.

JM: And I wanted to go in the direction of scientific research, but I didn't really have the education. And somehow, I'm not going to go into all the details, I wound up at this national lab in Illinois called Argonne National Laboratory working in a theoretical group with a bunch of primarily Russian scientists who were studying superconductivity. And I worked for one guy, his name's Valerie. Valerie sort of supervised me while I was there. And I was applying for graduate school. And so you can imagine applying for graduate school in physics, when you have a psychology degree, might be a little daunting because you're not really confident why anyone would possibly accept you beyond the letters of recommendation that I'm getting from these people who are supervising me. So people like this Valerie.

JM: And so, I came to Valerie one day and I said to him, I basically expressed my concerns like, "This is not going to work out or whatever." And so he decided he's going to tell me an inspirational story. And so he tells me, he's like, and I'm not going to do the accent, but you have to imagine a very thick sort of Russian, almost stereotypical Russian scientist accent. And he's telling me about back in the day when he's at the Landau Institute, which is this classic scientific institute in Russia. Sort of there where all the famous physicists come from and the big physicists, everyone at least in physics knows is Landau. And so he's talking, he's at the Landau Institute, and he goes up to some famous guy, I forget his name and he really wants to work in his lab.

CD: Mm-hmm (affirmative).

JM: And so, he asked the guy, he tells him. And so Valerie is telling me this, this is his inspirational story. And he tells me, "So I went up to him and I said, 'I'm really excited about what you're doing and I'd really like to work for you.'" And so this guy tells him, he says, "Well, if you'd like to work for me, I need to know that you're intelligent." And so he gave him a problem and Valerie's looking at this problem and it's really hard. And he goes home and he's beating his head against a wall. And he spends all week, doesn't sleep. All he does is work on this problem, works on the problem, works on the problem and come the end of the week. And then Valerie started to talking about something else.

JM: And so, I said, "Wait, wait, wait, hold off. So, you spent the whole week, right? So, what happened when you went to him and you showed him that you solved this problem?" And so, Valerie says, "Oh, I didn't solve the problem it was way too hard." And so, I said, "So what happened?" He's like, "I found a different adviser." And which I thought was great. And in many

ways is actually a great sort of story, right? You don't set these impossible marks. And I was not going to get into MIT in the end or whatever.

CD: Right.

JM: Because I don't have an undergrad thing in physics. And I don't think Valerie meant for it actually to be a useful story. I think it was just an odd story. So I wound up getting in grad school someplace else and going on, but I always kind of remembered that as this sort of motivation, it's like work hard, but don't kill yourself.

CD: Well, I was just thinking that sometimes, like you're saying, you don't necessarily take the path you would had intended on. You go with the other direction and it could lead you into something even more fulfilling.

JM: Yeah, exactly. And that's very true. And if I look back on my career, that's really what it's been. It's been a lot of, let's see what sort of happens and then things happen and it shapes your career as you move forward. If you look backwards, it's always easier to tell a linear narrative to most stories, but that's generally not the truth in real life.

CD: Yeah.

JM: So that was sort of a one silly thing that I thought it was somewhat entertaining as far as my research career goes.

CD: I like it. And it does make me wonder what kind of music were you playing in your band?

JM: Oh, so I was actually in a ska band as well as long time ago.

CD: Oh my gosh.

JM: Yeah. Isn't that? I don't know whether I want to admit that now, but...

CD: Well, I could still listen to it.

JM: Really? and so yeah, we played that and then we were always in little punk bands and stuff that college age things. They were really going to set me up for the future, but unfortunately none of them really broke big. Part of the problem was a clear, inability to play the instruments.

CD: Oh. And so, there was just one other question I wanted to ask you because this is for our podcast, but, and full disclosure, you and I don't live very far from each other and we're frequent walkers and runners. And so, we see each other around the area and I know that you're a big podcast fan. And so, in this time that we've kind of been settling in and listening to audio, either audio books or podcasts.

JM:Uh-huh (affirmative).

CD: And I suspect this will continue because I keep hearing more and more podcasts are being launched. But I just wondered if you have any recommendations of either things that you've listened to lately that you would recommend, or I guess this could also extend to any books that you're reading that might be of interest to people.

JM: Oh sure. So, I could geek out on the podcast thing way too much if you want, but I won't. So actually, I think you saw my tweet on this.

CD: Yes.

JM: This *Who We Are* podcast.

CD: Yep.

JM: Which just recently came out, which is all about essentially just racism in the US and how it's kind of maintained and brought us to where the US is a present. I've just started listening to that and really enjoyed it. It's a difficult listen because it's sad and it's pretty awful. They're not beating around the bush anymore. They're really showing how a lot of current topics like you see all this police violence in the news, or even things like the electoral college that gets discussed in the US and almost everything is somehow linked to slavery and its legacy.

That's a really good show, but on the more positive side, I really like *Reply All*. It's basically just to show where they just talk about the internet, essentially.

JM: And so that doesn't sound like much fun, but what they can do is they can really get into little memes or things that are happening in the internet. And it almost always makes me laugh when I listen to that show.

CD: Yeah.

JM: And so that's a great show that I listen to kind of all the time, actually.

CD: Yeah.

JM: And then I guess the third one I'd mention, if people haven't heard, I think the Ezra Klein show is probably one of the most intelligent discussions of politics and our world today. And so if you haven't listened to it, I would definitely recommend. Ezra Klein is a journalist. I think he founded Vox Media. So Vox is also a website.

CD: Yeah.

JM: It's not a newspaper, because there's not really many newspapers these days, but it's one of these online websites and it's a very intelligent discussion because he's one of these people that kind of will often take the opposite side of whatever the established thought is and sort of press on it quite a bit and I really appreciate that. And so I've really been enjoying the discussions lately, especially with things going so crazy in the election at the moment.

CD: Yeah.

JM: So that's the *Ezra Klein show*. So those are the three podcasts.

And then as far as what I'm reading, I just read a book called *The Evil Geniuses*. It's just about charting the rise of inequality in the US, so starting basically with Reagan. He argues a lot in the book that essentially a problem with our age is there's a lack of newness and I don't really buy his argument. But he talks a lot about how all the music is just kind of regurgitating things that we've done in the past. And so recently, this is maybe it's a little tangential, but I've been listening, I don't know if you've heard of this Moses Sumney?

CD: No.

JM: Yeah. So anyways, he just came out with an album recently that strikes me as actually really kind of new. So, it got me thinking because there is a lot of stuff that sounds like 90's stuff or a lot of stuff that sounds like eighties stuff. And so, I definitely see that sort of argument that a lot of it sort of cycles around and is being somehow just regurgitated. So, I've been looking for music that strikes me as something new and unique. This Moses Sumney, listening to his album, really sounds, it has a lot of hints of older stuff like Nina Simone or something like that, or even Bjork, but the way it's all put together seems just quite new. I also think Kendrick Lamar, actually, a lot of his rap is just really different than anything in the past. So my point is I kind of disagree with this guy in the book.

CD: Yeah.

JM: It sort of pushed me to kind of look for music that sounds like it's really unique to whatever we call these the 2020s or you know.

CD: Yeah. I like that. Because as you were saying, even if you're not in agreement, it's motivating you in this other direction. Maybe getting back to your point about sometimes the path you start out on, even with your research or whatever, it's like you find an alternate route and leads you somewhere else, right?

JM: Yeah. Exactly. So, the sort of unexpected adventure you go on.

CD: Yeah.

JM: I actually just started reading *Something Wicked This Way Comes* by Ray Bradbury. It's really good. I would definitely recommend it. It's a very creepy, essentially Gothic narrative.

CD: Yeah.

JM: I'm only at the beginning, but it's essentially small town in America has a carnival come in and there's something really dark that come with this carnival that you don't quite know about. But I think from reading about it, what's going to happen is the people in the town are going to

start fighting and acting like a mob and things are going to get out of hand. And it's very much an analogous to a lot of what you see in the US at the moment.

CD: Yeah.

JM: Because of the sort of dark presence that's really brought out these base insecurities and feelings in them. But it's a really strong read. And while Ray Bradbury's a science fiction writer, is also just a very good writer.

CD: Yeah.

JM: And so that makes it a lot of fun to read.

CD: Oh, it sounds like good sort of October reading like when you're just hunkering down and it's cold outside and I like that.

JM: And still in the moments when I'm not watching my four year old, I'm trying to read that book.

CD: But see, that is one of the nice things about podcast too, is even if you're watching your little ones around the house, I just find you could still have it on and maybe not listening to it as closely as you would be if you're on your own, but you get little snippets of it.

JM: It's funny I don't really listen to science podcasts. I think it's because usually when I hear that, the presentation it's so dumbed down in general, that it's a little frustrating to me.

CD: Yeah.

JM: And maybe just because I'm in the field. Although I still think, I haven't listened to a lately, but *Radio Lab*.

CD: Oh, yeah.

JM: Which I think you're familiar with, is still, as far as science podcasts go, they're good episodes are phenomenal. They had a whole episode on stochastic gene expression, which again, I'm not going to define it, but just the fact that they had the episode on that.

CD: Yeah.

JM: Really makes me respect them and they made it engaging and they came up with all these ways to visualize or just, it's not [inaudible 00:15:07] visualize after hearing sounds, genetic programs within the bacteria, just a phenomenal science podcasts. I've actually in my classes loosely assigned listening to a number of them over the years because I think it really provides sort of an insight or an understanding of things that might be hard to get across in a classroom.

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JM: The quick other story I was thinking of, the influence of podcasts or other media, and people's understanding of science in the world. I did a post-doc at the California Institute of Technology.

CD: Mm-hmm (affirmative).

JM: And so I was there for a number of years and Caltech is a pretty famous school, it's like an MIT or whatever on the West coast. And at the time the Big Bang Theory was really big. Right?

CD: Yeah.

JM: And so they were at Caltech actually. So there's at least there's images of Pasadena, California, which is where it is throughout the show. And they're supposed to be a bunch of these real physics geeks or whatever.

CD: Yeah.

JM: So, my mom calls me one day because she was really into The Big Bang Theory.

CD: Yeah.

JM: And she tells me she's like, "Did you know that they're at Caltech?" And I'm like, "Yeah, I know that, mom." She's like, "I think it's a pretty good school" And so it was like it didn't take her son getting a fellowship to go there, it took The Big Bang Theory to go, "Hey, my little Josh is doing all right."

CD: So, funny. Wow, I could talk to you all day about this stuff because there's so many things that you're making me think of. But anyway, I know time is short, but I just really wanted to thank you so much, Josh. It's always a pleasure to chat with you and for taking the time to chat with me today and tell me your story.

JM: Yeah. Thanks for asking. It was definitely fun.

[theme music fades in]

CD: I would like to thank everyone for listening to today's show.

I would especially like to thank my guest Professor Josh Milstein from the Department of Chemical and Physical Sciences at UTM, for taking the time to tell me about his work, his current podcast proclivities and book choices, and for his stories and the laughs.

I was actually giddy at the end of our chat because he was able to define for me, in a nutshell, the concepts of DNA mechanics and dynamics, and I truly got it, way better, I might add, than his brilliant friend William.

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[laughter]

CD: I love it!

JM: Step it up, Billy.

Unfortunately, I am trying to keep these new outputs short, so perhaps I will release that physics lesson for you all another time.

I would like to thank the Office of the Vice-Principal, Research for their support.

Thank you also to Jenny Rodrigues at the Bulletin Brief for her help in promoting VIEW to the U.

For any UTM researchers who have a story to tell and would like to be featured on the podcast, please get in touch with me. I would love to hear your story.

Also, if you can take the time to rate the podcast in iTunes, it helps others find the show and hear more from our great UTM researchers.

Lastly, and as always, thank you to Timmy Lane for his tracks and support.

Thank you!

[theme music fades out]