VIEW to the U transcribed
Season 2: Women in Academia; Episode #5
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[Theme music fades in]

Carla DeMarco (CD): Earthy Pursuits: an academic, and adventurer, a storyteller, and earth science enthusiast. Today's guest on VIEW to the U, Professor Lindsay Schoenbohm, has had wild times out in the field.

On today's show, Lindsay talks about her work that uses the landscape to read tectonics, with tectonics being the process that affect the properties, and the structure of the Earth's crust, and it's evolution over time. We also cover some of the faraway locales she has traveled to in order to conduct her field work – venturing most commonly to seismically active parts of the world, where earthquakes can occur, as well as some of the more exciting and memorable trips that have occurred over the course of her academic career.

With this second season of the podcast focused on women in academia, Lindsay also discusses the associated challenges and frustrations for women in the work environment, but she sees hope on the horizon with the open dialogue and debates that have been sparked over the past year or so.

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.

[Theme music fades out]

Lindsay Schoenbohm is an Associate Professor and an Associate Chair in the Department of Chemical and Physical Sciences at the University of Toronto Mississauga.

She earned her Ph.D. at the prestigious Massachusetts Institute of Technology in Cambridge, Massachusetts in 2004, before going on to do a post-doctoral position at the Universität Potsdam in Germany, and then on faculty in the School of Earth Science at Ohio State University. She has been a faculty member at the U of T since 2009.

Her research explores tectonic geomorphology, which is the study of the surface of the earth, and the forces that are involved in shaping it, both the constructive agents that build features like mountains and continents, but also the destructive elements like erosion caused by rivers, landslides, and glaciers.

CD: I know that your research is an exploration of tectonic geomorphology, and all that that encompasses in relation to the surface of the Earth. So I was wondering if you could provide a bit more detail about what tectonic geomorphology is, and as I mentioned using lay terms, and perhaps provide a couple of examples of current projects that you are currently working on?

LS: So tectonic geomorphology is what I do, and the geomorphology part is basically the landscape, so it's things like rivers or river terraces, or glaciers, or sometimes landslides, or sometimes it's sort of the architecture of a whole mountain range. But thinking about it from the landscape perspective. And then tectonics. So really what I do is tectonics, and I'm trying to use the landscape to read the tectonics. There's a lot of different ways to understand tectonics, and this is the angle that I take on it.

So one sort of branch of what I do, you could sometimes call it neo-tectonics. That's a bit jargony, so another way to think about it is just looking at the record of past earthquakes, for example. So I have a student right now whose in Argentina, he's actually due back tomorrow, and he was doing some field work along a fault in Argentina. And this fault cuts through a couple of river terraces. So these are sort of flat spots that the river has carved out, and then abandoned, and then the fault comes through and it cuts them, and it offsets them, and if we can measure how much it's been offset and then if we can date the age of that surface, we can figure out how fast the fault is moving. Or when the last earthquake is.

So we use these features of the landscape that are cut by faults, try to date them and figure out when the last earthquake was, or how active the fault is. And that helps us make predictions for seismic hazards.

CD: And are some regions then, because I know you do research in certain areas, are they just more prone to earthquakes because of these faults?

LS: Yeah, so there are seismically active parts of the world and seismically inactive parts of the world. And I tend to work in the places that are active. And that's where mountains, are growing.

CD: On your website, one of the topics that I was reading about was called "The Roots of Plateaus" and also "How Glaciers and Faults Interact in Plateau Regions" I was wondering if you could speak a little bit more about those topics?

LS: Yeah, so one branch of my research is this neo-tectonics, or looking at measuring faults. But the other branch is what we call Landscape evolution, so I'm looking at how the tectonics are sort of lifting up parts of the landscape, and then how the rivers, and glaciers are responding and eroding it back down. So it's sort of a push from below by tectonics, and constructive forces. So the tectonics are trying to build up the mountain range, and at the same time water, either ice or flowing water at the surface, is trying to tear those mountains back down.

And so we're looking at that competition, and sort of who wins out under what circumstances? I'm trying to read that in the landscape.

So, yeah, you mentioned the roots of mountains, so tectonic plates have two parts. They have the crust, and then they have this thing called the mantle lithosphere. And we think that when you create a mountain, you're thickening both parts. And we think that, that lower part, the mantle lithosphere, can get so thick that it actually drops off like a blob. Like exactly like a lava lamp, the exact same sort of physics behind it.

And when it does that, it has been acting like an anchor, so when it drops off the whole land above it pops up. And so for example, I work in Northwest Argentina in the Puna Plateau, and we think that it was probably relatively low until 36 to 40 million years ago. And then there may have been a big detachment event, and the whole thing sort of popped up, and now it's sitting at about four kilometers elevation. Which is pretty high.

There's a lot of different ways to examine whether that happened, but one of the ways is you can look at what happened at the surface. You can see if it changed elevation. Was it at one kilometer before, and now it's at four kilometers. I've done some work on that, and when that happens you expect a bunch of faults called normal faults. So these are faults that accommodate extension. You expect them to happen in a particular pattern, and so we're looking for those features. So we're trying to use the landscape to figure out what happened 30 kilometers deep in the crust, which is in the tectonic plate, which is pretty interesting.

And then the other thing you mentioned was glaciers, and how they interact with growing mountain ranges and active faults. And in some ways that's an offshoot of my research. It's something I've done with undergrads over the last couple of years, we're trying to sort of build up a database. The glaciers are a bit neglected, most people sort of look at how landscape interacts with tectonics through rivers as the media. Glaciers don't occur as often, and so they get a bit more neglected. But they're quite special because they are really tied to climate in a way that rivers aren't.

The river's sort of there or it's not, but the glacier will only be above a certain altitude. And if the climate changes they'll grow, but really interested in that sort of altitudinal relationship. So glaciers tend to hang out at certain altitudes, and so they affect the mountain range particularly at that altitude. And it's interesting to try to read that in the landscape.

CD: So then with your work, though, because you did mention climate, and this was sort of a follow-up question. Is your work really impacted a lot by things that you see changing due to climate change?

LS: Climate is always changing. It has changed dramatically over the history of the Earth. And obviously what's going on *now*, with the recent climate change is alarming. That's not something I really work on though, I work on climate in a deeper time context. So over the last several million years, so if we understand climate dynamics in the past, it does help us understand climate dynamics in the future, but I don't actually work on that stuff.

CD: Okay. I was thinking it must impact what you're doing, but I understand what you're saying, but because you're dealing with things that sort of-

LS: Over longer time scales.

CD: Yes.

LS: Although it does. Like one of the things I have my undergrads do is we map out glaciers. And glaciers, well in most parts of the world glaciers are receding right now. Not everywhere. And so that does actually affect the data that we're collecting right now.

CD: I understand, and you mentioned a couple of them already, but that you're field locations are all over the world. And so, I was wonder if you could mention a couple of the far-flung places that you've been, and also some of the field equipment that you use to conduct your research?

LS: Yeah that is one of the amazing and wonderful things about being an earth scientist is that the field is our laboratory, most of us spend a lot of time in the field, and some pretty exotic locations.

Most of my work I do in Argentina these days, the Northwest part of Argentina, it's a wonderful place do field work. Very civilized lifestyle, you know with a barbecue and wine for dinner, and a siesta in the afternoon. And it's also very beautiful, and the geology's fantastic. I spent a lot of time my PhD thesis and then my post-doc working in China, and Southwest China along the Red River, which is close to Vietnamese border. And then out west close to the Pakistani border, and the Afghan border.

And that was interesting. We had some adventures. Once in Southwest China we were canoeing, because there was very little outcrop, like that's what we want in geology, is you want to find the rocks, right? And in that part of the world there's a lot of mud and a lot of vegetation. Not a lot of rocks. And there were rocks along the river so we bought a canoe, a collapsible canoe, we shipped it over there, and we were trying to do field work from our canoe, and we capsized right above some rapids and all three of us got swept through. And we were separated, there was drama, but we were all fine.

And in Western China, it's interesting, because it's a fairly ... there's a lot of civil unrest in the region, and when I was there shortly after some big protests, and people were killed, and there was a really strong military presence, and sort of operating around that was difficult but interesting. I did a little bit of work in Africa once. I lived in Europe for a year, I did my post-doc in Germany. Turkey, I did a bit of work there as well. It's quite wonderful.

CD: With the equipment though, how do you end up transporting, or do you have sort of locations that are positioned there that you don't have to bring everything over?

LS: Yeah, good question. We don't use much equipment in my world. So one thing we need is a vehicle, we always just rent that there. In Argentina it has to be a four-wheel drive truck, or we can't get anywhere. And then we need our sort of personal hiking, and camping equipment. I have a supply of that in my lab, that my students can use, and I have my own stuff. And we bring that with us. And then we collect field data, we used to use paper maps, and some of us, like me, still do, but many of my students are now transitioning to doing it digitally, so they have an iPad, and a stylus, and an integrated GPS. And they're taking photos, and field notes, and actually measuring the orientation of rocks right with their field pad.

We have to keep it charged because we're often camping. So we'll bring solar panels and stuff with us, and then we also do GPS work sometimes. We all have GPSs' in our phones they tell you where you are on the surface of the Earth, but you can use it to make a topographic map of the surface of the Earth. So you basically have a very powerful GPS and we carry it around with us, we actually have little backpacks and these poles, and there's a little antenna on the top of it. And you're recording location at the top of the antenna. And we walk around the landscape, and you just walk over it, sometimes just in a transect, sometimes all over, and we can use it to create a map.

It's a bigger piece of equipment to carry with us, but we do take it with us. And then I guess the last thing is drones. I haven't used them much, but we're starting to get into that, because it's much more efficient to fly a drone over an area for 20 minutes, and take some photographs, and then model the landscape. It's more efficient, and more accurate than walking over it with a GPS.

CD: How are you able to date the-

LS: So how do we date the rocks? We ... sort of the field equipment question, or side of that is we are collecting samples, and then we have to ship them home. My student in Argentina just shipped home six buckets of samples, and two of them arrived today. We unpacked them, and look at them.

Yeah, so there's two kinds of dating that we do. One is something that people are more familiar with, that's radiometric dating. So C-14 is an example of that. And most people have heard of that, we don't actually use C-14, because it only goes back around 50 or 60,000 years before you sort of run out of signal. We use similar techniques, and they're basically ... you've got some material that traps radioactive isotope, a radioactive element like uranium. And then over time it decays to something that's stable, and you measure the ratio between the parent, the radioactive material, and the daughter product, the stable material. And based on that ratio, you can figure out how old the material is. So sometimes we'll find volcanic ashes, for example in the rocks that we're working with. And you can date volcanic ashes that way.

The other thing we do though, is called cosmogenic nuclide dating. So there's cosmic rays that come from space or the Sun from solar flares, and they are like little bullets, and they hit atoms on Earth, and they split them into smaller pieces. And most of those pieces just exist on Earth normally, but a few of them don't. They only form in these spalogenic reactions. They only form when the cosmic ray hits them.

And it's a little bit like sunburn. So these rays get used up, so you get a lot of these special nuclides that are forming right at the surface, and not very much as you go farther down. There's actually a few particles that will go all the way through the Earth, but very few. Most of them get sort of used up, and so it's sort of like they're causing a sunburn on the surface of the Earth. And we can measure that accumulation like basically how red the skin is, tells you how long you've been exposed to the Sun. So how much nuclide you have, tells you how old the Earth's surface is.

And this is really useful for geomorphology. Because we're dating things like river terraces, or glacial moraines, things that we're interested in ... they formed right at the surface of the Earth, and so that technique works great for them. So for that we collect a bunch of samples, we ship them home, and then we have to dissolve them, and do other fancy stuff to concentrate the nuclides that we're interested in, Beryllium-10 for example, or Neon-21. And then we ship it off to an accelerator mass spectrometer, we don't have one here, there's one in Ottawa. And we run it, and we figure out the concentrations, and we do the math, and we get an age.

CD: That is so cool. And are there any obstacles to even shipping these samples home?

LS: Yes. So one thing you don't want to do is label your products as sand. Because that's soil, and soil and sand are much more difficult. So you can ship them in, but you have jump through more hoops, and they're reasonable, I mean they're trying to keep us safe, right? But most of our samples are from deep in the soil profile, there's no actual soil in them so we label them as rocks.

CD: You dig them out?

LS: Yeah we dig them out.

CD: So then this is also part of the equipment that you have.

LS: Shovels?

CD: Shovels.

LS: Yeah that's true actually. What we do is we hire people locally, because to collect the cosmogenic samples, it's sunburned so you actually have to see ... it's like you have to see a profile of the skin, right? You have to see how red it is at the surface, but also how that drops off as you go down. We dig pits that are two meters deep, and that's hard.

CD: I was going to say, it's like a workout.

LS: Well it's like digging a grave. Like they're actually the dimensions of a grave. So we usually will hire local people to help us out. Yeah. And they often will provide their own shovels.

CD: Well, that's good.

LS: The shipping is really expensive, I mean we just spent $2000 dollars on this last shipment. Just getting the samples back here.

CD: Yeah, because that would be a big undertaking getting everything back here to be able to analyze it.

LS: Yeah, that's true. And it's also interesting how much of my time isn't spent on science, but it's spent on like wrapping samples in duct tape, and waiting to deal with the paperwork. You know shipping stuff.

CD: You would think with rocks you don't have to wrap to much because-

LS: That's true.

CD: It's not like china or I don't know something breakable.

LS: Yeah it's not fragile. Yeah. That's true. Well actually rocks, they're sharp, right? And so they'll actually sort of push through the cardboard boxes, so that's part of it. You're actually like taking the edges off. And also a lot of times, we're dealing with sand, or with loose cobbles, and we don't want it to burst apart.

CD: Right. And are there any findings, or results that you've come across over the course of your work that you found particularly surprising?

LD: Yeah. I was surprised once in the field. And it's funny I don't think I should have been but it's still, it's the difference between seeing something, reading about something, or seeing it on a map, and then seeing it in person.

During my PhD work I was in Southwest China, and we had this idea that it was sort of developing in our group at that time. That there's actually a flat surface sort of way up at the top of the Southeast margin of the Tibetan Plateau.

And there's a bunch of rivers that have cut down into it. But I've never seen this in the field. So we were driving through this very mountainous landscape, up and down, into valleys, and we were driving up this valley, and then we started driving up the side of the valley, the switchback roads your life is in danger around every corner. And there's landslides everywhere, and then all of a sudden we just like came up over the top of something, and it was a flat landscape.

Like not perfectly flat, not a pool table or anything. But it was rolling hills, and there was like little pine trees, the vegetation changed completely, and it was flat. And it was just so counter to what you'd expect. Normally when you drive up hill, you just expect to get steeper and steeper and steeper, and it didn't, it just flattened off. And that was the surface that we had been talking about. And I finally really got it.

CD: What a nice memory though, too.

LS: Yeah, it was.

CD: And can I ask how you got into this particular field of study in the first place?

LS: Yeah, when I was in grade eight, I took an Earth Science class, or actually it was a general science but someone with an Earth Science background who was teaching it. And she was incredibly inspirational, she's a family friend so we're still in touch. It was partly that, just her enthusiasm rubs off, right?

And it was also, I remember looking at a map of the ocean floor, and being amazed that there was so much topography down there, it's not flat. There's big underwater mountain ranges, and you know I think I just got the first sense of like the power of geology in shaping the world.

You know I was inspired by the subject, but I also like being outdoors, and hiking, and camping. And that's ... you know Geology is one of the fields where you can do that.

CD: And do you do any kind of diving?

LS: No. Jochen Halfar is a colleague of mine in an Earth Sciences group within CPS [Chemical & Physical Sciences], he does quite a bit of diving, so there certainly are aspects of Earth Science where that's important, but I'm a bit claustrophobic, so, no diving for me.

CD: And so what do you feel is the biggest impact of your work?

LS: I think if you go by the numbers, the paper that I've have most cited, was actually from my PhD work, and it was about what I was describing about driving up rivers, and then seeing the flat surfaces at the top.

I was part of the group that came up with that idea, I was one of the first people figure out a way to quantify that, to measure it. So we were looking at river profiles, and I could actually look at the river profile, that belonged to that flat part and reproject it, and sort of recreate the landscape before the river started to cut into it. And that's been cited quite a bit, because that technique is applicable in other places.

I think the sort of biggest body of work though, would be in Argentina. I've been working there for a long time, since 2004, and I have some colleagues, we published together. So I think our sort of body of work has really filled out the history of both on the plateau, and then around the plateau. The history of what's happened there, and how climate and tectonics have interacted, and what's happened, have there been these drips, and uplift of the plateau.

CD: You don't have to pick a favourite, but is Argentina- is it safe to say is your favourite place to go?

LS: Well, yeah, it's interesting. In some ways, Argentina is my favorite, it's certainly the most comfortable. You know when I step off the plane in Buenos Aires I feel very much at home, and I have very good friends that I work with there. So I certainly enjoy going there, but in some ways it's become routine. I mean I've been there a number of times, and sometimes I'll tell like a new friend, oh yeah I'm off to Argentina next week, and they're like, oh that's so amazing, I've never been there. And I have to be like, 'oh yeah, I should be more enthusiastic,' but so I do like going to the exotic locations.

You know I did just three short field seasons in Turkey, and I loved every minute. And China's the most, certainly the most challenging and exotic place I've been. And I love that too.

CD: And I've heard so many good things about Turkey though, like just an interesting country.

LS: And fantastic food.

CD: Oh yeah?

LS: Really nice, yeah.

CD: Do you end up going to Argentina like a couple times a year? Or it depends?

LS: Once or twice. I'd say, I think I tried to count. I think I've been there like 14 times since 2004. So it's not ... I guess that's averaging once a year. I mean I had some mat leaves in there, so those let me down. And these days it's mostly with students, so I often just go for a short visit, so I was there last fall, last November with a student, and I was only there for ... I think I slept in the field for three nights. So I think I had five nights in Argentina. Two nights on the plane. And that was it.

CD: And that can be also included into the impact of your work. Because I'm thinking you do ... I know you do a lot of work with students, and I think that, that's also a huge contribution.

LS: Yeah, I've worked with a bunch of graduate students, and I have my first PhD student, just got his first faculty position, and just took his first PhD student, and that's quite cool actually. And, yeah, working with graduate students is great, and then I also teach undergraduates. And I think if you want to look at actual impact on the largest number of people, that's probably where it is. I taught a large enrollment class for a bunch of years.

CD: I find it interesting, because when I ask that question, I do get a range of responses. But sometimes it is you know, very much the contribution to the field, but you know I think a couple people have brought up how many students they've worked with over their time, and it's like that's huge in terms of knowledge mobilization and all that stuff.

LS: Yeah. Exactly.

[interlude music]

CD: Coming up: Women in Academia.

Lindsay talks about the challenges women face in virtually any career, but also the hope on the horizon with the dialogue that has started, and new initiatives at the university.

[interlude music fades out]

CD: And so I think I mentioned to you that this season of View to the U is about women in academia. And so I do like to ask, you know and there's been a lot of discussion lately about promoting and supporting women in all different careers. But I'm just wondering if you've come across any sort of challenges in the course of your academic career, or if you have words of encouragement, or if there's a mentor that you want sort of give props to, or like any of those things that are tied in with your work?

LS: I saw this question in the list that you sent to me, and it's a difficult question to answer. Because in some ways it's hard to be…let's start by saying that I think that pretty much every woman, everywhere, faces challenges. We have particular challenges in Earth Science, or in STEM fields, or in academia, but you know this is a problem that I don't think I know any woman that hasn't dealt with some actually pretty serious problems.

I personally, it's interesting, I think I've only recognized some of it in retrospect. The times are changing now, right? That the conversation around sexual harassment, sexual violence is different now, I think literally at the time I didn't actually recognize that some of it was happening. But I've probably dealt with three fairly impactful episodes of harassment in my career in academia. I have, and I've heard about it from most every woman I've talked to. I have two friends who were harassed by sort of powerful men in their field, their advisors, and kept quiet about it for 20 years, and it finally has come out, these guys are kind of facing the consequences finally.

So and that's the big stuff. There's also a lot of sort of day to day ... I feel like I deal with the imposter syndrome a lot, and many of my female colleagues do. Some of my male colleagues too, there's a lot of self doubt for all of us, but I think particularly women. And there's pay gap, there's unconscious bias, there's the way student opinion surveys are known to be biased against women, and I'm lucky to be a white woman I think we have a real problem with diversity in STEM [Science, Technology, Engineering, Mathematics]. And particularly in Earth Science we're terrible with people of color, women of color.

So there are a lot of ways in which this is a difficult place to be, and also I have two kids, and it's certainly a challenge to be a working mom. Again that's not, unique to academia, but, that said, I would want to be encouraging for women. And I don't want to be discouraging.

I do think things are changing, and I think they're changing rapidly, and I think U of T now has a sexual violence policy, I do think university campuses are already changing in a positive direction, but I think that society as well, is starting to recognize how deep some of this sort of bias and harassment runs. And I think that's a good thing.

Numbers are better, you know there are now, I just saw a report recently, that in Earth Sciences we're equal at the PhD level.

CD: See, I find that very reassuring. Because I know I've heard the stats sort of circulated that ... people start out sort of at as equal, they're the same amount, sometimes higher for certain fields, but as you get higher up in PhD or post-doc, the number of women it goes down.

LS: It's the leaky pipeline issue. And if you look at when we achieved equality at different levels, and how long it would take for those people to get through, we haven't hit those milestones right? So we're losing people. You know for a lot of different reasons.

CD: I wonder about the reasons, because sometimes I hear people say well sometimes they feel they have to make a choice between career and family. Because if you're an academic, you do have to spend a lot of time doing what you do. But I don't know if it's totally down to that, though.

LS: Yeah I think that's a big part of it. But I also think it sometimes has to do with incidents of major harassment, there's women who don't want to continue in this career because their advisor, for example, hit on them, and they said no, and there will be repercussions for the rest of their career for that. Or the sort of smaller, you know the daily, you're not good enough message that people get. That's hard to quantify. But it's family as well.

But I would say that I think raising kids is hard for any ... well, any parent, but often the burden is on the mothers. Not always, but often, and academia has the advantage of ... well first of all you're in a relatively progressive workplace. There's usually pretty good policies, I think U of T's policies are great, and U of T's also open. I know that you guys in the V.P., Research Office are working on lactation rooms, and support for conferences and stuff like that. And that's incredibly helpful, and I think many women don't get that in their workplace. So that's great.

And the other thing for me that was wonderful was flexibility. You know if my kids were sick, I could go, and get them, and do the work later. So I wouldn't discourage, you know if you're passionate about the science, then go for it. The barriers are ... it's getting easier all the time, you can be part of the change, and yeah go for it.

CD: Good to end on a positive note. But thank you so much for coming in today Lindsay, I really appreciate it.

[Theme music fades in]

CD: I would like to thank everyone for listening to today's show. I would like to thank my guest Lindsay Schoenbohm for coming in to speak about her work, and her projects in the Department of Chemical and Physical Sciences at UTM.

For more information on her work, I highly recommend touring her wonderful website, lindsay-schoenbohm.com, where you will find detailed information about her research, as well as some videos that were shot while she was doing some of her field work.

Thank you to the Office of the Vice Principal of Research for their support, and for everyone who has expressed their interest in this podcast.

Thank you to CARA, that's the Canadian Association for Research Administrators for allowing me to present on the podcast at the annual conference in May.

Please feel free to get in touch with me, my contact information is on our sound cloud page. And if you have feedback, or if there is someone from UTM that you'd like to see featured on VIEW to the U please let me know.

Lastly, and as always thank you to Tim Lane for his tunes and support.

Thank you!

[Theme music fades out]