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- nobody didn't know any biologist, but it was different. Just like my teachers tried to talk me out of it all the time. They were like, "Wouldn't you rather be a nurse or a teacher?" And I was like, "No." And I like had this, and I had two teachers that like supported me, when I was in elementary school and high school, and there were Ms. Betty Work who was the science teacher for the elementary school. And then Mr. Morgan, who was the high school science teacher, and they like supported me. They were like, "Yeah, you could do this." Like, this is the thing.

- Awesome.

- But like a lot of people tried to talk me out of it. They thought I was crazy. I would interview for scholarships and they were like, "That's not a thing you, that's not something that can happen." It was just like crazy.

- Oh my gosh. They're like, you wanna be a nurse? And you're like, "No, but have you seen the otters?" Like.

- Yeah.

- [Presenter] This is the ORISE Featurecast. Join host, Michael Holtz, for conversations with ORISE experts on STEM workforce development, scientific, and technical reviews, and the evaluation of radiation exposure and environmental contamination. You'll also hear from ORISE research program participants and their mentors as they talk about their experiences and how they are helping shape the future of science. Welcome to the ORISE Featurecast.

- Welcome to the ORISE Featurecast. As ever, I'm your host, Michael Holtz in the Communications and Marketing Department at the Oak Ridge Institute for Science and Education. And as is becoming a new tradition here on the podcast, I am joined by my co-host, Matthew Underwood. Matthew, welcome. How's it going?

- It's going good, Michael, you know? It's always great to be here with you and learn about all the fascinating fellows in the department and what they're working on. So excited for another exciting conversation.

- We always have great conversations with our ORISE fellows, and today, I'm sure will be no exception. We are chatting with Nikki Cavalieri and Nikki, welcome to the ORISE Featurecast.

- Good to be here.

- So Nikki, if you would, talk about where you're doing your ORISE fellowship and what your research focus is.

- So I am a remote postdoc.

- Okay.

- I'm with the USGS. I am with, it's an interesting project because it's a USAID-funded project, but they're part of the Department of the Interior, and they can borrow scientists from the Department of Interior. So they asked USGS for scientists to help them do climate change projects in Tanzania. And they recruited my mentor and then my mentor was like, "I should get a postdoc for this," and then they found me. And so, I'm kind of attached to the Northeast Climate Adaptation Center of the USGS. Like that's where my colleagues are. I am a remote postdoc, so I'm actually in the woods in the lower peninsula of Michigan, about 10 miles from Lake Michigan.

- Okay.

- So, and then I, it doesn't matter because my, all my research is in Tanzania, and I'd have to be in the US anyway, so it's not like significantly farther if I was in Massachusetts or if I'm in Michigan, so it works out.

- Right.

- And so, like, we went to Tanzania to meet with all the partners and collaborators and stuff, but yeah, I'm in the woods.

- Awesome. So you're like double remote, like, not in Tanzania and also like in the woods of Michigan. I love it. So what are you studying? What are you focused on in Tanzania?

- So we're looking for climate change refugia. And climate change refugia are places where it's gonna be buffered from contemporary climate change. And so, that things will be able to persist. So we're looking for places where there'll be suitable habitat for species in the future under different climate change scenarios. That way, so the USAID's partners, which is the Tanzania Institute for Wildlife Research, the Tanzania National Parks Authority, their forest service, and all of these things, so they can make decisions because we went and we talked to everyone. We asked them, have you thought about climate change in your management plans? Are you incorporated into your things? And they're like, "We are concerned. We are seeing it happening, but we have a lot more pressing things." They still have a lot of poaching, and that's like direct and observable and right now. And how can you plan for the future if you're just trying to deal with your most immediate and pressing concerns?

- That makes sense.

- So they were like, "Yeah, if you wanna, if we would love to see this worked up," and then they told us what they were concerned about and things they had seen changed. And we incorporated all of their stuff into the project which was things that were doable 'cause we all have things we want done that are not possible. So, and then we're working on it.

- That's awesome. So has climate research always been something you've been interested in, or is that something that's come along recently?

- I have a very non-linear, non-linear trajectory. But it makes, so the climate research makes sense because my PhD was looking at biogeography and looking at climates in the past and how they shape the morphology and life history of carnivores. And so, this is just looking in the future for habitat. So it's the same skillset, but different questions. So I'm always been interested in how the landscape, how the landscape affects things and how that drives patterns of behavior and evolution. Like my master's was studying lizard behavior and now, I'm doing climate science in Africa. So that's like not something you would've seen from the beginning.

- But there's sort of a line through it in terms of habitat and landscape. And where do living things go when there's climate issues, right? I mean.

- Yeah, I mean, it makes sense if you look back and make a post hoc life, but all the way it has been complete clown shoes, but it's all the same skills, and it's the same questions. It's different questions, same skills, but it's been a wild ride.

- I love it. Has science always been an interest for you, Nikki? Is that something that from a young age, or was it, you discovered it one day and went, okay, I'm good?

- I am from very rural, southeast Oklahoma.

- Okay.

- Nobody goes to college still. Nobody leaves, everyone just kind of stays and it's been the same for a while. And so, I grew up very close to nature. I grew up on a cattle ranch and I have been feeding, I cannot remember a time when I was at feeding and caring for animals. And I used to go into the woods and follow otters on the creek and follow birds through the woods and observe them. And I was just kinda like a feral child. And then, so like, when I was in the second grade, I found out like wildlife biologist was a thing. And this was before like, you only could learn things from TV and the encyclopedia. There wasn't like the internet where you could just look up anything you want all the time. But like, so like I found like wildlife biologist was a job. And then I was like, I would like to do that. But like, so like my family was always super supportive, even if they didn't know how to be supportive because-

- Right.

- Nobody didn't know any biologist, but it was different. Like my teachers tried to talk me out of it all the time. They were like, "Wouldn't you rather be a nurse or a teacher?" And I was like, "No." And I like had this, and I had two teachers that like supported me when I was in elementary school and high school and they were Miss Betty Work who was the science teacher for the elementary school. And then Mr. Morgan, who was the high school science teacher, and they like supported me. They were like, "Yeah, you could do this." Like, this is a thing.

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- Oh my gosh, they're like, you wanna be a nurse? And you're like, "No, but have you seen the otters?" Like.

- Yeah.

- I love it.

- So the love of animals and zoology has always been there. Now, it's just the climate change just came layered to how you can help them, but the love for the animals has always been there.

- Oh, the love for the animals has always been there. I've always been interested in where they come from, what they're doing, why they're making their decisions. I just, the climate change is a new thing that's incorporated in.

- Right.

- But like kids now know about climate change, but back then, we didn't, so.

- Well, and like you said, back in the day when it was like the encyclopedia and you know, the occasional movie or you know, the card catalog, like.

- Occasionally, you would get like a Nat Geo special that would be aired on like one of the networks you could see, maybe. Like, I remember when the first Serengeti came out and all the wildebeasts cross in the water. Like I remember being like, "I gotta see that." And then now I'm doing that.

- I have to go to there. I love it. You talked about your teachers as kind of early mentors. Have there been, I assume there have been other mentors along the way that helped you? There has, so, I got into Oklahoma State University as an undergrad and no one had ever been to college in my family. No one had ever been to a four-year college that we knew. So, 'cause all the teachers would start out at the two-year college and then move to like a normal school. So like we had no idea what we were doing, but I had gone to, I had gone to Oklahoma State as part of 4H, and they have this program when you're like 13 to like, you're a senior, and they take kids from all over the state. It's called Roundup. And they take them and they turn them loose on a college campus and there's like workshops and events you go to. But like they just turned all these kids loose on a campus. And it was great because I had been there and because I knew where buildings were, and I knew how to like get around, I was fine. I was like, I'm gonna go to OSU, I already know where everything is. So I got into OSU and then I had like, I had no idea what I was doing. Like I remember like when my mom left, we lived a long way from there, like four hours from there. So like when my mom left me, she was like, "It's okay if you flunk out, we'll find something for you to do." And I got in the Honors College, that's true. So it was fine, but we didn't know. Had no idea. So, and then like when you're in the Honors College at the OSU, you can do projects with, you do like honors contracts and so. you can do projects with people. So like, I doubled down on that and I found Dr. Stanley Fox and he led me do a project with lizards when I was like 19. And we had lizards in the lab and we studied them, and there's sprint speed and tail autonomy. And I worked with another student and like, he let me into the world of science. He let me get my foot in the door and then I refused to leave. I was his master's student. But like, yeah, so like I got in and then I just stayed and it's just, like it's not like I said, it's not a linear trajectory. Like I went from studying lizard behavior for my master's. I studied evolutionary ecology in ontological development in biogeography for my PhD. I'm doing climate change stuff now. Like I've worked for the Nature conservancy doing climate, doing restoration plans for the Great Lakes. Like I've worked for pregnancy researchers helping with their statistics, so that they can determine what increases infant survival and mother success. Like I have done all kinds of random things, but I love all of it, and I'm always excited for the next new thing. Like I'm flexible and I like the novelty of it.

- I love that. I think that.

- That's awesome. So, all those different pieces that you've done, all the different places that you've touched, how has that helped kind of form you into the researcher that you are today?

- Well, like I have a broad perspective. Like a lot of people, like an easier way, an easier way to be successful is to get good at one thing and do the one thing really well. But like you miss stuff. And so, like, when I was working with the pregnancy cohort, the echo group here in Michigan, I was helping them do their statistics, and I was reviewing the paper, and they had talked about how that they could be seen, they could be seen these behavioral change because of a specific microbial system, microbial community in the guts of infants. And 'cause they were looking at different genera of, they were looking at different genera and being like, well, this has this in it, and this has cholera is also in this genius, so that's clearly causing this. And then I had to explain like how, like how much evolutionary time and diversity there is in microbes and within a genera. One of the things that cholera is also in the genera that makes bioluminescence. So that's not necessarily, we can't ask, we can't say that, but we should investigate it 'cause that's like, it might be a thing, but we can't say that directly here. So like that's not something that they had brought to the table is this deep evolutionary knowledge of how much stuff is in things. And so, that was like one of the ways that I felt like I really, really helped. I was like, okay, this is something I truly know this is important, so.

- Right.

- But it was like a, it's a small little thing, but it's something that, because they have a more focused background on nutrition and stuff like that, that it wasn't something that they had floating around in their head.

- Gotcha. I assume with all of your research, and particularly now with the Tanzania work, that collaboration comes into play 'cause you're not, you know, you're remote, and you're working with scientists I assume who are on the ground there and elsewhere. So collaboration is a big deal.

- Oh, this is a very collaborative project. There are so many partners at different levels and at different things also in a different language. So yeah, so that, it's a highly, it's a co-production project. So we went and asked them what they needed, which is not something that they're used to. And so, it took us a bit to get the communication out because usually people are like, "I wanna study elephants and then how do I study elephants there?" And I was like, "What do you need?" And they didn't know what to do at first 'cause they weren't prepared either, like that's an open-ended question. Like we need a lot of things. So like that we had tried, we'd had Zoom meetings with everyone, had talked before, and it was okay, but we went in October of '22, we went in October of '22, and I was there for four weeks and we talked to everyone and be with every, and that helped like being face to face, being, having a conversation in real-time and having no technical difficulties. And they were like, oh. And then we could get the conversation going. We could build the relationships, we could meet needs, we could figure out what was doable. And that was just like super helpful to all be in the same room together. So yeah, highly collaborative. We're working with their version of Fish and Wildlife which it's all kind of differently organized. Their park service, their forest service, district foresters, nonprofits, different refuges, which are in a different system. Like we're working with lots and lots of people, and scientists at the universities and yeah.

- So I have to ask, you know, small town in Oklahoma to a different country. How, take me through that. What was that experience like, your first time visiting there when you're just, you know, this small town girl and then all of a sudden, now you're in a different country. How was that experience?

- It's always a shock. It's always a shock. And I don't speak well, I didn't speak any Swahili. I've got, I went around by myself in parts of Tanzania with just a notebook piece of paper filled on the front side with Swahili. And that is how I got on. 'cause lots of people speak some English, and I had some Swahili and it worked. And then all the researchers and stuff are far like, are very fluent and like, it's just amazing that they can can deal with it. They're fluent even in other languages 'cause they talk to Europeans and stuff. So it's a shock because everything is different there. So I was prepared for the different like habitats and stuff, but they have a different land tenure system which I wasn't super familiar with before I went, so private property's not a thing. Things are put into village lands and different lands like that. And so, that's important for the work we do. But I didn't fully understand exactly how it went, until I talked to people there and like local people, so I could figure out like how it works, so that was a shock. And then once I got that I was like, oh, this makes, this fills in a lot of holes of why is it like this? So, and then like transportation, and there's different cultures like there, like Americans tend to be independent and do things and then people try to help you and then it's like an awkward polite off of like, oh no, after you, oh no, after you. So it was good, but it was like drinking from a fire hose. Like we didn't, nothing went bad, but it was like, all right, gotta catch up on this. Gotta change speed for this. Yeah.

- And learn your way around a new culture and yeah, all the.

- Learn your way around a new culture, which was, it's difficult because there's, it's a lot of cultures just like the US, like there's, and different parts of it. And I went, I missed the Southwest, but I went pretty much everywhere else 'cause I was trying to do site evaluations 'cause I was like, I can't tell if these maps are any good if I don't know what it looks like. So I need to go look at habitats and see what they are 'cause there's things that I've never seen before. Like I'd never seen low land rainforest that wasn't just completely second generation. So like, things like that. So like, it, it was a lot, it was exhausting, but it was very good. But it's a lot to completely change and do stuff.

- Right. In addition to kind of the obstacles of just that sort of learning curve and culture shock and all of that, have there been other obstacles that you've had to face either with the work in Tanzania or just in general?

- Well, I mean life is nothing but a series of obstacles. Oh, so we use a lot of geospatial data to do this. And it is huge files over continent scale, like one-kilometer continent scale. It's a lot of data, so we run it on a computer cluster and like, it's good, but I've been having some technical difficulties with it due to people changing stuff in the geospatial code and software and how that's not getting along with the cluster. So like I'm having, like right now, I'm crashing things as we speak right now. So that's what I've been doing all week, so there's technical stuff like that. Like it's just an enormous amount of stuff. It's enormous because we wanna do seven to 20 species. We wanna try to capture everything. There's lots of evolutionary considerations. And then can we get the data? 'Cause there's not as much freely available data at the scale that we need in Africa. Like people who do stuff in the US, you can get, oh, two-millimeter, two-meter resolution for stuff. I've got a kilometer, but I'm like mapping frogs this big, they don't actually move that far. So it's like I'm not catching things at the scale I want. So I'm like, this is the best we have. It's the best we can do right now. It's not perfect. It's not, but it's not bad, but it's not as perfect as if I could if I was mapping in the US.

- Gotcha.

- So there's things like that. So there's a lot of technical challenge. It's a huge project.

- Sure.

- Getting everybody on board. Yeah.

- And everyone's scattered around the globe, so that, there's that too.

- Everyone's scattered around the globe and there's a hard, there's like a two-hour window in which people can meet. That's like the working day for everyone. Just gotta get it in there.

- Squeezing all those meetings.

- And then they'll be in the field. They're like, ah, we're in the field for two months. And I'm like, I'll see you when you come back.

- So you talked about, you know, some of the obstacles. What do you enjoy the most about, you know, the research that you're doing?

- I like to find out why. So, like I am doing analysis and producing maps that will be good for the people, but I'm also making stuff, so I can see things, like I wanna know more than anyone else wants to know. And then I give them a nice, like a nice a thing, a thing people can use. But like, I like to find stuff out. So like I enjoy the discovery, I enjoy figuring things out. I enjoy biogeography deeply. So even though like I'll map habitat in places where I know species are and I'm like, this is a suitable habitat here. But I'm also super interested about like places where they're not, and I know they're not there due to like, there were barriers to dispersal at one point, like oceans. But then I can see there and I was like, well, this is habitat they'd be suitable to there. And I like to think about it like through evolutionary time and like, 'cause things are always changing. So, you know, things are moving north. Like, in two lifetimes, armadillos are in Oklahoma and Kansas and they weren't there when like my grandparents were young. So like, things are moving. So like what's gonna happen when things move north with heat and things moving around and how that'll change communities and like how that, how looking at the past informs that. But that's not part of the project. But that's the stuff I think about when maps come out.

- Sure, sure. Well, and you know, armadillos are in Tennessee, too, so-

- Yeah.

- they are definitely moving.

- In the fifties, they weren't in Oklahoma.

- Wow, that's amazing.

- So they had moved, they had moved north that way, so, yeah.

- Wow. That's a lot to pay attention to. How do you keep it all straight Nikki?

- Well, so the code is like very rigorous and very documented and all of that. And everything else is just like two tornadoes of thoughts in my head. So yeah, it's like, it's more clustery thinking than nice and linear then you have to take it and make it nice and linear for people who aren't part of the inner workings.

- That's amazing. I take it from your description and from the conversation we've had that you are enjoying your ORISE fellowship.

- I'm loving my ORISE fellowship, like this is great. This is super interesting. I'm doing exciting research. I got to go to a different continent and see different animals and talk to everyone about them. I'm still am able to do it because I'm double remote 'cause I wasn't able to move because it's expensive to move.

- Right.

- So like, I love it. It's fantastic. It works well for my mentor. It works well for USGS and USAID. They can easily work through the paperwork part of hiring people and getting things done, like it works great for them. Like ORISE has got like, they're always having some kind of webinar seminar, so you can get lots of professional development which is good 'cause I did like a USAID jobs one and I was like, "Ah, ah, that's important information I wish I had known earlier."

- I love it.

- So what would you say has surprised you the most? You know, just coming into it, you know, you talked about your first step in that first day on campus at Oklahoma State, not knowing what to expect. What has surprised you through the ORISE fellowship? What surprised you the most about what you're doing?

- Through the ORISE part or through the science part?

- Yeah, through the ORISE part.

- The ORISE part's incredibly easy. Like it is much easier than being hired by a department, like a department at a university or a state agency, or the federal agency, like it is smooth. Like I ask people, the only thing that's hard is to do international travel because we were doing like, I'm like, I need to pay a man for gas. Like, and he's not got a receipt.

- Right. How do I do that?

- And like, we need to book a flight on an airline that no one has in their system. So that was the only thing that was hard. And I could email someone and they help me.

- Right, right.

- So the only thing that's hard is doing travel, which is hard everywhere.

- Right.

- So everything else is super smooth.

- I need to pay a fixer to help me get around, and yeah, how do I that?

- It wasn't even that I was like, "I just need to pay them back for gas." And I was like, "I gave them cash, but like there's not receipts."

- I don't have a receipt, yes.

- There's no receipts in.

- Right, right.

- Well, last question for you, Nikki. This has been an thoroughly enjoyable conversation and I love learning what you're doing, and I hope we can come back sometime and see where you are further along in the project and learn some more. But my last question for you is what brings you joy?

- Oh. I think discovering the unknown. Like I'm super, super curious and I need to know everything. Like not just science stuff, like, everything. Like I love to learn, I love to know what's happening. Like, yeah.

- Awesome. I like that answer a lot. Well.

- And the otters. It all started with otters, right?

- The otters.

- That was the first curiosity.

- Otters bring everybody joy, right?

- That's right.

- They had, so the thing with the otters is they had been extra painted out of the area I was, and they released them. And we had fishing, do you know what trot lines are where you have lines out in the water to catch catfish?

- Uh-huh, yeah.

- So like they came and they moved it and then we couldn't fish anymore because they would just steal the fish. But it was worth it because they had built all these slides in the bank and you could watch 'em play and like, I was like, well, we can't fish in here anymore. But it was just fun to watch 'em and they were something that was gone that had come back. And so it was super neat.

- That's really good.

- It was nice to see 'em moving back in even if they did like ruin all our fishing, that was fine. But because they were super cool.

- I love it.

- I love it. Well, Nikki Cavalieri, thank you so much for spending time with us today and telling us a little bit more about your research and your background. And it's been a joy getting to know a little bit more about you. And as I said, I hope we get a chance to reconnect again sometime in the future.

- Yeah, it was an absolute pleasure talking to y'all.

- Awesome. Thank you so much. Have a great day.

- [Presenter] Thank you for listening to the ORISE Featurecast. To learn more about the Oakridge Institute for Science and Education, visit ORISE.ORAU.GOV or find us on Facebook, Twitter, and Instagram @ORISECONNECT. If you like the ORISE Featurecast, give us a review wherever you listen to podcasts. The Oak Ridge Institute for Science and Education is managed by ORAU for the US Department of Energy.