Christina Wildf...: I feel good about the work we're doing and it's all about how do we decarbonize industry.

Michael Holtz: Right.

Christina Wildf...: How do we reduce the carbon emissions, so how can we capture and reuse CO2? Can we integrate more renewable energy? So really looking at how industrial processes look today because everything is based on either economy of scale to make it more profitable. A lot of it is based on the use of fossil fuels for heat generation, which creates CO2 emissions. So what future technologies can we use to reduce those?

Speaker 3: This is The ORISE Featurecast, a special edition of Further Together, the ORAU podcast. Join 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.

Michael Holtz: Welcome to another episode of The ORISE Featurecast. My name is Michael Holtz in the Communications and Marketing Department and I am your host. I have the privilege today of talking with Christina Wildfire who participated in the National Energy Technology Laboratories Postdoctoral Research Program. She was a participant in Morgantown, West Virginia, and we're going to talk about her fellowship and where she is today and all of that kind of stuff. Dr. Christina Wildfire, welcome to The ORISE Featurecast.

Christina Wildf...: Thank you. Thank you. I'm glad to be here.

Michael Holtz: So tell me a little bit about who you are.

Christina Wildf...: Sure. Well, I'm now, as you said, a researcher with the National Energy Technology Laboratory, but I didn't always start out as a research scientist.

Michael Holtz: Okay.

Christina Wildf...: So I guess starting early in high school, I always thought I was going to be a medical doctor.

Michael Holtz: Okay.

Christina Wildf...: So I had this vision, that was my plan. I had scoped out colleges exactly for that. And I realized that I am terribly afraid of blood, so it was a small hitch in my plan.

Michael Holtz: Just a little problem.

Christina Wildf...: A little problem. And I was still trying to figure out ways to get around this, maybe just trial by fire, I'll eventually get over the squeamishness.

Michael Holtz: Sure.

Christina Wildf...: All of that, just trying to pump myself up. So I ended up getting accepted to Mercer University in Macon, Georgia, and I was going to go for biochemistry, premed. And they called me about a month before we started and they said, "We just got money for scholarships for women in engineering. If you switch to engineering, we can give you a full scholarship."

Michael Holtz: Wow.

Christina Wildf...: So I was very hesitant because one, I knew no engineers. I knew nothing about engineering. My dad and I went to the computer to try to find something about engineering.

Michael Holtz: What does this mean? What does it look like?

Christina Wildf...: Right, right. And now, we can Google anything. This was, let me think, 18 years ago or something like that.

Michael Holtz: Oh gosh. Yeah.

Christina Wildf...: Yeah. So it wasn't like we just plugged it into our phone and figured this out. So doing the searches for engineering, it was just building things, engines. And so I was like, "Dad, I don't know about this." My dad is actually a jeweler and a watchmaker, and I always loved watching him put together watches, taking them apart. I was terrible at actually putting them back together. He would let me try on some junk watches. I was terrible. I always had a piece missing or a piece left over.

Michael Holtz: Right. So loved finding out how things worked, but couldn't put them back together.

Christina Wildf...: Yeah, but putting them back together, maybe not my strong suit. So we talked to the guidance counselor and they're like, "You know what, you do this for a year, you can do biomedical engineering and if you don't like it, go back to biochemistry. You still get to keep the scholarship." I was like, "Okay, fine, won't hurt."

Michael Holtz: That's a deal.

Christina Wildf...: Right? Deal. So I ended up actually loving the engineering classes, and so that kind of started me down this journey of becoming a scientist.

Michael Holtz: Wow. Very unconventional.

Christina Wildf...: Very unconventional, yes.

Michael Holtz: Right, and a swap midstream, that's really interesting. So how did you find the National Energy Technology Laboratory in this process? And I guess, how did you go from an education perspective first? How did you get to the point that you would be working kind of in the energy sector?

Christina Wildf...: Sure. So going through my undergrad and Masters, I did that. There was a five-year program at that university that I did. I did a research Masters, which was unconventional for that university. Usually you just did a class only Masters and you could do internships and things like that.

Michael Holtz: Sure.

Christina Wildf...: I chose a research path for my Masters and really loved that. And I had done an internship with an Air Force base that was local and interned over a year there in the mechanical engineering department. My degree is in mechanical engineering. Sorry. I launched into my life story instead of my background.

Michael Holtz: That's okay.

Christina Wildf...: So my degree is in mechanical. I loved my materials science classes, and so I was a mechanical engineer with a materials science background. I knew if I stopped with my Master's degree, I wouldn't be doing the work that I really loved. I didn't enjoy the work at that particular Air Force base that I was doing as a mechanical engineer. I really loved exploring and inventing, and I kind of found that out through research. So I applied for grad school. I came to West Virginia University for my PhD, which is right down the road from the National Energy Technology Laboratory.

Michael Holtz: How convenient.

Christina Wildf...: Very convenient, right? And I got introduced through the ORISE Program during my last year of my PhD. I worked for the reaction engineering team under the ORISE Program developing kind of a scale up process for a catalyst that they had patented. So they needed to go from a lab scale to more of a pilot scale to commercialize it. So I helped them build a continuous system to make the catalyst. And my PhD was making high-temperature [inaudible 00:08:17] materials. So it was kind of in line with what my PhD was in. The materials were similar. And I really loved the research. I loved everything I did with my PhD, even though you're sleeping in your office and working through the night to finish, get this dissertation done.

Michael Holtz: Lots of all nighters.

Christina Wildf...: Yes, yes, but I loved it. I loved the atmosphere. I loved being around other researchers and I quickly fell in love with that type of work. But I didn't actually start my research journey until five years after graduating. So I actually worked in the industry, well I worked for a defense contractor in Michigan for a little while, for a year and a half, and then I actually taught in Washington State for two years. So I've been all over the place with my career. And a lot of that was my husband's also an engineer and we were kind of chasing some of his career goals. He had some really good opportunities in Washington and so we moved there and I taught while he was working as an engineer. And we eventually wanted to move back to the East coast. So I had my first kid, wanted to move back, get closer to family, and I reached back out to the reaction engineering team at NETL.

Michael Holtz: Really? Cool.

Christina Wildf...: And they were like, "Yeah, let's pick back up. There's an ORISE appointment. We'll do that again. We'll do a postdoc." And so I started my career again at NETL under ORISE.

Michael Holtz: Awesome. So you basically did two ORISE appointments?

Christina Wildf...: I did.

Michael Holtz: Different times, five years apart, and now you are an NETL researcher, right?

Christina Wildf...: I am, yep.

Michael Holtz: So talk about the work that you're doing today. Is it a continuation of the work that you did under your ORISE appointment?

Christina Wildf...: No.

Michael Holtz: No? Okay.

Christina Wildf...: So when I was working with them under my PhD... They're a catalysis group, so they had a patented catalyst that they were working on for reforming. And if you don't know about NETL, its traditionally a fossil energy laboratory. It's government owned, government operated, so it's a little different than the other labs. So some of the research staff is actually federal staff, and then some of the staff is contractor staff. And the reaction engineering team, they develop catalysts, they develop processes around producing chemicals, producing fuels. They do some gasification work. So when I had contacted my previous supervisor about maybe working again, he was like, "Yes, and now we're doing microwaves." I was like, "What?"

My supervisor's name is Sean. I said, "I don't know what you mean, but send me some articles and we'll get going." So between then and now, I've been back for six years, now I'm actually leading the effort for use of non-conventional reactors. And so my job has morphed over the past six years. So I went from ORISE to becoming a site support contract staff, and now I'm on the federal side. And so I've gone from being a researcher, being in the lab every day, developing these techniques, and now I'm kind of a hybrid. So I am a PI, a principal investigator on projects. I'm doing a lot more of the upper management type things. I report to the funding agencies and things like that. But the other part of my job is actually outreach to industrial and commercial partners. So there's quite a bit of outreach for that. So we talked to industry, we kind of see where the needs are, where the gaps today in technologies, and then we see how the lab can interface and work together and try to come up with solutions.

Michael Holtz: That's amazing. It sounds like great work and much needed. I mean, you're working on alternative reactors and alternative sources, and I know that is an important issue, not just for the Department of Energy and the various labs, but for industry as well. So you're sort of bridging that world with the work that you're doing.

Christina Wildf...: Yep. Yeah. I do love what I am doing now. I feel good about the work we're doing and it's all about how do we decarbonize industry, how to reduce the carbon emissions, so can we capture and reuse CO2? Can we integrate more renewable energy? So really looking at how industrial processes look today because everything is based on either economy of scale to make it more profitable. A lot of it is based on the use of fossil fuels for heat generation, which creates CO2 emissions. So what future technologies can we use to reduce those? And the reaction engineering team has really been looking a long time at smaller modular reactors.

So instead of going really, really big like some of these chemical processes are, why don't we make them smaller and more distributed? So now you kind of take away a lot of the transportation aspects of moving chemicals around. You can use more renewable energy sources when you go smaller, but then you also have to electrify more things and that's where the microwaves come in. So it's an electrical source of providing a heat to a process instead of using steam or burning fossil fuels to create that process heat.

Michael Holtz: Gotcha. And with a smaller reactor too, I imagine it takes up less space, so you don't have to have the land mass required to have a large scale facility and all of that as well.

Christina Wildf...: Yes. Capital costs go down. Yeah, there's a lot of positives, but the processes that we use today are so optimized. They are perfected at that scale and they just run all the time. And so it is going to be a big shift in the thinking and strategic planning to try to shift to a more modular business model.

Michael Holtz: Gotcha. But it sounds like, I mean, the interest is clearly there. It seems like that is definitely the wave of the future. It's just getting all of the pieces together to make that work.

Christina Wildf...: Yes.

Michael Holtz: Gotcha.

Christina Wildf...: Yes, it's very encouraging. Through the talks with industry, they're all putting these really aggressive goals of CO2 reduction in their emissions and making it part of their strategic plan. So we see a lot of outreach from companies wanting to work together to, "What can we do?" "How can we optimize our processes?" "What technology is available today?" So it is not just my team. NETL has a lot of fantastic capabilities when it comes to looking at a process, optimizing processes, doing the economic evaluation of a process, so helping companies plan and how do you implement these new technologies that are coming out of the national labs and from startups and things like that.

Michael Holtz: So cool. So very cool to be part of all of that. I want to go back and talk a little bit about your ORISE appointments. I know that when you're a research program participant, you have a mentor, and I expect that now as a principal investigator, you are mentoring others. So talk about I guess not only having mentors, and I assume because you wanted to go back you had good mentors, right?

Christina Wildf...: Yes. Yes.

Michael Holtz: But what's it like to go from being mentored to being a mentor?

Christina Wildf...: So both times, through both ORISE appointments, I had fantastic mentors. Mark Smith was my PhD mentor, and now he's a coworker. He's still with the group. And so now we get to work side by side and brainstorm as colleagues. And the second time around, my mentor was my supervisor, and I think he's the best supervisor in the world, but I'm biased. But that was part of also wanting to come back for a second ORISE appointment was the work atmosphere at the lab. You can't ask for better. And I did go out and try different things, different types of jobs, and you realize that supervisor relationship and the relationship you have with your colleagues is so critical when selecting a career path. So working for a defense contractor, I had an extremely good salary for someone that had just graduated, but we weren't very happy with the atmosphere and with our supervisors and things like that.

So the money does not make up for everything. And here, and with the mentors and the staff here, it's more like a family. We talk, we socialize. And so that was very important to me and to also relay that type of a relationship with being a mentor myself. And so I've had a number of interns that have come through, and then I most recently had my own PhD ORISE and so he'll be graduating this year.

Michael Holtz: Excellent.

Christina Wildf...: And he's already taken a job in Norway working in AI and we still talk. So I like to still maintain, even if they don't stay with the lab, I have maintained a relationship with a lot of the interns that I've had, with some of my first summer interns. I was a reference for her job applications and still chat. It's important to me to not just help them with the current task at hand, but let them know that I want to be helpful in their career as a whole.

Michael Holtz: Yeah, absolutely. And I assume, again, since you were an ORISE participant twice, you would recommend ORISE fellowship programs, ORISE research participant programs to others?

Christina Wildf...: Yes.

Michael Holtz: Right?

Christina Wildf...: Yeah, it's fantastic. I mean, it's such a smooth process to go through and it gives you a lot of opportunities. Working with the labs I think is, with any of the national labs, is an opportunity unlike any other because you really are looking at science and technologies that it may not be out the door and commercialized next year, but you're looking ahead 10, 20 years with some of these technologies and just some really cool stuff and just very, very smart people. So yeah, I highly suggest doing any sort of ORISE or internship, especially even as an undergrad if you can do an internship. I think it's critical to really understand what a job could entail with your education and how many doors engineering and science in general opens up. I have a mechanical engineering degree, but I don't do mechanical engineering now.

I have morphed. I did mechanical engineering when I first graduated, and then it was more when I got back to the lab, it was materials science and more chemical engineering. I had to relearn a lot of skills when I came back. And so I think what's important is its more of the mindset, not necessarily your degree, in science and understanding how to critically think and tackle problems and do the research and connecting dots I think is more important than, I'm a chemical engineer and that's what I do, or I'm a mechanical engineer and that's what I do. I think it's more about your mindset.

Michael Holtz: Right, right. Christina, have there been challenges and/or positives because you are a woman in science?

Christina Wildf...: Yeah. I would say working in certain atmospheres, and not at the lab, I've had no negative experiences I would say working within the national lab system. Everybody is super supportive. I have a number of women working with me on my team.

Michael Holtz: Awesome.

Christina Wildf...: And I really appreciate the diversity here. Working outside of research, there's definitely been, I wouldn't say challenges, but you do get looked over sometimes and I think that's changing. That was 10, 12 years ago when I was in those type of atmospheres.

Michael Holtz: Sure.

Christina Wildf...: You don't always getting taken as seriously as maybe your male counterparts and you have to be more vocal, but I can't say that I've had any of that working as a researcher.

Michael Holtz: Awesome. And then I guess last question because I've heard this from several other participants, particularly at NETL, but the interdisciplinary nature of the work. So you're a mechanical engineer who's now working in materials science, but you work with other types of engineers, other types of scientists. So one of the benefits, not only of the work that you're doing now, but of the ORISE programs are you get to see science from other people's perspectives.

Christina Wildf...: Yes, yes. So I'm one of the few materials scientists/mechanical engineers on my team. The others are chemists and chemical engineers. And then we have a number of technicians also that work and run our reactors and some of the other equipment. And I couldn't do my job without having people in other fields. I can't know everything.

Michael Holtz: Of course.

Christina Wildf...: Especially when you're trying to lead a project, you have to rely on so many others to make it successful. And my first year or two here, I felt like I was constantly bothering some of my fellow chemies on my team because I'd be like, "Can you show me how this equation works again because it's been seven years since I've looked at these type of things, or I've never done this because I've never done gas chemistry."

Michael Holtz: Sure, the same with [inaudible 00:26:32] engineer, right?

Christina Wildf...: Yeah. Yeah. I can make the materials, I can do the synthesis, but when it comes to putting it in the reactor, I didn't know what I was doing. So I really appreciate having people from different backgrounds and not just the educational side, but we all came from different institutions, some from different countries. So the perspectives even between the chemical engineers can be very different just from educational background and country of origin. And so the discussions are really good. I personally have weekly meetings with my teams for projects and sometimes we just sit and brainstorm.

And then our larger group, we try to have either biweekly or once a month meetings where we just go around the room and say, "What's going on with your project and what kind of problems are you having?" And I might not be involved in that project, but I may have seen something similar. And so we're all there to help each other out. And that's really the mentality of a lab as a whole, not just within our group. But if I'm having issues with a reactor planning, we have another group within the research institute that that's their specialty. So I can just walk into their office and say, "Hey, you're the expert in this, here's my problem," and we can just talk it out. And that's the luxury of having these labs. And I've even reached out from NETL to INTEREL or INL or Oak Ridge. So the National Lab networks themselves we're eager to talk to each other and help each other out too, so that's really nice to have.

Michael Holtz: Cool. So it sounds like you're in an ecosystem, within an ecosystem, within an ecosystem like science, diversity of thought and perspective, and all of that. So, that sounds like a great place to work.

Christina Wildf...: It is. It is. Its never boring.

Michael Holtz: I bet. I bet. Christina, is there anything that you want to make sure that we've covered that I've not asked you about?

Christina Wildf...: I don't think so. I think I've told you my life story.

Michael Holtz: That's right. That's right. Awesome. Well, thank you so much for your time, Christina. I really appreciate it. Thank you for being part of the ORISE Featurecast. I appreciate it.

Christina Wildf...: Yeah, thanks for the opportunity.

Michael Holtz: Thank you so much. Have a great day.

Christina Wildf...: You too. Bye.

Michael Holtz: Bye.

Speaker 3: Thank you for listening to the ORISE Featurecast. To learn more about the Oak Ridge Institute for Science and Education, visit orise.orau.gov or find us on Facebook, Twitter, and Instagram @ORISECONNECT. The Oak Ridge Institute for Science and Education is managed by ORAU for the US Department of Energy.