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Michael Holtz:

[Inaudible 00:00:26] was born right there.

Rebecca Maseline:

It really was.

Announcer:

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.

Michael Holtz:

Welcome to the ORISE Featurecast. As ever, it's me, your host, Michael Holtz, in the communications and marketing department at the Oak Ridge Institute for Science and Education. As always, I love talking to ORISE research participants. Today is another one of those fabulous episodes. My guest today is Rebecca Maseline, who actually was a recipient of a 2024 ORISE postdoc poster session showcase award during National Postdoc Week last year. We're going to talk about her poster, we're going to talk about where she's doing her research opportunity, and a whole bunch of other stuff along the way. Rebecca, welcome to the ORISE Featurecast.

Rebecca Maseline:

Thank you for having me.

Michael Holtz:

I'm so glad you're here, and I can't wait to learn a little bit more about you. Rebecca, tell me, where are you doing your ORISE opportunity?

Rebecca Maseline:

I am at the Plasma Science and Fusion Center at the Massachusetts Institute of Technology, here in beautiful Cambridge, Massachusetts. I did my PhD at University of California San Diego. I graduated in 2023.

Michael Holtz:

Excellent. What is your research focus?

Rebecca Maseline:

My research focus is on nuclear fusion. I run simulations of nuclear fusion devices, and in particular, my focus is on the exhaust systems in nuclear fusion devices.

Michael Holtz:

Gotcha. For folks who are non-scientists like myself, why is your research important?

Rebecca Maseline:

My research is important because it is integral to making nuclear fusion happen, and nuclear fusion has a possibility to be an essentially limitless source of energy, assuming we can get it to work. The way fusion works, we have very hot fusion fuel inside a confined device ... very, very hot, like the temperature of the freakin' sun hot ... and then that needs to be confined with these very large special magnets, that keep our fusion fuel suspended in our nice little metal device that we have. Unfortunately, that's not perfect. Nothing is, but there will be some exhaust that comes off of that fuel that will then slam into the side of our nice metal machine.

If you can imagine, something with the temperature of the freakin' sun smacking into the side of a metal machine, it's not so good. My research is to focus on how to mitigate the damage that the exhaust might cause to our core plasma ... that's what we call our fuel ... and how to protect that core plasma, which is very fragile, and if anything gets in it, it can stop the reaction if it's high enough in concentration. We want to keep that part hot, keep my part cold, and then everybody's happy.

Michael Holtz:

Gotcha. Well, and it's such an important issue, because there's so much focus these days on expanding nuclear energy and how do we use more of it. It's cleaner and all of the things. The focus on expanding the footprint for nuclear energy is really big. I imagine that safe nuclear fusion is an important issue these days.

Rebecca Maseline:

Yeah. Well, that's the great part about nuclear fusion, is that it is safe. If something goes wrong, it all just collapses in on itself. It doesn't go out, it goes in.

Michael Holtz:

It goes in, okay. Important to know.

Rebecca Maseline:

Oh, yeah.

Michael Holtz:

For people who are learning about this, just like me. You were a ORISE postdoc poster session winner during Postdoc Week last year. Was this also the topic of your poster?

Rebecca Maseline:

Yes. The topic of the poster is on helium ash in these exhaust streams. When atoms combine to make fusion happen, we get energy, which we like, but we also get one ash of helium as a byproduct. What we're trying to do with my project is characterize and understand the behavior of helium in the exhaust stream of these devices, and investigate whether we can use that to characterize efficiency of a fusion power plant as a whole.

Michael Holtz:

Gotcha. Okay. Again, really important issue, very relevant to our world today. I really appreciate you explaining what your research focuses on and why this is so important. Rebecca, have you always been interested in science?

Rebecca Maseline:

I think yes. I've always been interested in figuring things out and understanding things, and building things and making things in general. I think that, wanting to understand things as well, I like to just put stuff together and try to just try something weird just for fun. It was conducive to me becoming a researcher, because putting things together for fun is kind of the point. With research, it gives us a purpose.

Michael Holtz:

Right. I have to imagine you didn't wake up one day and go, "Oh, nuclear fusion."

Rebecca Maseline:

I really didn't. Spot on with that one. I had been interested in pursuing some type of career. I wanted to do something in public service and applied sciences, such that it would benefit humanity. I wanted to do something that would mean something, it felt like to me it meant something. That was either water or energy for me. I went into undergrad, doing a chemical engineering degree, thinking I could do something in either municipal water treatment or some energy topic.

Michael Holtz:

Of some kind, right.

Rebecca Maseline:

I was like, "I'll figure it out." My university offered an area of specialization in thermal engineering, so I was like, "I'll do that. I'll take all those classes and everything." I showed up to one of the classes. It was on just general renewable energy, and I really liked the professor. He was really, really funny. I was the only one who would laugh at his jokes because it was kinda scary, but I was still just sitting there in the front just like, comedy show, and he would just point at me and be like, "She gets it." It was weird, in a really good way. Then he was complaining one day that ...

Michael Holtz:

[Inaudible 00:08:27] was born right there.

Rebecca Maseline:

It really was, because then he was complaining, "Nobody comes to my office hours." Then I was like, okay, I'll go, and I gave him the same vague thing I just told you where I was like, "I don't know what I want to do with my life." He was like, "How about nuclear fusion?" He was right. I really liked it.

Michael Holtz:

There you go.

Rebecca Maseline:

Yeah. I have an engineering background doing a physics job, but we're figuring it out. That's what it's all about.

Michael Holtz:

I love it. The stand-up comedian nudges you to.

Rebecca Maseline:

Oh, for sure. It's crazy, but the smartest person I've ever met, also the funniest. It really [inaudible 00:09:10] all at once for him.

Michael Holtz:

Smart and funny, right?

Rebecca Maseline:

Livin' the dream, truly.

Michael Holtz:

Right. The perfect person. I dig it. Obviously he was one of your early mentors, because you chose the field of nuclear fusion at his urging. Talk to me about some of the other folks that have played a role in getting you to where you are today.

Rebecca Maseline:

Well, my mentor for my current project is Professor Dennis Whyte, who was the former director of the Plasma Science and Fusion Center here at MIT. He has been in the field for a very long time. Was actually a colleague of my advisor many, many years ago, so they're long acquaintances from back in the day. He is primarily focused on experiments, and has a lot of experience on different machines and working in different groups on different topics. He has a lot of valuable insight that I have never considered in my projects before, which has been really cool.

Then my other mentor, Dr. Mike Wigram, is the leader of we call it our boundary modeling group here at MIT. The boundary is the edge plasma that exhausts from the fusion device, and he focuses on more of the same stuff that I do with the exhaust physics and computation stuff. It's been a really nice balance, of having an experimentalist and then somebody who's got a lot of experience in more what I do. I feel like it's been really rewarding, being able to have both of those resources to do something really cool with this project.

Michael Holtz:

Absolutely. To flip the script a little bit, have you had the opportunity to mentor others along the way?

Rebecca Maseline:

I like to think that I have. It's been really nice coming here to the Plasma Science and Fusion Center because there's so many graduate students, other postdocs, so many people at different levels of their career, running around doing the same stuff that I am also, which is really, really helpful. When I was in graduate school, it was really just me and my advisor, so I didn't interact a lot with students or anything like that. It's been so great.

The students run the same code that I run, which is very complicated. It's a 30-year-old Fortran code. In science, that's what we deal with every day. The fact that they just come into my office and just sit down and just start unloading questions on me, and I'm just like, "Yes, I can help," I feel so good about this, because I never had that in graduate school. I was always like, "Oh, if I don't know something, we're going to spend the next two days going through source code and just hitting our head against a wall, bashing our head against a wall."

Michael Holtz:

"I have to spear it out by myself."

Rebecca Maseline:

Exactly. The fact that I can help them with the nitty-gritty things like that, and then they can focus on the science, I see them succeeding and I'm just like, "Yes."

Michael Holtz:

Sounds like good mentorship to me, Rebecca. I love it. It sounds too like a lot of collaboration. I mean, you said there's a bunch of people running around the lab and doing the kind of work that you are and involved in different aspects. Science isn't a solo sport, by any stretch, right?

Rebecca Maseline:

Yeah. It's really nice getting to have that. I gain so much from talking to people, and hopefully they sit through my nonsensical PowerPoints about my weird eccentricities of the code that I have discovered and enable me to do that. We're all having a good time.

Michael Holtz:

I love it. Have you faced any significant barriers in getting to where you are today?

Rebecca Maseline:

Honestly, I'd say the biggest one was I went to community college straight out of high school, and through no fault of the community college, there's not any research opportunities at community college. It's very technical-focused and education-focused. I to this day contend that the best education I got was from my community college professors. Through undergrad and grad school, it was absolutely top notch, and I was very lucky. Shout-out to Saddleback Community College ... Go Gauchos ... in Mission Viejo, California.

Michael Holtz:

Go Gauchos indeed. I love it.

Rebecca Maseline:

Oh, yeah. When I transferred, I knew that I would want to have at least the option of pursuing a master's or PhD open to me, and I knew that that meant that I had to do research. Many of the labs that I approached were directly just very cold and dismissive, like, "Oh, you're from community college, you must be lesser," or something like that, which was so not true. Because it's like, why would that make me any different than somebody who was a freshman here, kind of thing? It never really made any sense to me, and I was very lucky that my advisor just didn't care at all about that.

Yeah, so in particular, when I do outreach and things like that, I do try to highlight community college is an option, and I'm realistic with people that, yes, you might face these people who put you down for that, but I do try to reach out to the community college students directly and help them, be like, "Okay, here's what you will do. Here's how we can move forward on that."

Michael Holtz:

Keep looking for your person, right?

Rebecca Maseline:

Exactly. Exactly. It's been really good for the past couple of years, at least in my field. There's been a lot more initiatives at higher levels to engage with community college students directly. Research programs that would ordinarily only reach out to universities, I've noticed there's actually funding and opportunities for community college students, which is really cool. That's not something that I had, but it's really helpful. It's really impactful.

Michael Holtz:

Excellent. Again on the flip side, how about successes?

Rebecca Maseline:

Well, I feel like with the project itself, our approach to this project that I'm working on was to model simulations of an experiment that was performed on September 20th, 1995, which is very atypical, to go that far back. Usually it's like you're looking at data that's maybe a couple years old, so you have pretty advanced signals. You have institutional knowledge that still remains. You have things that have been filtered, processed and analyzed. It does not exist for what we have for 1995. That's 30-year-old data. Most of it has been lost, but we have post-processed figures and things like that that we have brought in to try to recreate we call them profiles of density.

As you go across your device, you can get a signal of density or temperature or something like that. We've replicated those synthetically, within just making our own data files that can then be read into the code that we use to try to get those to match. We're actually able to get almost perfect matching with a lot of these parameters, which is really hard to do anyway, but we did it with the most reverse-engineered, weird methodology, so that was cool. We're writing up a paper about that now. Even the methodology is just like ... I don't even care about the results. I'm like, "The fact that we did it was so cool."

Michael Holtz:

"How we got there was amazing."

Rebecca Maseline:

Exactly. This is truly about the journey, not the destination, but we'll let the reviewers decide that, I guess. Then, not to sound like a broken record, but the fact that I get to see my team succeed as a result of my help, I can't even explain how awesome that is. It's been one of the most rewarding and fun things that I've experienced in my career.

Michael Holtz:

That's awesome. I love it. Rebecca, is there anything I haven't asked you about that you want to make sure we cover before we wrap things up?

Rebecca Maseline:

Not that I can think of.

Michael Holtz:

All right.

Rebecca Maseline:

Yeah.

Michael Holtz:

Well, last question for you then, and I'm sensing you touched on this a little bit, but your answer might surprise me. Rebecca, what brings you joy?

Rebecca Maseline:

Solving problems. Fixing things. I don't know. I don't want to sound like ...

Michael Holtz:

Cool, no.

Rebecca Maseline:

Can I redo that? Yeah, I'd say solving problems and fixing things, helping people. I don't want to sound lame, but my job is really rewarding for me. I don't feel like I'm working, so it's a different outlet than anything I have. It's a good balance, I think.

Michael Holtz:

I love it. I love it. The best day at work is when you feel like you're not working, right?

Rebecca Maseline:

Exactly.

Michael Holtz:

Totally love that. Rebecca, thank you so much for spending this time with me. I really appreciate it. It's been a pleasure to get to know you and to understand more about your work, and it's really important. I hope that at some point we can come back and talk more about what you're discovering, what your research focuses on, and know a little bit more about the world of nuclear fusion.

Rebecca Maseline:

That'd be great. Thank you so much for having me. It's been great.

Michael Holtz:

Absolutely. Thanks so much.

Announcer:

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