Episode 48: Dr. Laurie Juranek

**KL**: Katie Linder

**LJ:** Laurie Juranek

**KL:** You’re listening to *Research in Action*: episode forty-eight.

[intro music]

# Segment 1:

**KL:** Welcome to *Research in Action*, a weekly podcast where you can hear about topics and issues related to research in higher education from experts across a range of disciplines. I’m your host, Dr. Katie Linder, director of research at Oregon State University Ecampus.

On this episode, I am joined by Dr. Laurie Juranek, an Assistant Professor in the College of Earth, Ocean, and Atmospheric Sciences at Oregon State University. Dr. Juranek studies what the chemistry of seawater tells us about life and death in the ocean. Her research takes her from the warm, aquamarine waters off of Hawaii to the ice-covered Arctic Ocean. When not doing science, she enjoys vegetable gardening, cooking, and weightlifting.

Welcome to the podcast, Laurie!

**LJ:** Thank you. Thanks for having me.

**KL:** So, Laurie, we are actually meeting for the first time now in the studio. I invited you onto the podcast because I heard about your work at one of our local meetings of a group called ORIN, which is Oregon Research Impacts Network, and you had come to present to this group about some of your research. And as a qualitative researcher who mostly reads books and, you know, that kind of thing for my own research efforts, I was fascinated to learn about the kinds of work that you do. So, why don’t we start out by you just telling us a little bit more about your central research questions and some of the things that you study.

**LJ:** So, as you allude to, I study life and death in the ocean, and that’s important in a kind of greater sense because I want to know about carbon cycling on the plant, and so knowing about the balance of life and death in the ocean tells me about how biology is taking up carbon and kind of sequestering it, holding it for timescales ranging from days to, potentially, millennia. So, I use dissolved gases to get at that balance of life and death. That’s where the chemistry comes in. So, I can look at dissolved oxygen, something that we need to live, to breathe, and I can measure the balance of oxygen in seawater, and that tells me about, essentially, the balance of life and death. So, I do that in places all over the Pacific, really. I haven’t branched out into other oceans except for the Arctic. But it’s important because we want to know, we want to quantify how active biology is. Tiny, tiny, microscopic plants and the things that eat them in the ocean, how active that is in terms of storing carbon in the ocean, and how that might ultimately contribute to mitigating our impact of greenhouse gas emissions.

**KL:** Okay, so, these are, like, ginormous questions [both laugh] that you’re asking, which I think is, again, super fascinating. And this is not my area at all, and I’m assuming that some of our listeners are also not scientists, so I’m going to try to break this down a little bit, too. So, when you’re going out on the ocean and you’re doing this research, what kinds of things are you collecting? Like, what kinds of data, what kinds of artifacts, if any? Like, what does this look like?

**LJ:** So, when I go out to sea, I collect gas samples, and so I take seawater---we’ll put a big, essentially, bottle down, and we can trigger it at different depths of the ocean. But I mostly concentrate on the surface, because that’s where most life is, or the highest concentration of life. And so I collect seawater, and then I can extract the gases from that seawater and then look at the chemistry of it. I look at things like isotopes and ratios of oxygen to other gases, and that tells me, essentially, what’s happened before I got to that particular place in time: so, how much, whether there’s more life than death. And if there’s more life, that means things are growing, and that’s taking up carbon from the atmosphere and storing it in biomass, storing it in plant material that will eventually die and sink to the ocean floor, or some small fraction of it. And so if there’s excess of oxygen, that tells me that we have potential to store carbon in the ocean.

**KL:** So you had mentioned the larger impacts of this work on things like climate change or other kinds of major contemporary issues. To what degree---and again, this is my complete ignorance of these topics---to what degree does this research impact larger ocean animals, or any information that we might have about that? Because you’ve mentioned microorganisms and other smaller organisms. Is there any connection to ocean animals, also?

**LJ:** Yeah, so, what I study is essentially what’s called *primary production*. It’s the same thing as studying tree growth on land or, you know, any kind of plant growth on land, but most of that occurs by tiny, tiny, microscopic plants in the ocean, and those tiny, microscopic plants get eaten by small little plankton, and they eventually get eaten by bigger plankton, and there’s a food chain, and so that initial input, that primary production, is what’s responsible for feeding everything that you see in the ocean. And so, things like whales, things like fisheries. So, they set fisheries’ quotas based on how productive ecosystems are, so how much primary production there is sets how much you’ll be able to harvest, because that’s the total energy input into the system to sustain those fisheries. And so it definitely has consequences for fish and whales and things that we’re more familiar with. I don’t specifically look at those interactions, but it is relevant.

**KL:** Mm-hmm. And certainly connected, it sounds like.

**LJ:** Yes.

**KL:** So, one of the things that’s always kind of interesting to me about a lot of the work that scientists do is that it’s often so niche and granular, but it does interact so much with these huge questions and have these huge impacts, so I’m really curious if you can tell us a little more about how you got into this particular niche, like, what led you to this kind of work.

**LJ:** [laughs] Wow. Uh, a long and winding path. [both laugh] You know, I think it was through the methods that I used. So, as an undergrad---so, I went to school at UC Davis, and I feel into working in this geology lab there, where they were using isotopes as tracers of environmental conditions. And it was a really great experience, and it kind of set me on the path that I wanted to go to grad school. And so, having that toolkit, you know, I really wanted to hang onto it, because I saw how valuable these isotope tracers were, and so as I was shopping around for grad schools, I was looking for projects, and I ended up at the University of Washington and fell into this project, working with advisor Paul Quay, who was great. So, he is what you would call an isotope geochemist. That’s a lot of jargon, but--- [both laugh] but basically he uses isotopes to tell you about processes in the ocean. I just think it’s really cool that you can measure seawater and it tells you about things that happened weeks ago. You know, a lot of oceanography, or biological oceanography, you have to be there as it happens, so you take seawater and you might put it in a bottle, and you incubate it, and you measure a change over time, but that’s really labor-intensive and difficult, and it’s hard to get a lot of coverage over the ocean, because you’re doing it little, small bottles at a time. But if you’re using isotopes, they’re what we call natural traces---so, they tell you about, in an integrated sense, what happened before you got there, and it gives you a little bit more information, and it’s a little bit easier. [laughs] So, it’s a really nice toolkit, and so I think I realized that, working as an undergrad, and then I just wanted to pursue it, and that’s what led me into doing my thesis research on this topic.

**KL:** How have you found that this research, for you, has evolved over time?

**LJ:** Umm, you know, it’s taken me to different places, I guess. So, I started out applying these techniques in the subtropical ocean, warm waters off of Hawaii, and actually riding container ships between [laughs] the US west coast and Australia, New Zealand, and so that’s another plug for doing this type of approach, is that you wouldn’t be able to collect information using typical incubation approaches from a container ship, but here I can ride a container ship, collect seawater samples along the way, and get a lot of coverage really quickly. So, I did a lot of that through my graduate degree, and now I’ve kind of branched out into doing high-latitude work in the Arctic, and so I ported those methods to the Arctic to look at some unique and interesting questions there.

**KL:** Well, that sounds fascinating.

We are going to take a brief break and then come back and hear a little bit more about Laurie’s research in the field, a little bit more about what it’s like to do research in the Arctic.

[music]

# Segment 2:

**KL:** So Laurie as a complete non-scientist, in the sense of not working in the field, I’m really curious about some of the logistics of your work and we have talked briefly in the previous episode about how you shifted from doing some work off of Hawaii and now you’re doing work in the Arctic. I’m wondering if we can just talk a little about what does this look like, to do this kind of work. So first of all, you know how frequently are you traveling to the ocean? And we’re actually not that far from the ocean but we are far away from the Arctic here in Corvallis. So tell us a little bit about your travel schedule and how do you kind of schedule those kinds of trips.

**LJ:** So usually I just do one cruise a year in the Artic, if that, so I didn’t go up there last year but I’ve been there most years since 2011. And typically it’s a month long cruise on an ice-capable ship, I go up at a time when the sea ice is at a minimum and, but you still need a ship that is capable of working under, you know, potential light ice conditions. And so I typically meet the ship at a place like Dutch Harbor, Alaska which is the, you know, the home port of the Pacific crab fleets, so if you’ve ever seen Deadliest Catch all those crab boats are…

**KL:** [Laughs] Okay

**LJ:** Kind of, you know in a line up there it’s just really exciting for me to get to go there or this year I’m meeting the ship in Nome, Alaska, so we have to travel quite a long ways but it’s better than [laughs] meeting it if off of Newport and you know, sailing all the way up because that would take up a lot of extra time.

**KL:** So when you meet the ship, what kinds of, you know, are you bringing tons of supplies with you, to do this work? Like what, and are you going with a team or are you going by yourself? Tell us more. [Laughs]

**LJ:** I-It so it varies. Yes I am taking a lot of equipment with me so I think last time it was 500 or 600 pounds of gear. [Laughs] So I take an instrument that helps me continuously monitor gases and seawater and that’s kind of the backbone of my research and then I take some bottles for collecting samples. I have gone solo and this year I’m going back with a team of probably about ten researchers from Oregon State. So, we have a new project that’s funded and we’re integrating my part, which is the gases, and we’re looking at life and death and then we have other experts that are studying particles in the ocean and the carbon chemistry of the ocean, so they’re looking at changes in carbon chemistry. So, we’ll have three different PIs and whole suite of technicians and undergrads and graduate students, so it should be really fun.

**KL:** [Laughs] It sounds like fun! So, when you’re on the ship and you’re collecting the samples, to what degree are you run analyses while you’re there and to what degree are you taking things back with you to do, maybe, in a lab setting here at Oregon State?

**LJ:** So, my instrument that I told you about before that can continuously monitor gases; that’s collecting data the whole time that we are underway - what we call underway, that means the ship is steaming – but, we have to take samples to calibrate that information and all those samples that we take for calibration have to be run back here at OSU. So, we still have a lot of work to do once we get back to shore, certainly, but it’ll take months before we can finalize our data.

**KL:** Let me start by asking: when you go on these trips by yourself and you’re on these ships collecting data, who else is on these ships with you? What kind of ships are you a passenger on?

**LJ:** So, that’s a really great question. In the first three years I went to the Arctic, it was a Coast Guard icebreaking ship. So, the coastguard operates two icebreakers that are for safety and defense; one goes to the Arctic and one goes to Antarctica, but they are also research platforms, so they do science while they’re up there. There are…gosh! I don’t even know how to estimate, but there are many, many Coast Guard people and they are training for whatever their role is in the Coast Guard. There are also many, many scientists because ship time in the Arctic is very, very valuable, so these cruises are really interdisciplinary. On past cruises, there have been people who are studying whales; studying acoustics and they monitor sound in the ocean and that tells them about the passage of whales in the region. There are people who have mooring – a mooring is just something that sits there for a long time and it has instruments on it - so there’s a lot of that going on in the Arctic because it’s hard to get there by ship and by sending something down there that can you can come and pick up later that records a whole lot of information is a pretty cost effect way of doing your research there. So, there are the sound recordings that I mentioned and there are people looking at physics, looking at circulation by different instruments or they’re looking at other properties of seawater, so nutrients or chlorophyll in the water, so there’s a lot of really interesting stuff. It’s actually a lot of fun going to sea in the Arctic because it is really, really, interdisciplinary and you end up talking to people that you wouldn’t necessarily get a chance to interact with just for your own research,

**KL:** Yeah, it sounds like a month long interdisciplinary conference.

**LJ:** [Laughs] Yeah, it is!

**KL:** You can talk with people, see what they’re doing, network and see what kind of different research questions that are happening. It sounds really exciting.

**LJ:** It’s a lot of fun and it helps you to broaden your perspective on oceanography too.

**KL:** What are some of the challenges you’ve found with doing this kind of research in the field?

**LJ:** Well, [laughs] it’s difficult! One: if something breaks or if something goes wrong, then it’s another year until you go back and, maybe, the conditions may be different next year, so having that lack of data can really hurt you. In the years that I’ve sailed there, there have been tremendously different ice conditions between 2011, 2012 and 2013. 2012 was the lowest sea ice minimum on record, so the lowest amount of sea ice that they’ve ever seen since they’ve been recording. 2011 and 2013 were completely different years, so if I had little chunks of data missing from 2012, I can’t go back and replace them and it’s a little bit frustrating, but that’s the way it goes; things break. Also, the other hard part is that you have to be so organized. You have to bring everything that you need with you because you can’t get it at the store on the ship, so you really have to think ahead about all the things that can go wrong and all the things that can break so you can problem-solve at sea. Sometimes [laughs], you fix something with duct tape and it looks really shoddy, but it works. You just keep doing what you do to keep things working and moving along, so it really tests your innovation skills and problem-solving skills, which, in a way, can be fun but also really stressful at the time because you’re under pressure to collect good data.

**KL:** Yeah, it sounds like, on a slightly smaller scale, like you’re going into space where you have limited things at your disposal and you have to be innovative if something goes wrong, but you have a certain and limited constraint of the things that you have with you to work through those problems.

**LJ:** Yeah, that’s a great analogy [laughs].

**KL:** Hopefully on a smaller scale; going to space would be pretty scary. As you’re working on these projects, you go out and you travel and you’re gone for about a month, when you’re back, to what degree is your time spent working on funding these projects, doing grant-writing and what does that balance look like?

**LJ:** A lot of my time is spent trying to get grants funded. Competition these days is really, really, fierce. This particular project I have coming up is funded by the National Science Foundation (NSF) and I think that this is the second or third time that this particular proposal was submitted. It mutated each time, so it doesn’t look like the first submission, but it takes a lot of effort each time [laughs].

**KL:** Well, it’s pretty typical to put things through multiple rounds before something gets accepted, particular with something like NSF.

**LJ:** Exactly. I’m not unique to my college, but we spend a lot of time on getting funding for projects and the rest of the time, we’re trying to analyze data and write up our results and get those out and publicize them because we want people to know what we’re doing, so that they realize we’re doing good work and so we can get more funding, potentially.

**KL:** I’m wondering if you had any kind of logistical strategies for your time management as you’re building that research pipeline because there is that balancing of getting the funding, actually doing the research, analyzing that research, publishing the research, promoting the research. How are you keeping that moving?

**LJ:** Lots of lists [laughs]. Every day, I try to make a list of the tasks that I want to get accomplished for the day. I might only get to 50% of them, but at least writing them down releases that mental burden from my mind from trying to remember everything and it gives me a goal. I might find an old list and, six months later – I should back up and say that I get a little bit frustrated that I don’t make as much progress on those lists. I’ll find that list six months later and realize that everything’s been done. Everything gets done as long as I keep chipping away at it, but it is a lot to manage. Now, I have a graduate student and that helps because I can delegate some tasks to her, so some of the lab duties that I had to do all by myself in addition to all those things you mentioned previously. I can delegate some of those to her, but it’s hard to know where to put your energy at different points in time. There’s always a funding deadline coming up, so it’s really easy to get caught in the trap of always pursuing funding, but you also have to keep working up the data and publishing, otherwise people aren’t going to trust you with money again.

**KL:** There’s so many moving pieces, I think, when you’re funding your research; thank you for sharing that. We’re going to take another brief break and when we come back, we’re going to talk about the broader impacts of Laurie’s research. Back in a moment!

# Segment 3:

**KL:** Laurie, I know one of the things that is really important to you about your research is the idea of broader impacts. I mentioned earlier in the episode that where I first saw your talk was at this ORIN or Oregon Research Impact Network that’s really a group focused on educating people about broader impacts and what they mean, so let’s start there. What are broader impacts to you and what do they mean in your research?

**LJ:** Broader impacts is just a buzzword, essentially, that means making your science mean something beyond academics and getting people interested and invested in the scientific process. I work a number of avenues with regards to broader impacts. I’m really interested in keeping the STEM (science, technology, engineering and math) pipeline flowing and trying to get the next generation of scientists excited about doing science. Part of that involves outreach to junior high and high school classrooms, so I have some projects lined up to do that. Also, it’s important to communicate your findings to the public and communicate in a way that is valuable to them. It’s hard for us, but trying to not to speak in scientific jargon and making our message really distilled and clear so that people can understand why what we’re doing matters.

**KL:** What’s been really interesting to me lately is to see how broader impacts is being foundationally written into a lot of grants. There is now a requirement that you discuss what is going to be the broader impacts of your work, so I think that it’s, for a lack of a better term, forcing academics to think along these lines, but for the reasons you pointed out, it’s really important to think about how you want to communicate these things to the broader public outside of academia. I wonder if you can tell us more about the programs you’re developing for junior high and high school classes. I understand that this is connected to some of your work in the Arctic.

**LJ:** One of the things that we’re going with this cruise that’s coming up in the late summer is that we’re in the process of selecting two teachers to take to sea with us, so we’re hoping one of those will be from a junior high classroom. We solicited from Oregon, so we got applications from all over Oregon, which was really exciting. The applications were fabulous; I wanted to bring all of them with me!

**KL:** It sounds like a really cool opportunity that I’m sure people were incredibly excited to even try for.

**LJ:** Yeah. I’m hoping that I’ll have more opportunities in the future to dole out more opportunities to the teachers that we’re not able to take with us. So, we’re hoping to select one junior high and one high school teacher to bring to sea with us and share that experience of the scientific process with them and, leading up to the cruise, have them involved in our cruise prep. There’s a ton of work that goes on, even before you get to sea. Just prepping, making sure you have everything that you need to fix anything that might be broken, and preparing all your instruments and your sample materials. You know, sharing that experience and sharing what our science questions are and how we’re going about trying to answer them and then involving them in the dirty work, so having them work on deck, collecting samples – it’s fun, it’s exciting and it’s a really unique environment – so that they can bring that back to their classrooms. We’re going to make some videos that will, hopefully, dispel myths about what science is and will show students that science is fun, that it’s fascinating and it’s not just wearing a white lab coat. You’re using skills that you wouldn’t necessarily think you’d get to use: problem solving, creativity, logistics and planning. There are interpersonal skills too because you’re on a ship for a month with a whole bunch of people who are different to you, so you have to work with them in ways that foster productivity. We’re hoping that all of that will come across in these videos and that they can take that back to their classrooms and, perhaps, inspire future scientists by showing them that science really is fun.

**KL:** I loved this point you talked about which was the myths. I think that projects like this can really demystify what it means to do science. These are real people doing this data collection, analysis and it’s directly applicable to questions we’re trying to answer.

**LJ:** We’ll have people from all walks of life on this boat. I’m a young female scientist and we’ll have undergrads and graduate students, so we’ll have people from different career stages and then we’ll have more senior researchers, so you’ll get a broad perspective of the types of people that are involved in science. It’s not a certain type of person that does science; there’s a spectrum, which is really cool, I think.

**KL:** And it’s so important for junior high and high schoolers, in particular, to hear. You also mentioned that a big part of broader impact is about communicating with people outside of academia and, earlier, you mentioned about trying not to fill things with jargon and using language that people can understand; I can understand how that would be incredibly difficult. Did you, particularly in some areas of science and in – I think you’ve distilled very well the kinds of things you’re doing, but it’s clearly complicated and there is jargon and things involved – what have you learned, over time, about how to communicate to a broader community about the kind of work that you’re doing.

**LJ:** I just attended this science communication training by this organization called Compass and it was eye-opening and it was fascinating. They’re a great group and they really taught me how to figure out how to distill your message. What you said is true. We are concerned with the details and the complexity, but often that is not important to people outside of science. We have to find the bigger picture and not use our jargon like a crutch. We use that because it’s a very distinct way to talk to our peers, but when we use it outside of academia, it loses all meaning and our message gets lost. It’s very important for us to be cognizant of that and speak in very clear terms and have that very clear and distilled message to communicate to the public and to show them why it matters and being personable too. So that was a big aha moment for me was, you know people will – they want to know what science has to say but they want to hear it from real people, people that are [laugh] you know.

**KL:** Yeah, that they can connect with.

**LJ:** Exactly.

**KL:** Absolutely.

**LJ:** So you know, storytelling is a big part of it. And connecting with people on a more personal level, showing warmth and these are all things that you know, had no idea, they just weren’t on my radar before I went to this training. So it’s really kind of opened my eyes too, you know, it’s excited me about communicating and I-I was kind of reticent, you know, prior to attending this communications training. A little bit scared about I don’t know how to do it, but this really energized me and gave me the tools t-to go out and I think it’s important. You know, we’re - our research is being paid by for or paid by tax payer dollars and so you know, it’s our mission. We need to report on what we’re finding and we need to do it in a way that is clear and has meaning to them.

**KL:** Absolutely, well we will have to link this on the show notes so people can learn more about this organization and I think, you know one of the things you’ve raised is kind of the importance of being open to developing new skills as you grow as a researcher and kind of realizing what are the areas where you want to go out and learn more and in this case you know, science communication, so it’s wonderful that you proceed that.

**LJ:** Yeah, yeah it’s ah, it’s been really great and I still have a lot of work to do obviously but you know, being here is a good step for me, it’s probably something that I would of been scared to do before I might of, you know, ignore the email but now I’m kind of enthused about doing this kind of outreach stuff so.

**KL:** Wonderful, well I’m glad my timing was so good. I want to thank you so much Laurie for coming on the show and sharing more about your research, this was really wonderful; to hear about what you’re doing.

**LJ:** No problem, thank you so much for inviting me, this was fun.

**KL:** And thanks for our listeners for joining us in this week’s episode of Research in Action, I’m Katie Linder and we’ll be back next week with a new episode.

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