

**Season 3, Episode 7: The Hidden Power of Uncertainty**

**Host:** ESF President Joanie Mahoney

**Guest:** Dr. Ruth Yanai

**Ruth Yanai:** If you can't replicate it, then you have to be more creative about how you assemble the pieces to say what's the overall uncertainty of the budget. The biggest uncertainty is not the forest carbon per unit area calculation, it's how much forest is there? I'm hoping that they're learning about being interested in mistakes and how we learn from mistakes, and that if you don't acknowledge a mistake, you're not going to get where you want to be. Perceptions of race in our culture have changed a lot over my lifetime, and I think are changing increasingly rapidly.

**Joanie Mahoney:** Hello, this is Joanie Mahoney, president at SUNY ESF, back with another Campus Conversation, the podcast. And today very happy to be welcoming as our guest, Dr. Ruth Yanai, a professor in sustainable resources management, and member of the search committee that landed me here. I will be forever grateful because as I was just saying, I feel like the luckiest person, not the least of which reason is because I get to do these podcasts. The fact that there's this incredible work that is done at ESF, but then I can ask people to stop and tell us about it. So what a fascinating job I have ended up with. And this is the latest installment of faculty members doing really interesting work. So welcome.

**Ruth Yanai:** You were just talking about reflection, how often do faculty members even think about what the outside world would want to know about it? If our audience is our students and the scientists who read journal articles, we may not be very aware of what the outside world would want to know.

**Joanie Mahoney:** And I will say, especially these days, the outside world has caught up with the mission of ESF. We've been here doing this environmental science and forestry work since 1911, and understanding our impacts on nature and then that impact back on us. And it's just taken a long time to get the outside world to see what, unfortunately, we're seeing now with 1,000 year storms happening two years in a row. These hurricanes and wildfires and droughts. And the work that you're doing and that your colleagues do here at ESF applied is going to be the solution that saves all of us. So I think people are a lot more interested than you might guess.

**Ruth Yanai:** I want to speak to that change. So even among environmental scientists, when I started my PhD, which was in 1983, working at Hubbard Brook Experimental Forest, the goal was to describe the undisturbed forest and compare it to the one we were clear-cutting. And I believed it and that was normal. And we were looking for these pristine sites where we were studying nature, and nobody would say that now. And we would look back and say, "1983, that wasn't undisturbed nature." What were CO2 concentrations in 1983? We had acid rain,

we had ozone, we have people out there manipulating the forest and everything. So the goals of our study of nature have changed.

**Joanie Mahoney:** So let's start at the beginning with you. What was your path here to ESF? Where did you grow up?

**Ruth Yanai:** Oh, my mother was an environmentalist in South Jersey and my father was an analytical chemist. And if you cross an environmentalist with a chemist, you get-

**Joanie Mahoney:** We meet Ruth.

**Ruth Yanai:** ... a bio geochemist who studies forests.

**Joanie Mahoney:** That's cool. I mean your mother had to be way ahead of her time as an environmentalist, so you must have had a very interesting household to grow up in.

**Ruth Yanai:** Yes, she was hopping streams and we were floating down the Wading River, and we camped and stuff like that.

**Joanie Mahoney:** And then where did you head off to school originally?

**Ruth Yanai:** International perspectives are important to me. My father's Japanese. I had visited Japan. But 1976 when I graduated from high school, we weren't like we are now. And when I spent a year in France as an exchange student, we didn't have the internet. You didn't call home. That was hyper expensive. You do that once at Christmas. Partway through college when I wasn't sure what I was doing, I dropped out and hitchhiked around Europe, and could not get an illegal job in France. I got an illegal job in England, working for the Youth Hostile Association, which doesn't seem like it'd be hiring illegal aliens, in the Lake District. So that was an exposure to nature and ecology. So when I got back to college where I had declared a major in physics and philosophy because you only had to do half of each, and I was interested in everything, including writing, I took Herb Bormann and Tom Siccama's class at the Yale Forestry School on [inaudible 00:05:26] Ecology, and I took an intro geology course.

**Joanie Mahoney:** That was the spark?

**Ruth Yanai:** Well, and I was introduced to Hubbard Brook, which is this important research site that I then, eventually, after a couple years after college, went back to do my PhD at, under the direction of Herb Bormann at Yale.

**Joanie Mahoney:** And this is in New Hampshire?

- Ruth Yanai:** Yeah. The research sites are in New Hampshire, not very convenient to New Haven, Connecticut, not very convenient to Syracuse, New York. The reason it's there is because the land wasn't valuable for something else, so it had remained forested. And the Forest Service set it up initially to study hydrology. And Herb Bormann in the 1960s with the advent of the auto analyzer and the plastic bottle, if we collect rainwater and analyze it and stream water and analyze it, and they have hydrologic budgets, we can multiply and calculate nutrient input-output budgets. So they discovered acid rain.
- Joanie Mahoney:** And so that spark has stuck with you.
- Ruth Yanai:** That connection to that place has stuck with me, which I've gone back and forth in terms of having funding to work there. But now, it's the focus of my on-the-ground forest ecology research is New Hampshire. Hubbard Brook is one of three sites in which we have nitrogen and phosphorus fertilization experiments of 13 forested stands.
- Joanie Mahoney:** I read that you have one of the longest term data sets.
- Ruth Yanai:** There were many such experiments in the world. One of the most famous is in Hawaii. There's one in Panama. They're in the tropics. I know of one in Alaska. There were none in temperate forests. So this is the longest-running-
- Joanie Mahoney:** Temperate forest.
- Ruth Yanai:** ... N by P factorial fertilization experiment in a temperate forest anywhere in the world. If you qualify it enough, you can be the only one.
- Joanie Mahoney:** And we get to [inaudible 00:07:20]. So what exactly is nitrogen and phosphorus fertilization? So you're adding nutrients and then studying the effects?
- Ruth Yanai:** The reason we're adding nutrients is to study how forests respond really to nutrient limitation. Plants, forests, ecosystems require elements in different amounts. We require nutrients in different amounts, and we're trying to balance that all the time with how we choose what we eat. So what does a plant do if it needs more nitrogen? What does a plant do if it needs more phosphorus? And we can disturb that balance by adding one or the other. So we're interested in the mechanisms by which plants and ecosystems adjust to resource limitation or resource balance.
- Joanie Mahoney:** So it's a limitation rather than too much?
- Ruth Yanai:** Yeah, we're not adding enough to be too much. We knew that at the Hubbard Forest when they added 150 kilograms per hectare of nitrogen, they killed the

trees. So they're low levels, and we see lots of things that are happening in response to those, but they're low levels of perturbation.

**Joanie Mahoney:** How would you tell people that is going to relate to something in the real world for them? It's very important to understand what's happening, why?

**Ruth Yanai:** The introduction to the proposals tells you, but I can't remember how many billions of dollars the forest products industry is, and that we don't know what limits productivity of our forests. Temperate forests have been assumed to be nitrogen limited. Of course, they should be nitrogen limited. They're on young soils. There's plenty of phosphorus in them, not like the tropical ones that are highly weathered and occluded. And it takes a long time to build up nitrogen because it relies on biological nitrogen fixation.

So I think part of the reason one of these experiments had never been established is because we thought we knew the answer. Everybody studies nitrogen. I studied phosphorus for my dissertation. So when we started this experiment, we had forests of different ages make part of this experiment, as well as it being at three different sites. So things change depending on what type of forest you're looking at. That's important to understand. So the simulation model said that the older forests should respond more to phosphorus than nitrogen, and the younger ones should respond more to nitrogen, and that's what we got. So I feel like-

**Joanie Mahoney:** Vindicated, I was going to say.

**Ruth Yanai:** Phosphorus is important. This is really basic science.

**Joanie Mahoney:** It is important and basic science takes such patience. And for you to have this long-term, three different sites and different ages of forests and multi-billion dollar economy surrounding our forest products, but that's in everything everybody should care about. But I'm also interested, are you looking at all in the productivity of the forest, in the climate based on the levels of nitrogen and phosphorus?

**Ruth Yanai:** An important context, and I should have included this in my story, is nitrogen pollution. So one reason you might doubt whether nitrogen is limiting any more is that we've been dumping air pollution... Acid rain is nitric acid and sulfuric acid, and they got plenty of that. So we can ask, are they phosphorus limited now because we-

**Joanie Mahoney:** Overloaded nitrogen.

- Ruth Yanai:** ... we overloaded them with nitrogen, and how long will that last and what happens as we recover from that? And there's experiments addressing that. Predicting climate change requires a different set of controls that we're not manipulating. So we're mainly learning about nutrients from this study.
- Joanie Mahoney:** Do you have an interdisciplinary team or are you working with folks in sustainable resources management?
- Ruth Yanai:** We were already the longest-running fertilization experiment in a temperate forest after three years, now it's been 11. My co-PIs in this phase of the research are Tim Fahey at Cornell and Melanie Fisk at Ohio Miami University. And they've been involved at Hubbard Brook for decades. Prior to that, most of these plots were set up during a calcium study in which the collaborators were Steve Hammer, who was then at Brown, Joel Bloom, who's a geochemist at Michigan. So it's somewhat interdisciplinary and multi-institutional. But key collaborator from ESF was Tom Horton, who when we were doing work with Mike [inaudible 00:12:13], he was involved.
- Joanie Mahoney:** When did you come here to ESF?
- Ruth Yanai:** 1994.
- Joanie Mahoney:** So you've been here a minute, as my kids would say, right?
- Ruth Yanai:** Well, and I was already involved in this work when I came here. So prior to the calcium study, was a series of sites that I had been working in when I came here.
- Joanie Mahoney:** I have a lot of questions for you, but I was given a very high level briefing to try to understand what your work is, and it is the document that was probably the most difficult for me to follow of any of the faculty that I have had the benefit of talking to. Because it says your work focuses on quantifying uncertainty. What is quantifying uncertainty?
- Ruth Yanai:** Quantifying the confidence in what we know. How confident are we of this? So scientists are doing that all the time with every statistical test of confidence. How probable is it that this difference arose by chance? And we ascribe a P value to that. And then we say, "Well, if it's really small, then we're very confident." And if it's-
- Joanie Mahoney:** Really high, there's more uncertainty.
- Ruth Yanai:** ... "Yeah, then we're not so interested."

- Joanie Mahoney:** So what work then are you doing that helps quantify uncertainty? Is that different than what you're describing with the phosphorus and nitrogen fertilization in the forest?
- Ruth Yanai:** Well, it's important to everything we report that we be first aware, and then honest about-
- Joanie Mahoney:** What we don't know.
- Ruth Yanai:** ... how confident are we. Yeah.
- Joanie Mahoney:** Okay.
- Ruth Yanai:** That's true for everything. And I think I've been attentive to that my entire career. It's hard to say which came first because my first assignment, which was to do a phosphorus budget for Hubbard Brook, there was no confidence assigned to the fluxes in any ecosystem nutrient budget. For one thing, because an ecosystem is hard to replicate. One good way to establish confidence is to repeat an experiment many times. You flip a coin many times and you say, "Okay, I guess I can't really predict whether it's head or tails with very much confidence."
- Joanie Mahoney:** Right, but if you're using a natural setting, it'll slightly different.
- Ruth Yanai:** If you're cutting down an entire watershed to see how it affects stream chemistry, you can only afford to do that so many times. I heard a prominent scientist give a talk about the global carbon budget and say, "There's only one planet, so there's no uncertainty." That's not right. You better propagate the uncertainty in everything you're doing and give us the final answer to how uncertain that number is. If you can't replicate it, then you have to be more creative about how you assemble the pieces to say, what's of the overall uncertainty in the budget? For example, the first nitrogen budget at Hubbard Brook, which was a feat to... I don't want to undermine it. This was an amazing thing.
- We know not only how much is coming in the rain and leaving in the streams, because of Herb Bormann at Hubbard Brook, we're going to add up how much is accumulating in the vegetation. We balance the budget except that 14.2 kilograms of nitrogen per hectare per year is missing. And that always bugged me. 14.2 plus or minus what? The plus or minus is not too bad until you get to the soil. Just the forest floor alone is plus or minus 22. And if you include the mineral soil, it's plus or minus 57. So how excited are you that we have nitrogen fixation if it's 14 plus or minus 57?

- Joanie Mahoney:** Yeah, it becomes a little less reliable. Is that the right word?
- Ruth Yanai:** Yeah, or you have to think about it differently.
- Joanie Mahoney:** So how much nitrogen is coming in the rain because you've measured it and you know how much nitrogen is leaving out of the streams after it's landed on the forest, made its way through the root system and down to the water table, and made its way to the stream and you know how much is left, right? And your job then-
- Ruth Yanai:** And we know how much is going into the trees. And what we can say with confidence is there's more nitrogen coming from somewhere, but it could be coming from the soil because every soil pit you dig is different from the other ones, so you destroy the whole thing if you tried to get your soil change within 14 kilograms [inaudible 00:16:37]. So we know it's coming from somewhere. It's either the atmosphere or the soil. And then you have to be smart about how you would detect whether it's nitrogen fixation or mining of organic nitrogen from the soil.
- Joanie Mahoney:** I can imagine that this is just endlessly interesting for you to just continue and study this and think about it, and try to do it differently. And is it something where we could test the soils, and then run these experiments and then test the soils again too?
- Ruth Yanai:** There is a major effort and I'm not involved with it directly, so I'm not going to be able to describe it very well, at Hubbard Brook, not to mention other people working on similar questions around the world, to address this question of the reuse of nitrogen from soils. So what degree is nitrogen or carbon accumulating in soils as a sink? And to what degree is that being released again? Then the hard part for me, and one that I got stuck on from the time I was a grad student until 25 years later was, how do we calculate the uncertainty in the biomass accumulation in the forest? It's easy to have replicate plots. It's not so easy to calculate the uncertainty in how you're calculating the mass and carbon or nutrient content of a tree. You don't cut down all the trees and weigh them and grind them up. We have done that to validate these equations.
- But what you normally do is create an equation describing the relationship between something that's cheap and easy and non-destructive to measure, like the diameter of the tree and maybe its height, and the answer that you want, which is what's the dry weight, what's the carbon content, what's the nutrient concentrations of it? And those are done with log log regressions, that are really nice, but there's a lot of them, especially if you need to account for the leaves and the branches and the bark and the roots and the wood, which all have very different concentrations. So that's why it was such an achievement to create

nutrient budgets of this type and why nobody was trying very hard to propagate uncertainty in them.

**Joanie Mahoney:** Wow. So that's what I mean by there's this lifetime of questions that you could be answering, but you've made a lot of progress.

**Ruth Yanai:** And then because I started publishing in this area with the forest biomass uncertainty, I got invited into carbon accounting of tropical deforestation for climate finance. So we pay countries now to reduce their tropical deforestation rates.

**Joanie Mahoney:** Who's we? I did see that-

**Ruth Yanai:** Oh, I'm sorry. We would be-

**Joanie Mahoney:** REDD?

**Ruth Yanai:** ... the World Bank. There's a lot of programs. The airline industry is saying they're going to offset carbon emissions. What should count as an offset? Are they going to be investing in forest-based solutions?

**Joanie Mahoney:** So the resources could come from the airlines to pay these countries to limit deforestation?

**Ruth Yanai:** Come from your airfare.

**Joanie Mahoney:** But not yet and only voluntarily, right?

**Ruth Yanai:** Well, you can now say, "Yeah, yeah, I'll pay extra to do that," but the airline industry is saying it's going to be built into your costs. It's hard for them to fly a plane without burning fossil fuel, so that's an area that's sensitive.

**Joanie Mahoney:** A tougher nut to crack.

**Ruth Yanai:** Yeah.

**Joanie Mahoney:** Right.

**Ruth Yanai:** There's also bilateral agreements. Norway, the UK. I'm not the expert on the policy side of this. I'm sorry.

**Joanie Mahoney:** No, it's interesting.



- Ruth Yanai:** I got brought in because in order to get paid for reducing your deforestation rate or increasing your carbon sequestration rate and afforestation, you have to report not only what your carbon emissions used to be and what they are during this period that you're getting credited for, you have to report the uncertainty in that estimate.
- Joanie Mahoney:** Interesting.
- Ruth Yanai:** There's a lot of politics in it and not just science.
- Joanie Mahoney:** Oh, there sure is a lot of politics, but the politics need the science. And you need people who want to be doing the right thing, and then they need the scientists to explain what are the policies we could be putting in place to mitigate the warming or some of the effects of the climate change.
- Ruth Yanai:** I want to insert that, the biggest uncertainty is not the forest carbon per unit area calculation, which is what I happened to have gotten interested in before I got pulled in. It's how much forest is there? So what they're doing to make these estimates of their carbon emission rates is how much forest is there now? How much was there then? And then you multiply by how much carbon is there in the forest per unit area. And the map accuracy is Steve Stehman's area of expertise.
- Joanie Mahoney:** And do you work with Steve?
- Ruth Yanai:** Well, Steve Stehman was a friend and a running buddy for 15 years before I got involved in this area. And I went to my first meeting of the REDD+ country level carbon uncertainty and Steve couldn't make it to that meeting. But everybody's talking about Steve Stehman. I was like, "You mean my Steve Stehman?" I knew that that was what he did, but I didn't ever anticipate that it would become relevant to what I had to offer.
- Joanie Mahoney:** Interesting.
- Ruth Yanai:** So now we're three students from Mexico, who are being funded partly by the Department of Defense, but State Department, USAID. I've always been like NSF funding.
- Joanie Mahoney:** Right, so this is a new world for you?
- Ruth Yanai:** Yeah, yeah, yeah. So I'm very lucky that Steve is here.
- Joanie Mahoney:** So I also know that you work with high school students, and I'm trying to guess where they might fit into all this work that you're doing.

- Ruth Yanai:** The biggest carbon and nutrient fluxes in forests are actually the leaf litter and the root turnover. So we have hundreds of litter traps in New Hampshire, collecting leaf litter throughout the year. Just drawing them in weighing them for carbon would be easy. But we're also interested in how different species are adjusting when we manipulate their nitrogen and phosphorus nutrition.
- Joanie Mahoney:** Fascinating.
- Ruth Yanai:** So we're sorting them by species.
- Joanie Mahoney:** So you can see the effects of your experiments in the leaf litter.
- Ruth Yanai:** We can see if the endomycorrhizal trees are benefiting response to nitrogen or phosphorus. But in two minutes, you can learn to tell a sugar maple from a red maple. And they sit around a table and they're sorting leaves into piles by species.
- Joanie Mahoney:** And are they doing that here on this ESF campus?
- Ruth Yanai:** They're doing it in my lab. Yeah.
- Joanie Mahoney:** And so are these local high school students then?
- Ruth Yanai:** Yeah.
- Joanie Mahoney:** This is great though because we want our local high school students to have exposure to an experiment like this. And I am hoping then that they learn the kind of work that's being done here at ESF, and the impact they can have. Do you teach undergrads also?
- Ruth Yanai:** Not now. I taught soils when I came in. I taught forest ecology for a while, so now I'm doing seminars with graduate students.
- Joanie Mahoney:** And those must be interesting too, because now you're talking to students who have a real clear idea of where they want to go, what they're interested in.
- Ruth Yanai:** I like project learning. So I teach the required capstone course for our non-thesis master's students. They have to do a project. And then I teach a course in the spring for students who are preparing manuscripts for publication, and that's all kinds of topics, and that's fascinating.
- Joanie Mahoney:** And that brings your interest in writing, that we started talking about, your interest in writing then gets fed a little bit with that role, I would imagine.

**Ruth Yanai:** It's important skill if you want to-

**Joanie Mahoney:** Absolutely.

**Ruth Yanai:** ... raise money and communicate your results.

**Joanie Mahoney:** Well, if you listen to some of these older podcasts, we've had people from environmental studies as part of research teams, and they come in and talk about their role in communicating this science out, and how important that is. And I just talked about policymakers needing scientists. Well, they also need scientists who can interpret what that science is, and what it could look like in a policy if you're trying to move the needle for the whole society. So I think writing is a skill. No matter what your professional work is, being a good writer I think is valuable to everybody. But I think particularly, in this space, where all of the faculty are doing this incredible work that has real-world application, and then you have people out in the public that I have found generally have good intentions and would like to do the right thing if they knew what the right thing was. I'm sure that's not the case for everybody, but how do you tell people the thing you could be doing in your everyday life that would matter is this thing?

**Ruth Yanai:** I'm thinking about what people can do and what some of the big lessons are. And in the uncertainty realm, and I think this applies to knowledge of all kinds of things and not just science, trying to identify what you don't understand. Some people aren't comfortable doing that, so modeling that it's okay to do that is helpful.

**Joanie Mahoney:** It's so eloquent the way you just said it, but it's so true, that caring would go a long way, especially about things that you don't know.

**Ruth Yanai:** And that it's okay to ask questions. Sometimes it's even hard to articulate the question, and that's what keeps me engaged in the uncertainty thing. I'm commonly on the edge. Oh, John Drake now is involved in one of these. And we joke about, am I dumb or am I smart? And you have to be comfortable being dumb enough to say, "This is the part I think I don't get." And unless you can identify the part that you think you don't get, you're not going to get it. And so the high school students make a lot of mistakes. It has to be really okay to admit that you made a mistake.

We have triple redundancy in... We record which sample we're going to do next. We check it off, there's a date, there's notes, it's written on the bag. And then there's still like two samples have the same... These can't both be the right one, and we're going to throw them both out if we don't know which one is right. And then there's handwriting and then there's the day it was processed. This happens all the time. So I'm hoping that they're learning about being interested

in mistakes and how we learn from mistakes. And that if you don't acknowledge a mistake, you're not going to get where you want to be.

**Joanie Mahoney:** Right. You're not going to make progress. Some of the best learning experiences in my life have come from times that I failed at something. I think those are the real learning opportunities. So I have another question for you. So you touched a little bit on the international student part of your life, but what we didn't touch on is you also have kept up that international aspect through your teaching. So you've had the ability to be a visiting faculty member at colleges around the world?

**Ruth Yanai:** Sabbaticals are a wonderful thing. And then I've had two very generous department heads when I got invitations to Japan, they let me go-

**Joanie Mahoney:** Oh, I think it's such a good learning experience for you and then for the students that you're teaching to have this exposure to somebody from here, and you can describe these experiments that you're talking about. Is that something that you hope to continue to do more of?

**Ruth Yanai:** I had a certificate of eligibility for a visa for Japan for 2021. So it got postponed. And I need to decide if I'm going to do it or when I'm going to do it.

**Joanie Mahoney:** Does your father still have family in Japan?

**Ruth Yanai:** Well, my father died a year ago and his sister died soon after that.

**Joanie Mahoney:** Oh, I'm sorry.

**Ruth Yanai:** So that generation's not there. My sister lives there, and my first cousins are there. But every time I've lived in Japan before it was with my father and my daughter. So that was an important part of the... Yeah, my Japanese is not that good. To live there without a personal family translator. [inaudible 00:29:16].

**Joanie Mahoney:** That's a luxury, Ruth. That's a luxury. I lost my dad earlier this year too, so we're kind of in the same boat. I said, I know it happens to everybody. It's just our time to be going through this, but especially-

**Ruth Yanai:** And then, are we not going to live forever either?

**Joanie Mahoney:** I know. I know. It starts to feel more real, right? But for you to have this extra reminder of this place that you will be really missing having your father there. So I'm sorry about that, but I do hope you get back. I didn't realize that you had Japanese roots, but of course, Yanai is a very Japanese name, but I just hadn't considered that. Did he grow up in Japan?

**Ruth Yanai:** Yes.

**Joanie Mahoney:** He did? My in-laws, grew up in the Netherlands and came here on their wedding day. So I'm married to a first-generation American. And some of the stereotypes are true. They're really awesome people, work hard. They came here with a purpose. And I'm the beneficiary of that. And I'm sure that the people in your life feel the same way with you being this first-generation American. It's a different perspective, isn't it?

**Ruth Yanai:** Yeah. Should we talk about race?

**Joanie Mahoney:** Okay, good. Yes. Yes.

**Ruth Yanai:** I don't know how much of this will be relevant. Perceptions of race in our culture have changed a lot over my lifetime, and I think are changing increasingly rapidly. One of the things I found cleaning out my father's apartment was an essay that my mother wrote the two years that they lived in Japan when I was already an adult. He started out as an analytical chemist working for Rohm and Haas, in Bristol, PA, which is why I grew up across the river from that. And got into plastics. And then Japan became an important trading partner. We're buying their cars, they should be using our plastics.

So he was either jet lagged or away from home. He was responsible for marketing Rohm and Haas plastics in all of Asia, and my mother agreed to live in Japan for two years. When I was cleaning up my father's apartment, I found this essay that my mother wrote. It was published in the Foreign Wives of Japanese journal. So she was a foreign wife of Japanese. And she wrote about race, being married to a Japanese in the US.

**Joanie Mahoney:** How interesting to see your mother's writing about her perspective.

**Ruth Yanai:** Well, and it ended up being... She wrote this in the 1980s, and I wasn't aware of it at the time. What she said was that my younger sister grew up very conscious of race, and I was oblivious.

**Joanie Mahoney:** Do you think the time was different or the personalities?

**Ruth Yanai:** Well, yeah. So one thing she said about it was the first time we visited Japan and the first time my father had been back to Japan in 17 years, my sister was in first grade and I was in third. So she missed the first month of school. When she came back, her classmates thought of her as Japanese. Every week for show and tell, she brought something from Japan. So it could be that she was younger and it could be that other people perceived her that way. I was kind of unaware... I'm kind of not very self-conscious to begin with, so that could be personality. At

my 20th or 30th high school reunion, someone who took a picture of me and a African American classmate said in the caption on-

**Joanie Mahoney:** Facebook or something?

**Ruth Yanai:** Yeah, that I was the only Asian in our class. And I was completely unaware that I was the only Asian.

**Joanie Mahoney:** That says a lot though. I think that's very interesting. And you were very close in time to Asia.

**Ruth Yanai:** It was part of my family identity, but it wasn't a class identity. Because we were the only Asian family in town, so who do you identify with? I think it would've been different if there were 10 of us on the playground and the white kids played together and the Asian kids played together. My identity would be different in that case.

**Joanie Mahoney:** Right, but you didn't have any school identity wrapped up in race, it was just one of the kids?

**Ruth Yanai:** Right. So when I first came to ESF, I don't know why I was recruited along with Russ Briggs out of one search for a soils professor. Phil Crawle retired and Ed White moved into dean of research, so there were two openings and I heard both of us. Was I the diversity hire? So they get to count me as a woman and as an Asian. And I used to think, "That's cheating. How Asian am I? Do I sound Asian? Do I act Asian?" The first time an Asian female graduate student told me that I was an important role model for her, and it was because I don't act Asian. She didn't say, "It's because you don't act Asian." What she said is, "We're not supposed to speak up."

**Joanie Mahoney:** Interesting.

**Ruth Yanai:** And I modeled an alternative for her because I was raised...

**Joanie Mahoney:** Differently?

**Ruth Yanai:** Yeah.

**Joanie Mahoney:** No, I think that's so interesting. And the more diversity, the better anywhere you are in any group. I think it's a healthier, stronger, bodes better for the future, group, the more diverse that it is. But when we talk about it today in 2022, it's that lived experience that we're trying to diversify. And your lived experience isn't a lot different than mine. So it shouldn't really count as the diversity hire, but who knows?

- Ruth Yanai:** I didn't realize I was a girl, not in the terms of gender identification.
- Joanie Mahoney:** I would say the same thing. I was a real tomboy growing up, and I was not limited at all. I was raised by parents who were, "You can be anything you want to be. Go do that." And so I'm a lawyer by education. I never felt limited by my gender at all, until there came a point in my political career when I got a job over the will of the party, and you really saw that undertone come out. And I thought, "Oh, I was fine as long as I was doing whatever he wanted me to do. But once I stepped kind of too far into the world that they didn't think I belonged, wow."
- Ruth Yanai:** They said, "You can't do that because you're a girl."
- Joanie Mahoney:** And good thing for me, I was in my 40s before I ever saw it. And I said, "I feel like I have to go back to the women that are a little older than me," because they always celebrated the fact that, "You're the first woman to do this." And I always kind of poo-pooed it because like you, I never identified that way.
- Ruth Yanai:** You didn't know there were barriers.
- Joanie Mahoney:** Yeah. But now I said, "I feel like I have to go back and apologize because I was really wrong. The world is not quite all the way to equal yet. And I do appreciate the work of the women who came ahead to try to level that playing field." But I thought the fight was over until then I realized, "Oh no, it's not completely over." And once my eyes were opened, I suppose I was a little less naive about it. But I had this blissful, not affiliated with any group. I could do anything I wanted to do. And I feel like I'm better for it. But it's interesting that you have that perspective now looking at a Facebook post all those years later, and someone has to tell you, "Ruth, you were the only Asian girl in our class."
- Ruth Yanai:** The female experience was... This is before Zoom. The first job I had out of my PhD was at the Boyce Thompson Institute for Plant Research at Cornell. And every Monday morning, there were two scientists who would each give an hour on their research. And if you couldn't make it, you could get the video of it. So I gave one and then I said, "I want to see it. I want to see the DVD." That was when I saw that I was a girl. I don't look like all the guys who'd been standing up there giving a talk there for half an hour every Monday morning. I don't-
- Joanie Mahoney:** Isn't that interesting?
- Ruth Yanai:** ... move the same, or I don't look the same as them. There weren't any other women for me to compare myself to, just like there weren't any Japanese kids on the playground.

**Joanie Mahoney:** So you've had such an interesting experience. I feel the same way. I've had careers. I was an assistant DA, heavily dominated by men in the office. And then being in the particular political realm that I was in, kind of the same. So I never did. You can kind of tell by looking at us, right? We're not all adorned and competing with women because we just weren't really cognizant of all of that. And I think we're better off for it, but it probably mattered to both of us in ways that we're just still learning. I think it's other people's perceptions that were a lot more important in those stories than how we felt.

So before we go, what's next for you? What's keeping you excited about the work that you're doing?

**Ruth Yanai:** One of my recurring topics of interest now is what does retirement look like? Because I'm very excited about what I'm doing. I don't know how to stop it. How do you stop an experiment that's already the longest running? I think, I hope I find successors who want to keep it going. I enjoy it. I don't have any reason to stop. But I'm 64. Are we going to live forever, and is there something else I want to do with my life? So it keeps me going. It all keeps me going. There's nothing I'd rather be doing.

**Joanie Mahoney:** Well, that says it all. The fact that you've had the career that you have and you're still saying that you love what you're doing, and that's what you want to be doing. That pretty much will define retirement. Good for you. I say you win the game of life if you feel that way. Do you have family in other parts of the world though that you'd like to be a little more flexible about seeing?

**Ruth Yanai:** Well, my daughter turned 25, so it's not obvious where she's going to end up, and that would affect where I want to be.

**Joanie Mahoney:** I don't want to rush my life, but I am looking forward to those days. It's been a real pleasure talking to you, getting to know you a little better and understanding now what was written on the paper in front of me about the work that you're doing. But thank you for taking time out of your busy schedule to sit and talk to us. And I wish you well in whatever the future holds for you. But we will see you and enjoy having you here at ESF.

**Ruth Yanai:** I learned some new things about you, but also some new things about me. Thanks very much.