Sidedoor Season 4, Episode 5:
The Wild Orchid Mystery

[INTRO MUSIC]

Lizzie Peabody: This is Sidedoor, a podcast from the Smithsonian with support from PRX. I'm Lizzie Peabody.

[MUSIC]

Orchid Judges: Okay. Um, we need some discussion. The spread is 77 to 86. Gordon, are you in or out?

Orchid Judges: I was on the low end, although I was not the lowest score. Um, it is a smaller flower…

Lizzie Peabody: This is the sound of a flower beauty contest.

Orchid Judges: Um, it does have good color, but, uh, it is not as dark as the red cornicerves that we've seen.

Lizzie Peabody: I'm eavesdropping on an event that happens every month*:* The National Orchid Society's DC-area orchid judging. People drive or ship their orchid plants from as far away as Florida to have them evaluated by the 12 or so judges in this room.

Lizzie Peabody: So, what kind of orchid is this?

Rob Griesbach: This is a Phalaenopsis. This is a species that's related to the ones that you buy in the grocery store.

Lizzie Peabody: Okay.

Lizzie Peabody: Rob Griesbach gave me a hushed play-by-play at the back of the room, like we were watching a major golf tournament. He is an accredited American Orchid Society judge. But, even if you're a novice like me, you'd probably still recognize an orchid from the plant aisle at the grocery store. They have long, thin stems, usually attached to a wooden stick with what looks like a tiny hair clip, and delicate, alien-looking flowers. These flowers are one of the things the judges are looking at as they pass each orchid around the table.

Orchid Judges: One plant, coming up!

Orchid Judges: Very nice.

Lizzie Peabody: They consider color, size, texture, form.

Orchid Judges: It’s symmetrically wavy…

Orchid Judges: Hmm, mmm.

Orchid Judges: Asymmetry is a killer in flowers.

Lizzie Peabody: Becoming an orchid judge is no casual process. It took Rob six years to be fully accredited.

Rob Griesbach: I mean, I started my PhD program at the same time I started doing orchid judging and I got my Phd two years sooner!

[LAUGHTER]

Lizzie Peabody: Rob Griesbach has now been an orchid judge for over 40 years. And just like in fashion, or architecture, he’s seen the aesthetics of flowers evolve over time. But judges are always looking for beautiful anomalies.

Rob Griesbach: So, I mean, what we're looking at is, we're trying to improve mother nature for artificial traits we say are superior.

[MUSIC]

Lizzie Peabody: So, orchid judging is a little like judging a dog show. The winners get bred for their superior traits. And it’s flowers like these that later end up in the grocery stores.

[MUSIC]

Lizzie Peabody: But, there’s another side to orchids. A wild side. Orchids are everywhere, not just in beauty pageants or at your local grocery store. They’re up in the trees, underground, and even in the arctic. And they’re incredibly varied. A single orchid

plant can be as tiny as an ant, or weigh as much as a rhinoceros. And those little specks in your vanilla ice cream? Orchid seeds.

Lizzie Peabody: But wild orchids are disappearing. Over half of orchids worldwide are thought to be endangered or threatened. And this is important because, for ecologists, orchids are the canary in the coal mine. When environments change, orchids are often the first plants to disappear. They hint at environmental changes we might not notice.

Lizzie Peabody: So, so how close are these orchids that are being judged to native orchids found in the wild?

Rob Griesbach: They're, they're not at all.

Lizzie Peabody: Rob says, like dogs and wolves, they're related, but still very different.

Rob Griesbach: You know, a Chihuahua is not very close to the wolf.

Lizzie Peabody: So, this time on Sidedoor, we leave the chihuahuas at home and set off in search of the wolves of the orchid world. Or rather, a lone wolf: the Small Whorled Pogonia. A secretive flower that Smithsonian ecologists are working to reestablish in the wild. But to do it, they have to solve a pesky problem they've been working on for 15 years: how to grow one.

[MUSIC]

Lizzie Peabody: If a suburban windowsill is home to the orchid chihuahuas, then a muggy, buggy forest is home to the orchid wolves.

Dennis Whigham: It's all the ticks. Chiggers.

[WALKING THROUGH THE FOREST]

Dennis Whigham: Mosquitos are kind of bad today, so I hope you put on the right perfume.

Lizzie Peabody: And that's where I headed with Dennis Whigham. He's a senior botanist at the Smithsonian Environmental Research Center, where a lot of research focuses on forest ecology, especially how plants growing on the forest floor respond to natural changes as well as those caused by people.

Lizzie Peabody: One of those forest plants is the Small Whorled Pogonia.

[WALKING THROUGH THE FOREST]
Lizzie Peabody: Whorl.

Dennis Whigham: Not World. Whorled.

Lizzie Peabody: Whorled.

Dennis Whigham: Whorled.

Lizzie Peabody: Whorled.

Dennis Whigham: W-H-O-R-L.

Lizzie Peabody: Whorl.

Lizzie Peabody: The Small Whorled Pogonia is one of over 200 orchid species native to North America. It grows from Georgia to Maine, but like most native orchids, it's rare and getting rarer in the wild. The Small Whorled Pogonia is now extinct in some places where it used to be found, like Maryland and DC, but there's a secret grove of them here in Virginia.

[CRUNCHING SOUNDS]

Lizzie Peabody: Uh, it is so beautiful and lush out here.

[CRUNCHING SOUNDS]

Lizzie Peabody: We walked down a dirt trail, and soon the noise of the highway traffic died away. And all we could hear was the birds, and the sound of our own feet. Well, mostly Dennis's feet.

[CRUNCHING SOUNDS]

Lizzie Peabody: Dennis, your boots are very musical.

Dennis Whigham: Are they?

Lizzie Peabody: Makes for great audio.

Dennis Whigham: Do I sound good?

Lizzie Peabody: Yeah.

Dennis Whigham: Okay, we're going to turn left here now and walk in the woods.

Lizzie Peabody: Oh, alright.

[CRUNCHING SOUND]

Lizzie Peabody: If I hadn't been following Dennis, I'd probably still be in those woods.

[CRUNCHING SOUND]

Lizzie Peabody: Dennis, how do you even remember where you're going out here?

[Laughter]

Dennis Whigham: Well, I've been here a few times and it sort of sinked in.

[Laughter]

Lizzie Peabody: Hang on, I'm caught up on my cord. There we go.

[Laughter]

Lizzie Peabody: I got snagged.

Dennis Whigham: The plants have produced a…

Lizzie Peabody: Our destination was a forest glade, where Smithsonian researchers have studied a population of Small Whorled Pogonia for decades. A few years ago, this group of orchids was down to just a handful of plants. Then, something surprising happened: a tree fell. And the very next spring 49 new Small Whorled Pogonia sprang up.

[CRUNCHING SOUND]

Dennis Whigham: Okay, here we are.

Lizzie Peabody: And Dennis wants to know why.

Lizzie Peabody: Wow!

[CRUNCHING SOUND]

Dennis Whigham: This is it. And that’s the tree we were telling you about that died.

Lizzie Peabody: (Gasp!) Wow! This feels like a really magical place.

Dennis Whigham: This is magical. I mean, this is so far above anything we've seen in the 15 years we've been working with this species. This is, this is amazing.

Lizzie Peabody: We stood in a clearing speckled with dozens of tiny flags, each one marking a little green plant.

[CRUNCHING SOUND]

Lizzie Peabody: This is an orchid?

Dennis Whigham: That's the Small Whorled Pogonia. That's what we focus on.

Lizzie Peabody: It doesn't look anything like the orchids that I have seen before.

Dennis Whigham: No.

Lizzie Peabody: The Small Whorled Pogonia looks like a little, green, star-shaped umbrella. The top of the umbrella, where the leaves spread out, is called the “whorl,” and it’s a Small Whorl after all. When the Small Whorled Pogonia blooms, which only happens for about 10 days a year, it produces a white flower that looks, to me, like a little dragon’s mouth with moustaches on either side.

Melissa McCormick: I could see that.

Lizzie Peabody: Like a green dragon.

Melissa McCormick: I could see that.

Lizzie Peabody: But it's a green dragon that's wearing a skirt.

Melissa McCormick: Uh huh.

Lizzie Peabody: Made of five leaflets.

[LAUGHTER]

Lizzie Peabody: Yeah, it's a dragon with a tutu.

Melissa McCormick: Yes.

[LAUGHTER]

Lizzie Peabody: Melissa McCormack is a research scientist at the Smithsonian Environmental Research Center. She was already at the site when we arrived, counting orchids and marking each newfound plant with a flag. She and Dennis have also put wire cages around the plants to stop deer from snacking on them.

Melissa McCormick: Sometimes deer will definitely seek out orchids. I think this is one that they like because it's nice and soft and juicy and deer can just nip the whole thing off in one bite.

[LAUGHTER]

Lizzie Peabody: But the greatest danger to these orchids isn’t deer; it’s actually people. That’s why this site is top secret.

Lizzie Peabody: Have there been instances of people finding out where rare orchid populations are and then coming and disturbing them?

Melissa McCormick: Yes, that happens all the time.

Lizzie Peabody: So, there are orchid poachers essentially.

Melissa McCormick: There are absolutely orchid poachers. Frighteningly many.

Lizzie Peabody: What kinds of people do you think, I mean, who, who are the orchid poachers?

[LAUGHTER]

Melissa McCormick: Um, unscrupulous people, who decide that this is a rare orchid and they want one for their yard will, come and dig them up.
Lizzie Peabody: And digging up one of these orchids means certain death, for the orchids, not the people.

Lizzie Peabody: So, the people who are seeking these out know a lot about orchids…

Melissa McCormick: They do.

Lizzie Peabody: presumably, and they would know that digging one up is a death sentence?

Melissa McCormick: Well, one would hope they would know that.

Lizzie Peabody: Hmm.

Melissa McCormick: But there's knowing it in your head and there's knowing it in your heart and there's thinking, “oh, but I can make it right for this one. It won't die on me!”

Lizzie Peabody: Hmm.

Melissa McCormick: But it will.

[LAUGHTER]

Lizzie Peabody: It will die because the Small Whorled Pogonia has an unlikely, but necessary bed fellow called fungus.

[MUSIC]

Lizzie Peabody: Here’s what we know about that relationship. Orchid seeds are as fine as dust. They are so small, there’s not enough food inside the seed for the orchid to begin to grow on its own. It needs to be fed by something else. Enter our friend: the fungus.

[MUSIC]

Lizzie Peabody: In a single teaspoon of soil there, are about 150 different kinds of fungi. And some of them will form relationships with orchids.

Lizzie Peabody: So, is it the fungus that chooses the orchid or the orchid that chooses the fungus?
Melissa McCormick: It seems to be the orchid that chooses the fungus.

Lizzie Peabody: Okay.

[MUSIC]

Lizzie Peabody: And orchids are choosy. To put it in terms of a romantic relationship, some orchids are monogamists. They'll partner with one kind of fungus their whole life. And if that one type of fungus isn't around, they can't grow. Other orchids are polygamists. They'll form relationships with several different kinds of fungi. And others are serial monogamists. They partner with one fungus to grow from a seed. And then later in life, invite a different fungus to grow into their roots and be eaten.

Melissa McCormick: And why the fungus grows in there, we don't know.

Lizzie Peabody: So, it does seem like a kind of a one-sided relationship, like, "Come into my house, I won't eat you."

[LAUGHTER]

Lizzie Peabody: "Just kidding."

Melissa McCormick: Yeah, exactly. Um, I think, I think it's kind of a nice turnaround. I mean, for anybody who's grown plants, you know that fungal pathogens are the bane of your existence.

[LAUGHTER]

Lizzie Peabody: Yeah.

Melissa McCormick: In this case, we have a plant parasitizing the fungus and as far as I'm concerned, turnabout is fair play

[LAUGHTER]

Lizzie Peabody: So, not exactly the model of a healthy romantic relationship, but orchids will be orchids. And it's because of this relationship that orchids are able to give us information about subtle environmental changes.

Dennis Whigham: And a good way to think about it is that orchids, because of this, uh, adaptation they have in interacting with fungi, if the fungi are there, which means just a healthy ecosystem, then the orchids are going to be there. So, if you start to change things around, then the orchid will suffer from that. It's a group of plants that if they're present, you have a healthy ecosystem.

[MUSIC]

Lizzie Peabody: Dennis and Melissa are pretty sure that the sudden reemergence of the Small Whorled Pogonia, near the fallen tree, has to do with the presence of fungi in the soil. But, as a scientist, the only way to be sure you understand a process in the wild, is to replicate it in the lab. And that's exactly what Melissa and Dennis are trying to do: combining orchid seeds with fungus, to try to raise little orchid wolves in captivity. So, it's a good thing the Smithsonian just so happens to have the largest bank of orchid fungi in the world. And that's where we'll meet you after the break.

[MUSIC]

[DENNIS WHIGHAM'S SHOE SQUEAKS]

Lizzie Peabody: We're back, and we made it out of the forest. As you can hear, I'm still following Dennis Whigham. This time, down the hall at the Smithsonian Environmental Research Center in Edgewater, Maryland. He's leading us to the plant ecology lab, which is currently "orchid central." We're here because the world has an orchid problem.

[MUSIC]

Lizzie Peabody: Over half of the world's orchids are endangered or threatened. Smithsonian scientists are working to reestablish healthy populations in the wild, and to do that, they need to better understand how they grow.

[MUSIC]

Lizzie Peabody: I thought I knew how plants grow. You plant a seed, give it water and light, and presto! But, for orchids, it's not that simple. Because orchids in the wild have

evolved complex relationships with fungi in their environment, if you take them out of the environment where those fungi live, they die.

[MUSIC]

Lizzie Peabody: So, Dennis Whigham and Melissa McCormick have a very simple goal for the Small Whorled Pogonia.

[MUSIC]

Lizzie Peabody: The goal is to bring the fungus and the seed together and watch the magic happen.

Dennis Whigham: Exactly. Yeah. That's the ultimate goal.

Lizzie Peabody: Except…

Dennis Whigham: No one yet has figured out how to germinate the seeds of the Small Whorled Pogonia.

Lizzie Peabody: No one, anywhere, has done it. At least, not yet. But Smithsonian scientists have something others don't.

Dennis Whigham: What you're looking at right there is the largest collection in the world of Orchid Mycorrhizal Fungi.

Lizzie Peabody: This vast collection of orchid fungus looks a lot like a stack of tupperware containers on a shelf. That's because it is. But even if you're someone who gets extra mushrooms on your pizza, this fungus collection doesn't look like anything you'd want to eat.

Lizzie Peabody: Oh, that's gross looking!

[LAUGHTER]

Dennis Whigham: Melissa, eventually we'll want to, you know, identify what, what these things are. So…

Lizzie Peabody: Can I hold it?

Lizzie Peabody: Dennis handed me a clear plastic container and inside was a poof of fuzzy white fungus.

Melissa McCormick: And that's what they look like when they first start to grow out is they look like a little white or slightly cream snowflake.

Lizzie Peabody: Melissa and Dennis have amassed this collection by pulling little fungus balls from the roots of orchids. Then placing each fungus ball in its own container to grow. Then they can identify the fungus through DNA sequencing. They've done this with hundreds of different kinds of fungi. And side note, 99% of these fungi are completely new to science! They're basically creating a collection of eligible young orchid-suitors.

Lizzie Peabody: So, you are essentially a fungus orchid matchmaker.

Dennis Whigham: Yeah. That's what I'd like to become when I grow up. Yeah.

[LAUGHTER]

[MUSIC]

Lizzie Peabody: And for the Small Whorled Pogonia, that match is made! Through the fungus-banking process, Dennis and Melissa have learned that our little orchid forms a relationship with a fungus that is actually pretty common in the forest. So, good news! Except…

Dennis Whigham: Uh, there's a little bit of a problem with the Small Whorled Pogonia fungus because it's one of these that interacts with, with tree roots.

Lizzie Peabody: Specifically, living tree roots.

Melissa McCormick: They are dependent on that tree.

Lizzie Peabody: Hmm. Okay.

Melissa McCormick: And then the orchid is dependent on that fungus.

Lizzie Peabody: I see. So, you have to bring the whole chain.

Melissa McCormick: Yes.

Lizzie Peabody: Into the lab.

Melissa McCormick: And last time I checked, trees don't fit in labs very well.

[LAUGHTER]

Lizzie Peabody: This is not a hypothetical. Melissa and Dennis already tried bringing oak trees into the lab.

Melissa McCormick: We put the fungus with the oak roots um, and tried to get it established there and it just didn't work.

Lizzie Peabody: This may have been because they were baby trees, and young trees don’t have nutrients to spare the way mature trees do. But mature trees are too well-established in the ground to be relocated. So, they tried growing the fungus without the tree by feeding it the nutrients it would have gotten from the roots. That didn’t work either.

Melissa McCormick: So, it makes it very challenging. That happens to be a very challenging species to work with.

Lizzie Peabody: Yeah.

Lizzie Peabody: So, what do you do when half of a couple is not cooperating? Well, like any single person done with dating, you forge ahead solo: footloose and fungus-free!

[MUSIC]

Lizzie Peabody: And it is possible to trick some orchid seeds into growing without the partner fungus, by placing the seed on a bed of orchid food. But even though this approach has worked with other kinds of orchids, so far, the Small Whorled Pogonia will not be tricked into sprouting sans fungus! But every failure is a step closer to a solution.

Lizzie Peabody: So, you have a two-part problem: One is that you cannot get the seed to germinate.

Dennis Whigham: Right.

Lizzie Peabody: And the second is that the fungus that you believe you need in order to get the seed to germinate in the lab, you are having difficulty growing in the lab because it needs to be attached to a tree root.

Dennis Whigham: Exactly but we haven't given up. There are a variety of approaches we can still use that we haven't exhausted yet.

[MUSIC]

Lizzie Peabody: Next, Melissa and Dennis and their team are experimenting with tweaking the orchid food recipe, refrigerating seeds to simulate seasonal changes, and even exposing them to smoke to imitate forest fires. And through all of this, they learn more about the environment necessary for the Small Whorled Pogonia to grow. This means, they'll have a better understanding of what it's not getting in the places where it's disappearing.

[MUSIC]

Lizzie Peabody: While Melissa, Dennis, and their team will continue to work on solving the puzzle of the Small Whorled Pogonia; that's just one piece of a much bigger problem. Over 100 orchid species are disappearing from North America. And like the Small Whorled Pogonia, each has its own unique preferences.

Lizzie Peabody: At this rate, a lot of these orchids may be lost to science before there's time to figure out how they grow. So, Dennis has done what we all do when a project is just too big: called in friends. In partnership with the United States Botanic Garden, he created the North American Orchid Conservation Center, also called, "NAOCC." It's a network of collaborators all over the U.S. and Canada; all working to conserve native orchids.

Dennis Whigham: We know that one orchid is not the same as another orchid. And if we're going to conserve orchids, we need to make sure that we do all the right things to capture their genetic diversity and have it available for future efforts to restore and conserve the species.

Lizzie Peabody: The idea is to safeguard orchid seeds and orchid fungi, so that even if it takes a few more decades to figure out how to make the orchids grow, and even if during that time, the orchid goes extinct in the wild, they'll still have the genetic material they need to bring it back.

Lizzie Peabody: So, all those fungi in the bank...

Lizzie Peabody: You're going to freeze them, like Han Solo style?

Dennis Whigham: Yeah. Yeah. We're going to put them on to something where they're, they're happy. And when somebody brings them out, some years later, they will start growing again. That's the ultimate goal.

Lizzie Peabody: Dennis says, when an ecosystem is healthy, orchids are there. But when they're not, it hints at some invisible breakdown. So, Dennis wants to see them back in the places where they once were.

Dennis Whigham: Part of, at least, my vision for the long-term conservation is, once we know how to create the environment in which the fungus and the orchid are both happy, we can give those to homeowners. And they can create environments in their gardens and things like that where they can grow these orchids. And they will probably be able to put these orchids back in places where they probably were, until we made them into houses, shopping malls and things like that. So, the more we can repopulate orchids in the landscape, the greater the chance they can respond on their own to changing climate, to changing conditions and survive.

[MUSIC]

Lizzie Peabody: So, the holy grail for you might be walking past somebody's house and looking down and seeing the Small Whorled Pogonia growing in their front yard.

Dennis Whigham: Oh, you got it. I'd buy them a beer.

[LAUGHTER]

Lizzie Peabody: That round of beers is still some years away. But for now, Dennis, Melissa and their team will continue to study the Small Whorled Pogonia and keep trying to make it grow. It's not a question of "if" at this point. It's a question of "when."

[MUSIC]

Lizzie Peabody: And when that day comes, I plan to fill my own yard with a ballet full of little white dragons in tutus.

[MUSIC]

Lizzie Peabody: You've been listening to Sidedoor, a podcast from the Smithsonian with support from PRX. If you'd like to see snapshots from the orchid judging competition, or get a few tips on how to keep your orchid chihuahua alive, you can find them in our newsletter. Subscribe at SI.edu/Sidedoor.That's SI.edu/Sidedoor.
[MUSIC]

Lizzie Peabody: And, tell us what you think of the show! If you enjoy Sidedoor, leave us a review in Apple Podcasts. That means you, Mom. We love hearing what you think of the show, and the reviews help us reach new listeners.

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[MUSIC]

Lizzie Peabody: Our podcast team is Justin O'Neill, Jason Orfanon, Michelle Harven, Caitlin Shaffer, Jess Sadeq and Lara Koch. Episode artwork is by Greg Fisk. Extra support comes from John Barth and Genevieve Sponsler. Our show is mixed by Tarek Fouda. Our theme song and other episode music are by Breakmaster Cylinder. If you want to sponsor our show, please email sponsorship at PRX.org.

Lizzie Peabody: I'm your host, Lizzie Peabody. Thanks for listening.

[MUSIC]