

## **PLANT PEOPLE Season One Episode One ‘The Importance of Collections’ Transcript**

**JENNIFER BERNSTEIN NARRATION:** In the heart of a bustling city, there's a story unfolding about plants and people. It is a story shaped by pressing questions about how we can sustainably share our planet, and thrive.

This is Plant People from NYBG, the New York Botanical Garden. You may know us from a recent visit; perhaps you've experienced the annual Orchid Show. Or it could be that you've never had the chance to explore our 250 acres in the Bronx.

I'm your host Jennifer Bernstein, CEO & The William C. Steere Sr. President at the New York Botanical Garden. I'm not a botanist or horticulturist, but I am a Plant Person, and I welcome you as we set out on this journey to discover the story of plants and people.

One of the very best parts of my job is meeting and working with an amazing array of different types of Plant People. This season, we'll meet scientists and curators right here at the Garden, and we'll go beyond NYBG to hear the many ways in which plants and people are inextricably linked. Plants need people, and people need plants.

For our first episode, we're starting right here on Garden grounds, where there are two very important -- and enormous -- collections that you may have missed on your last visit.

So whether you're a trained botanist or are just trying to keep that houseplant next to your sink alive, welcome to Plant People.

**JENNIFER BERNSTEIN:** Rhonda, what is the LuEsther T. Mertz Library and what do you do as its director?

**RHONDA EVANS:** Hi, Jennifer. I'm so excited to be here talking with you today. So my name is Rhonda Evans, and I am the director of the LuEsther T. Mertz Library at the New York Botanical Garden, which means I get to oversee all of the work that our wonderful reference library staff is doing, our cataloging staff is doing to make things accessible, the different programs that are going on here. It is the biggest botanical library in the world.

**JENNIFER:** Wow.

**RHONDA:** And so, what does that mean? We have a few major areas of focus that we have in our library. So, of course, botany, horticulture, gardening, and landscape design. And what I love about being here at the LuEsther T. Mertz Library is there's so many different types of materials here. So we have books and manuscripts dating back over nine centuries.

**JENNIFER:** Wow.

**RHONDA:** We have botanical art, we have microscopes, but we also have a huge children's collection. So children and parents can come in and spend time here and learn about botany and gardening and flower design, and anything that's related to plants is available here for people to access.

**JENNIFER:** Giving people a view into the wonderful world of plants, that's incredible. How did you become a plant person?

**RHONDA:** I think it actually started with my grandmother. My grandmother loved plants. She loved flowers. She always had a flower bed.

She didn't graduate from high school and she was a stay at home mom. So after she passed, I asked my mother, how did my grandmother learn so much about plants and flowers? And she said, well, she went to the library, she got books about plants.

So, you know, so there's other people who have that same experience and will come to the library and teach themselves and provide their own education about what interests them about gardening, about plants. And another great thing about the Library is we have plant information specialists.

So if you're having trouble finding the information that you need about the plants that you want, we have people here who can look at photographs of what you have at your home, your home garden, on your windowsill, and provide information. And so, how I became a plant person, just thinking about that connection between my family, my lineage and libraries.

So it all comes full circle.

**JENNIFER:** Yeah, that's amazing. I think so many people become plant people through their family. Through parents or grandparents teaching them about the natural world. So it's wonderful that you're now carrying on that legacy here at the Mertz Library. So can you talk a little bit about how the Library at NYBG enables research?

**RHONDA:** We are under the umbrella of NYBG Science. NYBG Science, of course, has a large staff doing incredibly important scientific research all over the world.

We provide access to all types of scientific journals, other research that's been done. We have the archives of most of the botanists who used to work here at the Garden so people are able to build on their research.

We work closely with our Herbarium to provide the full story of the specimens that are there with the field notes that we hold here.

But then there's a lot of independent researchers who come who want to access, you know, for example, we have a large collection on Charles Darwin. We have letters from Charles Darwin. Maybe they're interested in that. Maybe they're interested in more of the humanities and the story of how plants and people really connect.

And I think what's great about libraries is that everything here is so inspirational.

**JENNIFER:** It's amazing how many disciplines, too, you interact with at the Library. It's science, but it's also the humanities, as you say, and history. It's incredible. How many items, it's millions, how many millions of items do we have here?

**RHONDA:** In terms of volumes, we have 750,000 volumes. We have over 12 million items in our archives, which documents the entire history of the New York Botanical Garden and also holds the papers of other really important botanists, such as John Torrey. So we have a general collection that is used by our research staff and also used by the public, but we also have a circulating collection that people can come and read fiction and get magazines, that is millions of items, hundreds and thousands of books here for people to use and access.

**JENNIFER:** It's a lot to keep track of.

**RHONDA:** It's a lot to keep track of!

**JENNIFER:** So, back to the research for a minute. Can you talk about a breakthrough that happened through the scholarship that was happening within the library?

**RHONDA:** I think one really great example is a recent book that was published called A Curious Herbal. And I think what's really fantastic about that is that it tells the story of Elizabeth Blackwell, who was a botanical artist, and she published her book called A Curious Herbal in about 1790.

And so the more recent book about her work brings to light a story that was not as well known.

An undertold story about a field where there still is not a lot of women. And so having her story told and having her original work here in the Library is really important and really special to us.

**JENNIFER:** So right now we are in the Rare Book Room of the Library. Can you tell me a little bit about what's different about this collection compared with the rest of the collection of the Library?

**RHONDA:** Our Rare Book Room has over 20,000 books and folios. So folios are just kind of the very large books. And this collection that's specifically in this room, everything dates from the very late 18th century and then goes all the way back to 1190. Yes, so it's one of our very, special items called Circa Instans and it's one of the very first Western books on pharmacology.

It was created by monks in Salerno, Italy. And we acquired it through the collection of a man named Emile Starkenstein.

His history was in pharmacology; it was during the Holocaust and he was taken to a concentration camp. And his family knew how much that he loved his books, and he loved this wonderful rare book collection that he had built. And so they took it and they kind of hid it among different areas in the Black Forest.

And so, unfortunately, he did pass away in the concentration camp, but they went back and they collected his library, and they took care of it. And eventually, we were able to acquire it here at the New York Botanical Garden.

He didn't just provide our oldest book and one of our most famous books here at the Library, but many other works here belong to that collection as well. And as a librarian, you always see that connection between books and people. And here, as we're purposeful plant people, we get to find that connection between plants and books and people.

And his story is, of course, you know, very sad and tragic. But think about the fact that the New York Botanical Garden really helps his legacy live on by the fact that we are the stewards of his books. And the Circa Instans is such an important piece of botanical history, and we have that here, and it's digitized so people can view it digitally, scholars can use it.

**JENNIFER:** So maybe this is a question you've gotten before, I don't know: Why come to a library instead of just Googling?

**RHONDA:** Yes, you know, librarians get that question all of the time. And so I can give you a long answer, I can give you the short answer.

**JENNIFER:** Medium. Give me a medium answer.

**RHONDA:** The medium answer is, you know, as much information as there is on the internet, not all information is on the internet. There's still so many things that are not available on the internet. And, one of our big goals here at the Library is to eventually digitize more of our collections, because we do understand that is a primary way that people seek information now.

Manuscripts, archival material, rare book, ephemera, is not on the internet. And so sometimes you do have to go to the physical spaces to access those materials or to learn those stories. And you're able to pull all these different books off the shelf, to look at the different materials, to ask the reference librarians to help you.

**JENNIFER:** To sort of follow your curiosity, and not in an internet rabbit hole kind of way. So I know that the Mertz Library is considered a special collection. And I know that many times special collections aren't really open to the public. But this collection is and that's been a priority for us. So why is that important here?

**RHONDA** It's really important here because, the saying goes that knowledge is power, right? And so being able to have access to knowledge, it has changed the course of history. It changes people's internal lives.

We want anyone who is curious about plants, the history of plants, the connection between plants and people to come here and explore their curiosity. And so it's really important to us that we have that open. And also, we are in the middle of the Bronx and we want to make sure that we continue to foster a strong connection with our Bronx neighbors.

You can come and you can browse the shelves, you can just sit and do your own research, or you can talk to a librarian about accessing some of these special and rare materials.

**JENNIFER:** It sort of reminds me of, you started with the story of what inspired you to become a plant person, your grandmother, and she didn't graduate from high school, but she had access to a library. So it's important for all kinds of reasons.

You touched on it a little bit, but digitization has been a big drive here and at many libraries, of course. Why is that so important and what has it enabled us to do here that's different?

**RHONDA:** Yeah, so, digitization is important for many different reasons. It's a preservation tool, but for me, one of the biggest reasons that preservation is important is access. We do want people to come into the space. We do want people to come in and talk to librarians, but that is not always available to everyone. So if you can't come into the Library, we still want to try to make our collections accessible to people. So by digitizing it, we're hoping that someone who's in France or in Senegal who wants to use our materials and can't make it to the Garden can still find a way to access it.

**JENNIFER:** Okay, so we were talking a bit about the scope of the collection. We have the circulating collection, what visitors can access when they visit here, the 12 million items in our archives. What does it take to steward all of those collections?

**RHONDA:** It takes a lot of work and a really skilled staff, which we have here. So we have conservators here at the New York Botanical Garden Mertz Library, who are the ones who really take great care of all of the books, all of the artwork and all the special collection. So they clean and repair and build special cases and boxes for our collections.

**JENNIFER:** When we get a rare book or something unique, they have to sort of bring it back to life a little bit and then put it in a position where it can be properly cared for. Is that what that means?

**RHONDA:** Exactly. And so, they can do all different kinds of treatments. And so one of the treatments that people are really surprised about is washing. People don't realize you can wash books and you can wash paper.

**JENNIFER:** Yeah, the first time I saw it, I thought, what are they doing? They're going to ruin that book. But that's how they do it. They wash it.

**RHONDA:** Yeah, they wash it. They repair bindings. We have great catalogers here who make the cataloging records that you find when you're searching online for what we have.

And they don't just, you know, put the information and metadata about the book. They do research. They try to find out the history, the provenance, what makes that book special. So it takes a lot, but it's a great team who work really well together to take care of and provide access to the books.

**JENNIFER:** Okay. So I hear that you have brought a surprise item. I can't wait to see it. What is it?

**RHONDA:** So one of the things – and you kind of mentioned this – that I want to highlight is even though we're a library, we don't just have books. And so kind of to describe to the listeners here, this is a poster from World War One and this is a poster promoting what was called 'victory gardens' or 'war gardens'.

And so back, you know, uh, during World War One, if we wanted to communicate a message, you know, they didn't have social media.

**JENNIFER:** Right, they didn't post about it, yeah, they did a poster.

**RHONDA:** They did a poster, exactly. Instead of posting. And, and one of the messages they wanted to spread was that they wanted people to plant their own vegetable gardens. Because there was a food shortage in Europe during the First World War, and we were trying to provide aid. And in this poster, you'll see Lady Liberty and she is a kind of looking off very serious into the distance.

**JENNIFER:** But also full makeup.

**RHONDA:** Full makeup. Her dress is the American flag.

**JENNIFER:** Beautiful dress, and not great for gardening.

**RHONDA:** But, and she's walking and she's letting the seeds just fall out of her hand. And one of the great things is, you know, maybe you didn't know how to plant your own vegetable garden. Well, that's okay. Because on the poster it says you can write to the National War Garden Commission and you can get a free book on gardening.

**JENNIFER:** Yeah.

**RHONDA:** And so I have just to accompany here one of these, one of these booklets that you would, that you would receive if you wrote to the War Garden Commission.

**JENNIFER:** So if you wrote, you would get this. You would get this back.

**RHONDA:** So you would get a little booklet.

**JENNIFER:** “War Gardening and Home Storage of Vegetables”.

**RHONDA:** Exactly. And I love this because it's still relevant today because what they were trying to teach people was how not to waste food, how to grow your own food, how to preserve food.

**JENNIFER:** Empowering people with plants.

**RHONDA:** Exactly. Empowering people to feed themselves, to store vegetables, they could have it, but also again, thinking about how gardening and plants connect to history. If you had your own victory garden, if you had your own war garden, you were not just gardening, you were contributing to the war effort.

**JENNIFER:** You were patriotic.



**RHONDA:** You were patriotic. So it's just a really unique part of history that we hold here in the Mertz Library.

**JENNIFER:** It's amazing. Thank you. Thank you for sharing that.

**RHONDA:** Sure.

**JENNIFER:** Well, Rhonda, it's been so fun talking to you. I love being here in the LuEsther T. Mertz Library and everything that you and your team do is so incredible and it was just a pleasure. So, thank you.

**RHONDA:** Thank you, Jennifer.

BREAK MUSIC

**JENNIFER NARRATION:** That was my colleague Rhonda Evans, Director of the LuEsther T. Mertz Library here at NYBG. We invite you to check out our library from anywhere at [nybg.org/learn](http://nybg.org/learn).

You can even send us your gardening and plant questions, and our experts will be happy to help. Here are just a few questions we've received recently: "When is the best time to prune roses?" "How do I grow kiwi?" and "How do you care for a Venus fly trap?" You can find answers to these questions and many more through our Library.

Right after the break, I invite another Garden colleague here into our Rare-Book-Room-turned podcast studio. Not surprisingly, books are great at sound-proofing, on top of keeping us up to date with our plant knowledge. More on how plant collections help us thrive, shortly.

[BREAK]

**JENNIFER NARRATION:** This is Plant People from NYBG. I'm Jennifer Bernstein.

So now you know we have a library and why it matters. But we don't keep plant specimens in our library. That's where our William and Lynda Steere Herbarium comes in. A herbarium is a collection as well -- for plant specimens collected from

all over the world. The specimens are pressed, dried, and mounted on paper, and then kept in climate-controlled storage here at NYBG.

Rhonda says that when they work together, the Mertz Library and the Steere Herbarium tell a complete story of each plant specimen. The Library has the field notes, the books, the history. And the Herbarium has the specimens archived and available for study.

Here with me now in the Library's Rare Book Room is a colleague from the Herbarium.

**JENNIFER:** It's so good to be with you today. So, maybe if you could start out just by introducing yourself. Who are you, Emily?

**EMILY SESSA:** I am Emily Sessa. I am the Patricia K. Holmgren Director of the William and Linda Steere Herbarium here at the New York Botanical Garden.

**JENNIFER:** Wonderful. So, how did you, Emily, become a plant person?

**EMILY:** So I grew up not too far away from the Garden, just a little bit further upstate in New York, and I'm an only child, and I spent a lot of time running around in the woods, and just playing with plants, and observing nature, and I think I've always been kind of oriented towards plants.

It might have something to do with the fact that my favorite color is green, so kind of tuned into them from the beginning. Being surrounded by them and thinking they're really beautiful and then getting older and thinking that they're more than beautiful, they're also really interesting.

**JENNIFER:** Time in nature as a child is a common thread for so many people about why it is that they care about plants or why they work with plants or why they're even gardeners. It's those childhood experiences that I think really plant the seed, which is a big part of why we do what we do here. So can you tell us what is the Steere Herbarium?

**EMILY:** Yeah, so the herbarium, or herbaria in general, they're a type of biodiversity collection, that houses representatives of the world's flora and funga in the case of herbaria. So, biological collections in general, whenever scientists are going out in the field, they're doing their research, they're making collections of the

organisms that they're studying, it might be capturing a fish or a bird or in the case of plants they're taking a sample of that plant material and they're going to preserve it in some fashion.

With plants it's usually we're drying things as quickly as we can and then they get brought back to these institutions that are these collections and they get curated and then they get stored there for the future. Artists, educators also might use them, but they really are serving as kind of a primary record of biodiversity on Earth that people can come back to for decades and even centuries to know what was in a particular place in the past and study all kinds of aspects of those organisms, thanks to having physical collections that were collected all through time.

**JENNIFER:** So you said centuries. We do have specimens in our collection that go way back, right?

**EMILY:** Yeah. So herbarium specimens, the way that we preserve them now is the way that they've been preserved for around 300, 400 years. And we do have specimens in our collection that date back to the earliest history of herbaria, of sort of modern herbaria.

**JENNIFER:** Which is amazing.

**EMILY:** We have three and a half hundred years, 350 years of the Earth's flora documented in our building, on our grounds at the New York Botanical Garden.

**JENNIFER:** How many specimens?

**EMILY:** About eight million.

**JENNIFER:** Eight million. The specimens are inspiring objects and they've inspired a lot of different types of work.

**EMILY:** They're amazing inspirational objects for educators, for artists, and even for some of our own young staff members. A lot of our digitization efforts are done through grants that are funded by the National Science Foundation, and, we have a number of interns who do a lot of the imaging and a lot of that digitization process and transcribing the labels as part of that work. So many of our interns are just out of college, they're really excited about collections or about museums and they're trying to get some experience to figure out what their next path in life is gonna be,

and so they come and do like a six-month internship with us and they spend that time in the Herbarium diving into specimens and learning all of the workflow of taking care of them and getting them digitized.

And what often happens is that they'll get so into a specimen that they just--

**JENNIFER:** They want to know its backstory.

**EMILY:** Yeah, they like go down the rabbit hole of a particular specimen or set of specimens or collector; you'll get to recognize the handwriting of a particular collector.

**JENNIFER:** And you wanna know more about this person.

**EMILY:** And you want to know more. And we have this amazing library here. And so, they'll put together the pieces of these stories that they get really interested in. Another community who has taken inspiration from the herbarium and who uses the collections regularly are artists. And so a wonderful example of that was the artist Ebony G. Patterson who in the summer of 2023 was the Garden's show-stopping, amazing summer exhibition. And the inspiration that she took from the Herbarium was that she was very interested in exploring themes of extinction. And we pulled for her all the specimens that we had in the collection of extinct plants.

So we've got, it's not a huge number which is nice, but we have maybe 20 to 30 specimens of plants that are extinct in the wild and she spent a lot of time with those and they ended up inspiring these really beautiful clouded glass sculptures that she made of plants that are extinct. And she posed them in our Conservatory so that you could see the ghosts of these extinct plants.

**JENNIFER:** They were haunting. They were beautiful.

**EMILY:** Yeah, it was really moving to see what this amazing artist made of our Herbarium collections.

**JENNIFER:** So, our focus this season is about how it is that we help nature thrive and how nature helps us to thrive. Can you talk a little bit about how you think a collection like a herbarium does this?

**EMILY:** I see humans, I see us as part of biodiversity. Like we are part of nature. We are part of life on this planet.

**JENNIFER:** Right, we're not separate from nature.

**EMILY:** And we are so intimately intricately tied to all of life on this planet and plants are producing the air we breathe. They're producing, the building materials that we use to make the structures we live in. They're making our foods.

**JENNIFER:** Our clothes.

**EMILY:** Our clothes. So understanding plants is fundamental. We have to understand these organisms, to understand ourselves, and to understand how we can live in a world that we're rapidly changing. and plants are remarkably resilient in a lot of ways, but, we're certainly learning ways in which they maybe are not so resilient and trying to understand what our future looks like for our species living as part of this interconnected web of biodiversity on this planet.

**JENNIFER:** So you've brought a specimen to share. Tell me what it is.

**EMILY:** I've brought, so I have a folder full of specimens here, so you'll be able to hear the sound of me opening these folders. Um, and I know you're from New Mexico.

**JENNIFER:** I am.

**EMILY:** I did my background, my research before coming here.

**JENNIFER:** Is it gonna be a yucca?

**EMILY:** It's a yucca. It's multiple yuccas. It's some of our most beautiful yucca.

**JENNIFER:** Oh, I'm so excited!

**EMILY:** So, they're from a variety of states. So this first one is from Nevada.

**JENNIFER:** This is the New Mexico state flower.

**EMILY:** It is. And there's a, there's multiple species among the set of specimens I've brought.

**JENNIFER:** Okay, so I'm looking at one from Nevada.

**EMILY:** And they're, they're really beautiful. So yuccas have these--

**JENNIFER:** *Yucca brevifolia*.

**EMILY:** *Brevifolia*. They have really, really pointy leaves and quite large flowers. And when they're alive, the flowers are a really lovely creamy white color. And then they dry to, I think, a beautiful range of sort of yellows and browns and tans and taupes. And they also have a delightful feature, which is that their leaves have these curly little strings that come off of them. And you can see that quite nicely on some of these specimens.

**JENNIFER:** Okay, so you've got a few here.

**EMILY:** I have a few, yeah. I was told to bring just one and I couldn't.

**JENNIFER:** So this was, it looked like this was collected in Colorado?

**EMILY:** That one was Utah I think. Yeah, that's Utah. Absolutely. This one, this one's Arizona. The one you're holding is New Mexico.

**JENNIFER:** You know, I don't want to pick favorites, but... I like the New Mexico one.

**EMILY:** Well that new, the New Mexico one is particularly beautiful. And so these are, you know, the geography we get from the labels. So we've got four specimens from four different states here. Um, and I wanna give a shout out to Matthew Pace, who's the Assistant Curator of the Herbarium who chose, helped choose these.

**JENNIFER:** Yeah, they're beautiful. They're beautiful. That's what I love about these specimens. They, you know, they're scientific collections, of course and they're used primarily for scientific purposes. But they're so artful and beautiful. And they also tell a story.

**JENNIFER:** Can you talk about one of the specimens in our herbarium that sort of changed your perspective or gave you a different understanding on plants?

**EMILY:** So I'm a fern specialist. Ferns are the plants that I love the most. So I did my Ph.D. research on a group of ferns called the wood ferns. And I'm not going to pick a specimen. I'm going to give you a set of specimens.

**JENNIFER:** Are they going to be ferns?

**EMILY:** They are.

**JENNIFER:** This is one thing I love about botanists. They really do get attached to their plant family, and there is a sort of sense of pride of being a specialist in this or that. And, you know, maybe there's beef. I don't know. I kind of gather that there is. It's like all things.

**EMILY:** My plant is better than your plant.

**JENNIFER:** Yeah. My plant is better than your plant.

**EMILY:** I remember visiting the Steere Herbarium, when I was in graduate school, to look at our collections of *Dryopteris*, which is the genus of ferns that I was working on. And it's like a one stop shop. You could do the work by visiting here, because our collection is so big, it's so rich, that you might have to go and visit five other institutions maybe to get the same diversity and variety. And for a poor grad student, it was amazing to be able to just come to one place.

**JENNIFER:** That's amazing. I know that we welcome scientists from all over the world, and so I'm interested in hearing more about why is it that a scientist from Brazil or Germany or New Zealand or wherever they're coming from would need to visit this collection?

**EMILY:** If you're a scientist working with plants, there are times when you are just going to need to look at the specimen.

You're just going to need to see it. So one thing that we do, as a really extensive part of our activities now is we do digitize our collection. And we are working through our nearly eight million specimens.

**JENNIFER:** Eight million, right.

**EMILY:** As fast as we can, which is not fast enough, to try to get them all digitized. And they're like roughly half digitized now.

And part of that digitization process is getting a high resolution, beautiful image of that specimen, which we put online on our Virtual Herbarium. And those are freely accessible under a Creative Commons license, so anyone in the world can download them, can use them for whatever they want to. It's a service we provide to the global community.

So those images are amazing, but sometimes you just need to see the specimen. Maybe there's a microscopic character that you just can't make out even in that high resolution image. Maybe there's something about the color or the texture or parts that aren't visible in the image that's hidden underneath a piece of the leaf or something like that.

But there's also what you can get from the specimen. And so we allow destructive sampling of our specimens, which means that we allow researchers to take hopefully a very small piece of a leaf usually that they can use to extract DNA.

They can do various types of chemical analyses. You can do things like measure isotopes to figure out what carbon dioxide concentrations were like in the air at whatever period in time you're interested in. One of my favorite examples is that there are a number of plants that have tiny little fragments of glass called silicates, very microscopic. Their density or their concentration might be responsiveness to fire or to grazing or to these sorts of things.

**JENNIFER:** So you can tell the environmental conditions at the time that the collection was taken based on that? That's incredible.

**EMILY:** So you can actually, you can, like, collect a data point 50, 100, however many years after the actual specimen was collected.

So each of our specimens, it's the plant, or the fungus, or the lichen, or the algae, or whatever it is, the actual organism. But then, the other really important part of the specimen is the label. The label is just as important as the actual organic material, because the label tells us who collected it, and where they collected it, and when



they collected it, and that just opens up a whole huge other range of things that we can do with these specimens.

**JENNIFER:** You were talking about the isotopes and all of the ways in which we're using these natural history collections that really weren't even imagined at the time that many of these specimens were originally taken.

We have a Darwin specimen in our collection. When he was making that collection, he had no idea that we would be extracting DNA or understanding the environmental conditions based on the specimens. There are all of these new technologies coming online right now, which are allowing us to think about these data sets in very different ways.

**EMILY:** I think about the herbarium actually as a data set. I think about the whole building as a giant data set because the plants and fungi themselves have data, and then there are all these label data that we were just talking about.

The people who were making these collections two and three hundred years ago, as you just said, had no idea what their potential uses might be. And that also, to me is inspiring and also daunting, too, that like we have a responsibility to continue maintaining these things.

**JENNIFER:** To the future.

**EMILY:** Yeah, for the scientists of the future. So it's like we have this responsibility to kind of keep these things going and carry them into the future.

**JENNIFER:** Right.

**EMILY:** You can't overstate how transformative DNA has been. The fact that you can use these specimens to get DNA, is amazing. So much of what we know about just the basic fundamental relationships among all groups of organisms now is based on DNA. As we think about climate change and we think about how organisms are going to respond to the environmental challenges of all kinds, having those data that really allow us to reconstruct what the histories of these organisms have been.

**JENNIFER:** AI can help with that?

**EMILY:** AI can help with that. In fact, if you've heard of niche modeling or, some of these, scientific, analytical approaches for making predictive maps of where plants might be in the future, that actually is using AI already, to do some of that.

**JENNIFER:** AI is not actually new.

**EMILY:** Yeah. If you've got a lot of herbarium specimens of a species or of a particular place, you can reconstruct what, the relationships between those organisms and their past climates might have been, and then make predictions into the future based on how we know that the climate is going to change or how we would predict that the climate is going to change, what's going to be able to live there. And that's not just presence or absence sort of thing, we can actually say with a level of predictability and confidence, like there's a 70-percent chance that if you go there a hundred years from now, you can say yeah, with a level of confidence, whether you're going to find that same species or not.

**JENNIFER:** And that'll inform restoration efforts too.

**EMILY:** Yeah, absolutely.

**JENNIFER:** So I wanna hear more: why ferns?

**EMILY:** They're beautiful. Honestly, that's, that's really my first and best answer.

**JENNIFER:** Okay. That's a good answer.

**EMILY:** I kind of think of them as like some of the underdogs of the plant world. Like they don't have these showy flowers. They don't have fruits, like any of those things that you might think about when you're walking around a garden. They don't have any of that. I feel like they just leave you with the greenery and the basic, underlying biology of that. There's so much that we don't know about them. That's true of basically any group of organism, but it just, it struck me particularly that there was a lot to learn about them.

**JENNIFER:** And you've done some really interesting research about how ferns were among the first species to come back after extinction events.

**EMILY:** Absolutely, ferns have this really interesting, and I would say underappreciated phenomenon in the fossil record. That if you look at the fossil

record following major mass extinction events, and, you can see this most sort of spectacularly if you look at the K–Pg mass extinction event at the end of the Cretaceous. So this is the one that killed all the non-avian dinosaurs and half of all plants and animals on earth. Half gone, whew, just wiped. So if you look at the fossil record for right after that event, what you basically see is, as you might expect, there's no pollen or spores.

That's called the palynological record. So the record of pollen and spores; it doesn't sound very exciting, who would want to look at pollen all day, but in fact pollens and spores, they're very beautiful and extremely informative. Because, you imagine like a leaf is not going to necessarily fossilize very well, but pollen and spores actually do fossilize very well.

They have a hard coating around them that's like UV-resistant and drought resistant so they don't degrade as easily as a leaf does. So if you look at that record of the pollen and the spores, what you see right after that extinction event is, again as I said, as you might expect, the planet's kind of wiped clean. The first thing that comes back is the ferns. So, it's called the fern spore spike, it literally has a name.

**JENNIFER:** The fern spore spike.

**EMILY:** The fern spore spike. Yeah.

**JENNIFER:** So resilient, these ferns.

**EMILY:** Yeah, very resilient. If you're in roughly the right sediment layer, and you find this fern spore spike, you can put your finger on that as the K–Pg boundary, as the mass extinction event.

**JENNIFER:** The question becomes why, what makes them capable of coming back?

**EMILY:** Exactly, yeah. And so, this is what I mean when I say that they're underdogs. This phenomenon was recognized since the early '80s, and nobody asked that question. Why? Which, to me, was the first thing I wanted to know when I heard about this. Yeah, so I set out with a group of collaborators, there were five of us, five PIs, all at different institutions and with different expertise, tackling this question from various different angles to try to figure out, basically, why.

**JENNIFER:** And if we wanted to go and live on Mars, maybe we would bring some ferns with us?

**EMILY:** We might strongly want to consider that. And, one of the wackiest things I've ever written in a proposal to a federal funding agency was – we literally put that in. And it's very small. It's one sentence at the end. But, you know, if you're considering terraforming Mars, if you're considering life on another planet, it would be really nice to know what was able to live on our planet when our planet looked a lot like Mars does. Which our planet did.

I don't actually recommend actually that we try to go to Mars anytime soon, but ferns would be in my backpack if I were going to do that.

**JENNIFER:** Good to know. We talked to Rhonda Evans of the Library...

**EMILY:** Our wonderful Library Director.

**JENNIFER:** And we talked to her about that wonderful collection.

**EMILY:** There is so much interaction and exchange between the Herbarium and the Library and even at the level of the materials we have. Those staff are constantly talking to each other and asking each other questions. One of my staff was just telling me today that she's been going back and forth with one of the Library catalogers because he needs information about species that she's a specialist in.

**JENNIFER:** It's an amazing set of resources. So how does an individual, a New Yorker or someone visiting, how do they become involved or understand or connect to what's happening in the Herbarium?

**EMILY:** Well, they listen to the podcast first.

**JENNIFER:** Yes, that's step one.

**EMILY:** We do tours both occasionally for the public, on Earth Day, for example, and other sorts of events around the year. We also do tours for Members of the Garden, so there's lots of opportunities for members of the public to come and see the space in person. There's also the Virtual Herbarium, as I mentioned, and so if you're interested in exploring what our specimens look like, that's very easy to do.

We also have opportunities for volunteers. Both in person, on site, and online. So we have volunteers helping us image our specimens, we have folks who help us actually mount the specimens, which means taking the preserved specimen that we get from the scientist in the field and actually doing the work of arranging it on paper and gluing it or sewing it, so we have lots of folks who help us with those activities that are really essential.

But then part of the digitization process – so we take these amazing high resolution photos of the specimens, but how do we actually get the data from the label into our database? And then online in a way that it's searchable. And part of that can be done with AI, part of it can be automated. But especially if you think about our historical specimens, of which we have many millions.

There's a lot of handwriting and a lot of challenges for computers and AI with interpreting handwriting.

**JENNIFER:** Old timey handwriting.

**EMILY:** Oh yeah, beautiful, beautiful, yeah, beautiful old cursive. But sometimes it just needs a human. It just sometimes it just needs a pair of human eyeballs to look at it and do that transcription.

And it can be very, almost like therapeutic if you just like sit on your couch and we use these wonderful, online based platforms where we can upload a set of images and there's instructions for how you do this, and then you can just sort of sit and look at the label and then type what you see and then you go on to the next one.

**JENNIFER:** Well, Emily, you're so much fun to talk to this. The Steere Herbarium is such an incredible place.

And I think really un under known, you know. Here we are, eight million specimens, facilitating the work of researchers all over the world. And so I'm just excited to talk to you and tell that story.

**EMILY:** Thank you. Yeah. Thanks. It's amazing. Just right here in the Bronx. You have the whole world's flora at your fingertips.

**JENNIFER NARRATION:** It's astounding to think about all the biodiversity knowledge we've yet to uncover. To learn more, and help us digitize our archive

visit the Herbarium at [sweetgum.nybg.org](http://sweetgum.nybg.org). We could use your help transcribing hundreds of years of handwritten notes!

Next episode, I'm happy to be joined by a dear friend of NYBG, Edwinda Von Gal, as we chat about our national obsession with lawns and how we can help our lawns flourish naturally.

Thanks for listening to Plant People. We're excited to bring you more stories about plants and the people who love, study, and care for them in new episodes dropping every two weeks.

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