Getting Curious with Jonathan Van Ness & Dr. Alex Monro

JVN [00:00:01] Welcome to "Getting Curious". I'm Jonathan Van Ness. And every week I sit down for a 40 minute conversation with a brilliant expert to learn all about something that makes me curious. On today's episode, I'm joined by botanist and research leader at the Royal Botanic Gardens Kew, Dr. Alex Monro, where I ask him, "How do plants get their freak on"? Welcome to "Getting Curious". This is Jonathan Van Ness. We are with Dr. Alex Monro, who is a botanist at the Royal Botanic Gardens. So picture it. We're kind of, we're in London, right?

ALEX MONRO [00:00:40] Yeah. On the edge of London.

JVN [00:00:41] On the edge of London and we're at Kew Gardens, which is?

ALEX MONRO [00:00:45] It's the world's biggest botanical gardens and Botanical Research Institute. So it combines natural park like landscape with amazing collections of living plants. And then a giant collection of dried herbarium plants, which, for example, that I study on.

JVN [00:01:01] I think I just saw a tree that was from 1775.

ALEX MONRO [00:01:06] Yeah. Yeah, you would have. Yeah. So-.

JVN [00:01:08] That is wild. That's like that was like the Boston Tea Party and the Battle of Bunker Hill-, not to bring up a sore subject in the United Kingdom. You know? But I think that wasn't the same year.

ALEX MONRO [00:01:17] Yeah, yeah. Probably.

JVN [00:01:18] Like wow. That's old. Kew Gardens has really been like a living, breathing museum for plants, where, where people can come view them. You can see these big, beautiful glass houses they have like palm trees. And I also saw this like one glass house place. It looks, it like mimics like high altitude-.

ALEX MONRO [00:01:36] Oh, yeah, yeah. The palm, the Alpine house.

JVN [00:01:38] What's the deal with the, how, do you know, why? Why does it mimic a high altitude? Yeah.

ALEX MONRO [00:01:42] Because they have to generate cold air in the summer because it it's kind of too hot in the summer for it to be alpine. And in the spring they like to kind of get some of the early warmth they can kind of so that they can have the plants flowering. So it's a really nice greenhouse because they bring plants in when they come into flowers. It's always full of flowering things.

JVN [00:02:00] Interest.

ALEX MONRO [00:02:01] Yeah.

JVN [00:02:01] Love that. So when, ok so now and then there's also the seed bank.

ALEX MONRO [00:02:06] Yeah.

JVN [00:02:07] Which that is like. So this is like a three hundred acre, like big rolling, like hilly, lakey like space. But then the seed bank is like not like that.

ALEX MONRO [00:02:20] No, the seed bank is a vault for storing seed and it's one of the probably only places in the world where you have I think it's 10 or 20 percent of the world's diversity of plants.

JVN [00:02:31] So it's almost-.

ALEX MONRO [00:02:32] It's like an ark.

JVN [00:02:33] Did you ever see "Panic Room" with Jodie Foster in the early 2000s and-.

ALEX MONRO [00:02:39] No.

JVN [00:02:39] And Kristen Duns-, or not Kristen Dunst. Kristen Stewart. Kristen Stewart. It's a classic. It reminds me of "Panic Room", but for plant-, seeds, basically. So what's the importance of a seed bank? Like, what is it? So basically she's like a vault with a ton of seeds.

ALEX MONRO [00:02:55] Yeah, but it gives so much. And it sees, it sees the potential plants when it's planted out, you can, you can then. So that seed is protected and saved and conserved and the habitats maybe being destroyed by logging or farming or whatever. And then in the future time if you want to restore, rescue those species, they become incredibly rare, which a lot of them are. You could take that seed, germinate it and implant it back where it came from.

JVN [00:03:19] Are any seeds, the seed bank ext-, like are the plants extinct? Are any of them?

ALEX MONRO [00:03:25] Yeah.

JVN [00:03:25] Really?

ALEX MONRO [00:03:26] Yeah. You should go.

JVN [00:03:29] That's incredible.

ALEX MONRO [00:03:29] Yeah.

JVN [00:03:30] So now-.

ALEX MONRO [00:03:31] I mean, extinct in the wild. Obviously.

JVN [00:03:33] Yeah.

ALEX MONRO [00:03:33] 'Cause they are in the seed bank but yeah.

JVN [00:03:36] That's really incredible what do you by the way.

ALEX MONRO [00:03:38] Yeah.

JVN [00:03:38] Do you know? Well, not to pull out a seed bank question 'cause I know that's like not your main thing, but do we know when it was built?

ALEX MONRO [00:03:44] The seed bank?

JVN [00:03:44] Yeah. Like, how long has it been there?

ALEX MONRO [00:03:47] 2000. It's a Millennium Seed Bank because it was built to celebrate the millennium.

JVN [00:03:51] Now, millennium is all in context.

ALEX MONRO [00:03:53] Yeah.

JVN [00:03:53] In the title of the millennium seed bank. Got it. And that's a part of Kew Gardens. OK. Everything's come into focus for me. So now you, Dr. Monro. So like you're just minding your own business in the United Kingdom when you were little, when you realized you wanted to be a scientist?

ALEX MONRO [00:04:08] I never really wanted to be a scientist. I think I really wanted to explore and go into forests. I loved being in forests. I was obsessed with wildlife or nature, insects in particular actually.

JVN [00:04:19] Insects?

ALEX MONRO [00:04:20] When I was little. Yeah, I loved insects. When I was three, I used to go out into the garden with a plastic bag on my hand and catch bumblebees and keep them in jam jars, which I think is probably cruel, but-.

JVN [00:04:30] You know, we actually did an episode on "Getting Curious" called "How Can We Be Less Rude to Bees".

ALEX MONRO [00:04:36] Yeah. So I was very rude to bees.

JVN [00:04:38] Well it's ok, you were curious. You you were "Getting Curious" when you were really little. So how did your life lead you to being-. Because your title. Because we love a title and you got several. You're a doctor. You're a botanist. And you're also, aren't you like another "ist"? Like isn't there like, like a tax, are you not-?

ALEX MONRO [00:04:54] Taxonomist.

JVN [00:04:55] Yeah.

ALEX MONRO [00:04:55] Yeah. I am.

JVN [00:04:56] Aren't you that too?

ALEX MONRO [00:04:56] Yeah, I am in taxonomist as well.

JVN [00:04:57] How dare you give me that questioning look in your face like I was like getting your credentials wrong?

ALEX MONRO [00:05:01] No, because-.

JVN [00:05:01] You terrified me.

ALEX MONRO [00:05:02] I was worried what you were going to say.

JVN [00:05:04] No.

ALEX MONRO [00:05:04] I was just thinking of all the things end in "ist". Like bigamist or whatever. That's what I was worried about.

JVN [00:05:07] Oh no, not like it. No, I meant, no like when you're, when you're a doctor. I feel usually it's kind of fierce, you know, biologist or like a-.

ALEX MONRO [00:05:15] Yeah.

JVN [00:05:15] So it's a taxonomist?

ALEX MONRO [00:05:15] A taxonomist is a classifier of things. So we kind of we say what they are, we identify them, but we also describe and identify new things. So if you think you've got a new species, we're the ones who say we think yeah, this is new and then we describe it.

JVN [00:05:31] My friend really likes to name plants a lot. Well, like 'cause there a landscape architect.

ALEX MONRO [00:05:38] Yeah yeah, of course.

JVN [00:05:38] So like a fatsia japonica or something?

ALEX MONRO [00:05:41] Yeah.

JVN [00:05:41] What's the deal? That's like something from Japan.

ALEX MONRO [00:05:44] Yeah. Yeah. So Japonica means Japan like some relationship to Japan. Yeah.

JVN [00:05:48] So if we're here, is juniper from Japan? "Juniper" sounds a little "Japonica"-ish.

ALEX MONRO [00:05:49] No, juniper isn't. It's "juniper". It's not "japonica". No.

JVN [00:05:55] Oh. Why am I so basic? It sounds the same to me. No.

ALEX MONRO [00:05:55] Yeah, so like we tend to have those two parts of the name. It's a binomial-.

JVN [00:06:01] Genus and species.

ALEX MONRO [00:06:02] Genus and species. The genus is like the group of things which we say are more related to each other than sort of the other things. So that's the genus.

JVN [00:06:09] Wait, why is it more related to another thing?

ALEX MONRO [00:06:11] Because for evolution, obviously, like everything is, so we're all related to each other, and all living organisms are related to each other, but obviously we're way more related to each other than we are to grass.

JVN [00:06:20] That's cute and fun to think about, that we're all kind of related.

ALEX MONRO [00:06:24] Yeah, we are. Yeah.

JVN [00:06:24] Yeah. Tell me more about that.

ALEX MONRO [00:06:28] Well, that's evolution, that's the major assumption behind evolution, which is the thing speciate. So you have one species and then it splits into two species and that's the process.

JVN [00:06:38] Got it.

ALEX MONRO [00:06:39] Yeah.

JVN [00:06:39] So taxonomists you had to learn all about like all that like the titles and all the things. Yours is more about like discovering new things.

ALEX MONRO [00:06:46] Yeah, that's main job.

JVN [00:06:47] But I jumped around too much because I really want to know how you became one.

ALEX MONRO [00:06:50] Yeah. OK. So how I did become one? Well, actually, I wanted to be an entomologist as a kid to study insects. And then when I went to university, I thought it's a really bad idea to study your favorite subject. So I study biology.

JVN [00:07:00] Why?

ALEX MONRO [00:07:01] Because I was an idiot and I just thought I was being clever, but I wasn't.

JVN [00:07:05] Are you sad now? Do you want to study insects?

ALEX MONRO [00:07:07] No, I don't. But I have moments when I think, why did I do that?

JVN [00:07:11] Well, honey, it's never too late. You can go back and become an entomologist.

ALEX MONRO [00:07:14] It is too late.

JVN [00:07:15] It's not. You're a literal baby.

ALEX MONRO [00:07:18] I don't think so.

JVN [00:07:19] If you want-. If you felt like it, you could.

ALEX MONRO [00:07:21] I'm a very, very old baby.

JVN [00:07:22] I think it'd be really fun if you like, all of a sudden, like through all of academia on its heels. And we're like, no, Dr. Monro is gonna go back and become an entomologist now.

ALEX MONRO [00:07:30] But anyway, I did. And I had this love for forests so that was kind of what drove me really. So I did a degree in biology, and through that I did an expedition to the Bolivian Amazon, which was amazing. We spent two months camping in the Amazon and I just, it cemented the fact that I wanted to work in tropical forests.

JVN [00:07:47] What was going on in the Bolivian Amazon forest then?

ALEX MONRO [00:07:50] So we were collecting trees. We were doing. It was a really remote, unexplored area and it was very rich in primates. I think it's still the richest place in the world for primates with like twelve or thirteen species of monkey in any kind of forest.

JVN [00:08:04] Where's Bolivia in relationship to Brazil? Is it in central or south.

ALEX MONRO [00:08:07] It's kind of next to Brazil. It's north, northwest.

JVN [00:08:11] So it's in South America, but it's like on the upper part of it.

ALEX MONRO [00:08:14] Yeah. Brazil, yeah. So the Amazon sort of extends across into Bolivia, Peru, Ecuador, Colombia.

JVN [00:08:21] Interesting. Love that. So you're there for two years, like in your early 20s, like were you-.

ALEX MONRO [00:08:25] No, two months. We camped for two months.

JVN [00:08:27] Two months, two months.

ALEX MONRO [00:08:27] We were students, we were like, I think I was 19 or 20.

JVN [00:08:30] I love that.

ALEX MONRO [00:08:30] Just a bunch of us. Yeah, it was totally nuts really.

JVN [00:08:33] What was goin-, like? Were you aware of like, did you have to like take any certain precautions, like when you all went there? Or like had to be careful of like?

ALEX MONRO [00:08:42] I guess we should have. We were like, we were students and it was really excited and we're collecting, climbing up trees. You know? Kind of 60 foot trees or higher.

JVN [00:08:50] Love that.

ALEX MONRO [00:08:51] Yeah. Yeah. Yeah. And it was just really, it's just such an amazing place.

JVN [00:08:57] So first your undergrad was in biology?

ALEX MONRO [00:09:00] Yeah. So through this expedition, I kind of got a segue into looking at forest and tropical, tropical ecology. I started a PhD on that, where I was based in Minas for a couple of years.

JVN [00:09:10] Where's that?

ALEX MONRO [00:09:11] At the capsule of the Brazilian state of Amazonas. And then I got really sick and then I had to drop out of that. And then I came back to the UK. I spent quite a lot of time sick. And then I got a job at the Natural History Museum as a botanist. And then they sort of just went on from that.

JVN [00:09:29] Wow. So then when do you start at Kew Gardens?

ALEX MONRO [00:09:32] I started Kew Gardens about five years ago.

JVN [00:09:34] Not to give you like a full, a full 20 questions of your life.

ALEX MONRO [00:09:36] So I spent 20 years at the museum as a botanist and then I came here after 20 years, and I have been here for five years. So that tells you that I'm not a baby.

JVN [00:09:45] Because a botanist is-. I know what you look amazing, honey. I mean, so but so a botanist is?

ALEX MONRO [00:09:52] Somebody who studies plants.

JVN [00:09:54] So you study plants and you also like studied like the classification of them?

ALEX MONRO [00:09:58] Yeah. So I've asked the tax, taxonomy. But botany is like I think everything that's studying plants. And then we study. So my group taxonomists say we study the classification description of plants and we do explorations and inventories of plants as well.

JVN [00:10:11] So and also, like, isn't traveling still a big part of your job?

ALEX MONRO [00:10:15] Yeah yeah yeah.

JVN [00:10:15] So tell me about that.

ALEX MONRO [00:10:16] Yeah. Well, so for every probably five or six months I go away and go exploring.

JVN [00:10:22] So for the last five years?

ALEX MONRO [00:10:24] No, I've been doing that for 25 years.

JVN [00:10:27] Well, hon-. So even when you're at the museum, you're were still like traveling and doing.

ALEX MONRO [00:10:29] Yeah. A lot.

JVN [00:10:30] Fun. So you went from the Natural History Museum to the?

ALEX MONRO [00:10:33] To Kew's.

JVN [00:10:34] Fun. So you always been like a scientist who is based in London like, well except when you're-.

ALEX MONRO [00:10:37] I have. Probably a bit of a contradiction. I love forests. I love the wilderness. But I was born in London and grew up in London and will probably die in London. I'm also a Londoner.

JVN [00:10:48] I love that.

ALEX MONRO [00:10:49] Yeah, it is unusual because it's not you couldn't you know, it's not obvious.

JVN [00:10:52] But it seems like Kew Gardens, there's like a very large, like, scientific community that's all very much like, you know, dedicated to like all things plants.

ALEX MONRO [00:11:01] Totally. So it's about 300 scientists, I think, across the two sites. And everyone is totally dedicated and fascinated and obsessed with what they do.

JVN [00:11:11] How does that, how does that community interface with like a daily interaction or like an outlook on, like sustainability, climate change? Like how does Kew Gardens or how does anyone in-? Like any tips on how like, on how scientists are trying to be like, like what do you do so we can all do it?

ALEX MONRO [00:11:28] Well, I'm not sure we're better than anyone else, but we're certainly really aware of it. And it's something that we talk about a lot in, just socially, but also something we try and weave into our work so that what we're doing is helping address climate change. So we do a lot of conservation assessments. So we look at species in the current distributions and how they'll be affected by changing climates, for example, with coffee. That's been, we've done a lot of work

on that. And will this be, you know, where will the will the site populations go? Will they be wiped out or do they have habitat they can move into?

JVN [00:11:58] Is that because we're wiping out like parts of forest to grow coffee beans or.

ALEX MONRO [00:12:02] No, no, sorry. So like we're looking so the, because coffee grows in mountainous areas in Ethiopia. And as the climate changes, the sites where they grow become too dry and obviously they have to move up because it gets warmer. And so where can they move to the top of a mountain? That's it, they got nowhere to go.

JVN [00:12:20] And tht affects global economy and-?

ALEX MONRO [00:12:22] Yeah. So that's a kind of really practical example. But we, but we kind of look at that for many different plants, which may be, you know, maybe they don't have any known uses, but they're still really important parts of our kind of global ecosystem.

JVN [00:12:36] So when you would go out exploring or like when you currently go out exploring, like what, like have you been to like all the continents? Or like six?

ALEX MONRO [00:12:45] Where I've been to? I've been to Latin America. And so to both. I have been to Australia. I've not been to Africa. I've been to Africa on holiday but that doesn't count.

JVN [00:12:54] You weren't exploring the plants. Yeah.

ALEX MONRO [00:12:56] Yeah. But I've done a lot work in China, for example, in southwest China in the limestone plateau.

JVN [00:13:01] You have?

ALEX MONRO [00:13:02] Yeah.

JVN [00:13:02] What was the deal with the plants over there?

ALEX MONRO [00:13:04] Oh it's amazing. So they have this incredible ancient karst landscape, which is limestone that's been weathered by tropical rains, kind of like 50, 60, 100 million years. And it was incredible, like shaped rocks and really spiky. And it's quite difficult for plants to survive on because it's really dry and then really wet and really hot and then cold. And so I've been working on the natural family, which is actually my personal speciality.

JVN [00:13:29] So I don't know if you all knew that, but we just took a really quick break because our literal scientist had a literal phone call, which I love, like how real we are, we can't help it that we're just doing like real podcasts in the real world. So because a lot of times I'm in a studio, but right now I'm in your office.

ALEX MONRO [00:13:53] Yeah.

JVN [00:13:53] Which I think is like interest. So you-. Welcome back to "Getting Curious". We have Dr. Alex Monro. So you, when you would go exploring like and you've been to-. Well, we're talking about China.

ALEX MONRO [00:14:04] Yeah. The limestone.

JVN [00:14:05] 'Cause it's hot and it's cold, and the limestone.

ALEX MONRO [00:14:07] And for some reason, nettles really attracted to limestone and especially weathered limestone.

JVN [00:14:12] Now, what's nettle? Because I fee like nettle tease.

ALEX MONRO [00:14:13] A nettle. Yeah. So it's a group of about 2000 species of plants and about 50 odd genera. So there's everything from small herbs to a kind of big trees.

JVN [00:14:23] Really?

ALEX MONRO [00:14:25] Yeah. And they have I don't know what to say. I think they they got kind of, normally the leaves are sort of toothed like the nettle.

JVN [00:14:29] Yeah.

ALEX MONRO [00:14:30] And they have really small inconspicuous green flowers and they kind of the most boring group of plants that are known to man. I think apart from to myself.

JVN [00:14:38] But what, what's the most interesting thing about nettles?

ALEX MONRO [00:14:42] Most interesting thing about nettles. I think is the fact that, now you've got me now. For me, the most interesting thing is the fact they have incredible female flowers. So the actual female, they're tiny but incredibly intricate and beautiful and they look really specialized. But the whole group or the whole family is wind pollinated. And so I don't understand why they have such specialized flowers.

JVN [00:15:05] Oh, because they don't really dittle?

ALEX MONRO [00:15:06] Because they just like passively kind of accepting pollen that's flying in the air. So they should all be the same in my book but they don't. And so I think that's kind of interesting.

JVN [00:15:14] OK. Well, I'm really glad that you brought up plant sex and not me, because I did want to specifically ask about how do you plan to reproduce? How do they do it? How do they like what are the different types so-? How many different types of-. Because isn't pollination essentially plant sex? Or no?

ALEX MONRO [00:15:31] Plant sex, god, plants has just so drastic and.

JVN [00:15:34] Different?

ALEX MONRO [00:15:35] Different. You know, I mean, they just like totally non-binary in that sense, you know, to put it in a normal setting.

JVN [00:15:42] Why? Because they don't. 'Cause it? Well, you know how you were saying earlier, wait. Did we get on tape, how you're saying that like we're all record-. Yeah. Yeah. Yeah, yeah. I've been sitting here this whole time. So because you know how a you're saying like they were all related, right?

ALEX MONRO [00:15:52] Yeah.

JVN [00:15:52] So yes. When I was thinking about this episode, I was like like I wonder like because of same questions, I was like it's like for plants, like what is like a plants daily life in terms of like if they were human, like how do they, you know, have babies, how do they reproduce? Like what would their like, little environment be like? You know, how did they learn? How did they decide to do stuff? 'Cause like-. So sex feels like the first thing that popped into my mind, you know, I can't help it. Like chemicals. I can't help it. I'm a person and I'm still-.

ALEX MONRO [00:16:18] Oh, it's a big part of their lives.

JVN [00:16:20] Yeah.

ALEX MONRO [00:16:21] They invest a massive amount in sex.

JVN [00:16:23] Plants do?

ALEX MONRO [00:16:23] Yeah. God. A tremendous amount. Yeah.

JVN [00:16:25] They invest tremendous amounts in sex.

ALEX MONRO [00:16:27] Yeah.

JVN [00:16:28] I love that sentence.

ALEX MONRO [00:16:28] Yeah. And if you look, if you look at an oak tree at the moment is covered in like thousands or hundreds of thousands or more flowers. And when it has fruit. Imagine how many kinds of-.

JVN [00:16:38] Babies.

ALEX MONRO [00:16:40] Yeah. And how many seeds it produces.

JVN [00:16:42] So. Yeah. So how are the-. What are the different types of pollination like plant reproduction?

ALEX MONRO [00:16:47] So the pollen is like the semen of the plant. So when there's various ways you-. So plants don't just reproduce by taking semen and putting it on an egg. They reproduce in lots of different ways. Ok? So sometimes they basically, bits of them will fall off and

that's a form of asexual reproduction. Sometimes the egg, in the flower, will just develop unfertilized into a healthy seed.

JVN [00:17:14] Really?

ALEX MONRO [00:17:15] Yeah.

JVN [00:17:15] Love that.

ALEX MONRO [00:17:15] That's quite common.

JVN [00:17:17] Like, who does that?

ALEX MONRO [00:17:18] So sort of, nettles do that. So I've been working on a group of nettles that grow in caves in southwest China. And it seems to be a lot of them are. That's how they reproduce.

JVN [00:17:28] Can you tell the difference between a nettle that's like reproduced asexually?

ALEX MONRO [00:17:32] You can. Not by looking at it though, you have to take some tissue and you have to basically see what's going on.

JVN [00:17:39] So is that because like is-, tell me more about that. What it was. What's the difference?

ALEX MONRO [00:17:44] Okay. So when they reproduce, it's called "apomixis" so asexually, you can look at the chromosomes and you can kind of tell.

JVN [00:17:52] Oh, there's only one?

ALEX MONRO [00:17:54] Well it's just that there's. Yeah. So the short-. Yeah. Kind of, the shortcut to doing that is to kind of measure the the weight of the nucleus. And then you can relate that to the size of the genome and relate that back to their kind of chromosome count. So that's used quite a lot.

JVN [00:18:11] What about like=. I mean obviously like snakes aren't plants but you know how many snakes do that? Like you know-.

ALEX MONRO [00:18:16] Yeah, yeah. Lizards I think. I think geckos can do that.

JVN [00:18:18] So is that is that a similar thing? Like just like-?

ALEX MONRO [00:18:21] Yeah, a similar. You know, I'd say it's similar. Yeah. And then plants can also hybridize. So they do tend to hybridize quite freely.

JVN [00:18:27] What's that mean?

ALEX MONRO [00:18:27] So what they'll, so like, basically a female of one species will reproduce with a male of another species. Then you get a novel-

JVN [00:18:35] Oooh. How-, is there any cool plants that?

ALEX MONRO [00:18:37] There would be if I had a, if my memory was any better.

JVN [00:18:40] You never know where you're going to go in an episode of "Getting Curious". You know what I mean?

ALEX MONRO [00:18:43] I can see that.

JVN [00:18:44] Yeah.

ALEX MONRO [00:18:45] But there yeah, there must be. It's not a rare phenomenon and some birds do that as well. So it's not unique.

JVN [00:18:52] But then there's also like, isn't there like bees taking the pollen?

ALEX MONRO [00:18:57] Yeah. There's all the different ways that they get the sperm from the from the male part to the female parts of this. There's wind, there's bees, there's mammals. You know, any, there's tons of different things, there's tiny little micro insects.

JVN [00:19:11] What's an example of a m-, because they're like like what? Like horses like rub up against something in like North Dakota. And then they like run around and pollinate something?

ALEX MONRO [00:19:21] Yeah, exactly. Yeah. So it's pretty random in a way. I mean, some plants are really sort of tailored the way that they do it. So they attract particular species of bird or butterfly.

JVN [00:19:31] Okay now. That's what I want to know about.

ALEX MONRO [00:19:32] Okay. Yeah.

JVN [00:19:32] Tell me all about that.

ALEX MONRO [00:19:33] So you have lots of the whole group of plants which which like to control who takes the pollen.

JVN [00:19:39] How did they know?

ALEX MONRO [00:19:41] I think it's they they don't know, obviously. That's the crazy thing about evolution. You don't have to be smart to evolve. So, you know, bacteria evolve. And they're obviously not, you know, to occupy new habitats. But they they're obviously not thinking, you know, I've got to do this or something's going to happen. So it's a process of kind of reciprocal process between the two parties. So you have something pollinating something. So you've got something coming and eating the pollen. And then for some reason, the plant will change and the flower might get a bit deeper. And so there's less things that can pollinate that plant. But then it

turns out, because there's less things able to plant that that plant, the ones that can become more specialized because they've got something that no one else can get. And then they'll pollinate it. And then that's how the relationship can develop. Does that make sense?

JVN [00:20:29] Yeah. It's like those hummingbirds that have like the long things.

ALEX MONRO [00:20:30] Yeah. And then the flower gets longer and then hummingbirds beak gets long they become more and more wedded to each other. So for the hummingbird, the cool thing is like no one else can get the sugar by having these really long flowers.

JVN [00:20:40] Right.

ALEX MONRO [00:20:40] So you have to have a really long thin beak which is basically hummingbirds. So that's the two sides of the relation, kind of two motivations for it going on evolutionarily. And then and then to the plant. It means it's got a guaranteed pollinator who's going to go from that individual, that species to another individual of that species. They're not going to go from, you know, like an oak tree to a nice daisy.

JVN [00:21:04] Oh.

ALEX MONRO [00:21:05] Which is not going to be very useful for the plant because it's pollens is basically going to be wasted. It can be pretty sure that that thing is going to take its pollen and go to another individual, that same species, and deliver that pollen to. So it's a way of tying it in.

JVN [00:21:17] Yes. Question. Are, so does one plant have like the both anatomies and so-?

ALEX MONRO [00:21:26] Yeah. So it depends. So so that's the other thing. You know, some plants have got both sexes in the same flower. They're kind of effectively herma-, bisexual. Some plants have both sexes, but each sex is in a separate flower, but the separate flowers are on the same individual. Some things have got each sex.

JVN [00:21:42] Can some be both?

ALEX MONRO [00:21:43] Yeah, some things can be both. Some things can change sex through time. There's a whole group of trees that when they're small, they might be female. When they're tall, they become male.

JVN [00:21:52] Really? Like who?

ALEX MONRO [00:21:53] Yeah. Like with the fig. The fig families. So like a mulberry. I have a mulberry in my garden. It starts out female and then as soon as they got to a certain size it became male.

JVN [00:22:04] How do you know?

ALEX MONRO [00:22:05] Because the flowers look different. They're totally different. So the male flowers are kind of look, look, nothing like the female flowers. And there's a whole group of trees where this has been studied in some detail. Kind of makes sense. So when the tree is really tall, if

it's wind pollinated, that's the time to produce male flowers, so your pollen gets sent to long distance on the wind. And then when it's small, they just, you know, it's producing the fruits and maybe the fruits written by birds or in this case, they would be. So you don't need to be so, being tall isn't such an advantage.

JVN [00:22:34] So and then fruit is-?

ALEX MONRO [00:22:37] The fruit is the way of one of the ways that you deliver. You can deliver the seed. So the seed is like, I guess, the embryo for us.

JVN [00:22:45] So why did we. What is this whole evolution thing? She's such a big deal. So, OK, so there is the pollination.

ALEX MONRO [00:22:53] Yeah.

JVN [00:22:53] Then there is-. Is that all of the reproduction like pollination based or is there some other kind, in the plant world, that's like not pollination?

ALEX MONRO [00:23:00] Well, you have the asexual ones where there is no pollination in mosses, for example, is way more complicated in mosses and ferns. And I don't really want to explain that because one time my-.

JVN [00:23:09] Ferns are green like-.

ALEX MONRO [00:23:10] Yeah, ferns use a totally different strategy.

JVN [00:23:13] Don't do it?

ALEX MONRO [00:23:14] They can't do it differently. They do it for different life stages.

JVN [00:23:19] Interesting.

ALEX MONRO [00:23:19] Yeah.

JVN [00:23:20] That's like another episode of "Getting Curious" with like a fern person.

ALEX MONRO [00:23:23] You should definitely talked to a fern person, I can recommend someone.

JVN [00:23:27] Yeah, 'cause they're old as hell, ferns. Right?

ALEX MONRO [00:23:28] Yeah. They have a really cool reproductive system.

JVN [00:23:30] And it's apparently working.

ALEX MONRO [00:23:32] I think so. Yeah.

JVN [00:23:32] We hope so.

ALEX MONRO [00:23:33] Yeah.

JVN [00:23:34] So now I want to know about. Well I actually think I want to know more about plant reproductions. I'm still a little confused.

ALEX MONRO [00:23:41] Yeah, OK.

JVN [00:23:41] So trees pollinate?

ALEX MONRO [00:23:44] Everything. So everything is reproducing sexually. We'll be exchanging pollen. So it's like us will be taking semen and fertilizing an egg. Like a whole group of plants can also the egg will develop. They don't have to receive the pollen. So that basically is like having sex with yourself in some ways.

JVN [00:24:01] Right.

ALEX MONRO [00:24:01] And in other things actually can pollinate each other. So some, in some, you got a lot of species that pollen from one flower can fertilize itself. You mentioned that. So, again, like bisexual, you could basically having sex with yourself and you're producing a fertile offspring.

JVN [00:24:17] I think you're more pansexual if you're having sex with yourself.

ALEX MONRO [00:24:20] Is that right?

JVN [00:24:21] Yes.

ALEX MONRO [00:24:21] Is that right?

JVN [00:24:21] Because bi just means that you're like, yeah, I think bisexual doesn't really apply here because really, like if you're having sex with yourself, honey, you're getting down with everybody cause like you'll get down with the other boys, the other girls will get down at yourself. I think they're pan.

ALEX MONRO [00:24:34] OK. Ok. Perhaps.

JVN [00:24:35] 'Cause they're even more than bi. You know what I'm saying? They're like in to everyone.

ALEX MONRO [00:24:38] We need to update. We clearly need to update our terminology.

JVN [00:24:39] I also think it's like I think it's like it's difficult to group, like totally compare. But, you know, I do love to it. You know, it's human nature. We like to compare so we can understand like what is happening. So because there's trees.

ALEX MONRO [00:24:55] The sex, the sex is unrelated to whereas with a tree-.

JVN [00:24:57] No, I totally get it. But like how many different kinds of like? How many? What's before genus?

ALEX MONRO [00:25:02] Family. You mean what's above genus?

JVN [00:25:04] Yeah.

ALEX MONRO [00:25:05] Yeah.

JVN [00:25:05] So how many families are planted there?

ALEX MONRO [00:25:07] There's about 400,000 species of plants and there in about 350 families.

JVN [00:25:13] So there's. And what's before family? Or above family?

ALEX MONRO [00:25:16] Above family, you go order.

JVN [00:25:18] How many orders of plants is there?

ALEX MONRO [00:25:20] I have no idea. I'm guessing like about 20 or something, maybe more.

JVN [00:25:24] Because what are, were in mammal?

ALEX MONRO [00:25:25] Yeah. We're in mammal.

JVN [00:25:27] And then how many is there again?

ALEX MONRO [00:25:30] Well, how many mammals?

JVN [00:25:31] No like how many like categories are there or-? Is there like five or something? Is that like really 80s? We don't think about it like that anymore?

ALEX MONRO [00:25:36] Yeah, I'd say they're really interesting. Yeah. No, I don't really think, so I guess for us what we kind of notice of families and the genus and the species and then the global amount of species. So there's 400,000 species, which is, you know-.

JVN [00:25:50] Wow. And at the Millennium Seed Bank, they have like a tenth of those or so in the thingies?

ALEX MONRO [00:25:54] I think they got like 20,000 species.

JVN [00:25:56] And here there's like in, like a bunch of big buildings all the best ones.

ALEX MONRO [00:26:00] We've got over seven million specimens here in this building and we must have about 80 percent of plant diversity.

JVN [00:26:08] So-.

ALEX MONRO [00:26:08] In this in these buildings.

JVN [00:26:10] There must be extinct dried out plants.

ALEX MONRO [00:26:11] Oh yeah. Yeah, yeah, for sure. Yeah.

JVN [00:26:13] Uh. Can't even handle it. OK, so there's pollination is how they is how were procreating and some plants can either pollinate themselves and create seeds.

ALEX MONRO [00:26:23] Yeah.

JVN [00:26:24] To then become their own plants. Others do you know like they pollinate like other types of plants in the same species.

ALEX MONRO [00:26:31] Yeah.

JVN [00:26:31] And then there's other ones that can help cross hibernate. I think there's a hybrids of a green big bushy plant that I think a lot of people like. You know, now that I'm thinking about hybrids.

ALEX MONRO [00:26:40] Yeah. Yeah.

JVN [00:26:40] You know?

ALEX MONRO [00:26:40] Yeah. There's a lot for that.

JVN [00:26:41] Yeah. Ok. So I think that makes sense because yeast like spuds or something like it just like breaks off of each other.

ALEX MONRO [00:26:48] Yeah. Plants kind of do that as well. So you get a base of rule-breaking off like and creating new plants or branches, cutting and you stick a branch in the ground. That's kind of the same thing.

JVN [00:26:56] Oh yeah. That's a little spudding.

ALEX MONRO [00:26:58] I'd say that was pretty much that. Yeah. So they can reproduce that way. They can as you said they can fertilize themselves. They can produce seeds without any fertilization.

JVN [00:27:10] Is that, and how common is that?

ALEX MONRO [00:27:11] That's pretty common. I mean I don't want to give you a percent.

JVN [00:27:14] What if like five trees in the United States or like in the United Kingdom, honey? Like did one of those trees pollenate itself?

ALEX MONRO [00:27:20] So you're asking a tropical nettle specialist about-.

JVN [00:27:22] Well, I don't know.

ALEX MONRO [00:27:24] Tree. I think a lot of them can. And there's kind of so, so they're just plastic. You know, they've tried different things in different situations. So, for example, the ones that can fertilize themselves, they may actually put a lot of effort into not fertilizing themselves, because they don't want, you know, because it's not doesn't make sense in the long term.

JVN [00:27:43] Right.

ALEX MONRO [00:27:43] You know, you get the seeds in the short time you producing seeds, whereas in situation we maybe wouldn't have. But in the long term, you're not going to kind of increase your your diversity. And diversity is really important. Sex is basically about maintaining diversity. Yeah.

JVN [00:27:58] So. Okay. But actually, that was such a gorgeous segue to an expert on. Yes. Okay. Here's a really quick break. We, our producers are so good at getting us on breaks. We're gonna be right back with more Dr. Monro after this. Welcome to "Getting Curious". This is Jonathan Van Ness. We have Dr. Alex Monro. So you are a tropical plant specialist who specializes in nettles in the Amazon.

ALEX MONRO [00:28:28] Nettles in the world.

JVN [00:28:29] Nettles in the world. But you really like the Amazon. You're down there a lot.

ALEX MONRO [00:28:31] I do like the Amazon. Yeah.

JVN [00:28:32] So one of my other questions I was curious about. Is like, what about plants that eat animals? Because isn't there's some of those in the, in the Amazon? Isn't there that Venus thing?

ALEX MONRO [00:28:41] Venus Flytrap Trap. I'm not sure it's in the Amazon so that the plants that eat animals tend to be in areas where the soils are really, really poor and they want to get the nitrogen.

JVN [00:28:51] Where the what is sore?

ALEX MONRO [00:28:52] The soil.

JVN [00:28:53] So oh.

ALEX MONRO [00:28:54] You know the ground.

JVN [00:28:55] Yeah.

ALEX MONRO [00:28:56] So there's not a lot of nutrients. And so they tend to be plants which grow where they want to get protein or nitrogen from the protein.

JVN [00:29:03] Oh, and that's that, because the Amazon is probably really nutrient rich.

ALEX MONRO [00:29:04] The Amazon's got somewhat sand forest. So must have some, I'm guessing, but I don't know. It's not the most famous place for it. So Southeast Asia's got a lot in-.

JVN [00:29:14] Oh, it does?

ALEX MONRO [00:29:14] Some kinds of forest. Yeah, they pit, the giant pitcher plants in Africa and Asia.

JVN [00:29:17] Yeah. The pitcher plants.

ALEX MONRO [00:29:18] Yeah. And in North America as well.

JVN [00:29:20] They are?

ALEX MONRO [00:29:22] The Sarracenias. Yeah. You've got the, yeah.

JVN [00:29:23] And what, do, where in America are those?

ALEX MONRO [00:29:26] They grow in bogs.

JVN [00:29:27] In where?

ALEX MONRO [00:29:28] I don't know if my, in bogs. In flooded bogs. Yeah.

JVN [00:29:31] Oh. And then basically that's like a plant where there's like a bunch of like poison stuff at the bottom and the little-.

ALEX MONRO [00:29:35] Yeah, well it's kind of I was I had so much poisonous. It's basically really slippery. And the thing falls in and it can't get out. It's a really shiny, beautifully kind of waxy shiny in a surface. And it tries to claw out and in the end it gets exhausted and drowns. And then the liquid has got enzymes in it, which will, dissolve it slowly. What's like the biggest animal a plant can eat?

ALEX MONRO [00:29:56] A horse?

JVN [00:29:57] No.

ALEX MONRO [00:29:58] No, I'm making that up. of course not.

JVN [00:29:59] Just like a little, like, do you think it could do like a mouse?

ALEX MONRO [00:30:02] No, it could do. I'm guessing it could do like a very small lizard or possibly.

JVN [00:30:09] Okay. So-.

ALEX MONRO [00:30:09] A large fly or bee, maybe.

JVN [00:30:12] What about that one fl-? I hope this is like not not in the Amazon. I'm, I'm pretty sure it is. 'Cause I think I read about it in like third grade. What about that really stinky, gigantic flower?

ALEX MONRO [00:30:21] Rafflesia.

JVN [00:30:22] What's that? What's their story?

ALEX MONRO [00:30:23] It's the world's biggest flower. But that that actually that's interesting. So that's not eating insects.

JVN [00:30:29] Well I knew it wasn't eating insects, I just know it stinks.

ALEX MONRO [00:30:31] It sinks of rotting meats and it has the color of rotten meat and its giant, the flower can be maybe kind of two foot across and it grows in Southeast Asian in tropical forests.

JVN [00:30:40] Dang it. Why does everything I think is Amazonian in Southeast Asia? Is that like a problem in middle of America? We think that like everything in the Amazon is actually-.

ALEX MONRO [00:30:49] It's amazing. The Amazon is most incredible place. But just unfortunately not for those things.

JVN [00:30:54] Who knew? OK, so what are your favorite plants? Other than nettles in the Amazon?

ALEX MONRO [00:30:59] I think the epiphytes. So the plants which grow up in the branches, the primality, and then there's lots of orchids and they're stunning.

JVN [00:31:05] There's orchids?

ALEX MONRO [00:31:07] Yeah. And there's a particular family which is an eve of those actually called airotes, which are the-. Do you have a Swiss cheese plant?

JVN [00:31:13] No.

ALEX MONRO [00:31:13] No. We call monstera. You probably have a cooler name for it, but it it is a large leaf, which is kind of very deep indentations, break losses, grown a lot as an office plant. Anywah.

JVN [00:31:26] I didn't know that.

ALEX MONRO [00:31:27] That family has tons of amazing species growing as epiphytes in the Amazon.

JVN [00:31:32] What is, we just an episode on some of the deforestation that's going on in the Amazon. what has been some plants that are having a hard time with just surviving in the face of deforestation and in climate change in the Amazon? Like, what are you kind of studying down there? What's your, what's happening?

ALEX MONRO [00:31:48] So we do botanical inventory. So we're normally looking at what's there rather than what's not there.

JVN [00:31:55] That's kind of an optimistic way to see, to approach it.

ALEX MONRO [00:31:57] Yeah. The amazon is incredible. The Amazon is is one of the least explored and collected places for plants in the world. So we still know very little.

JVN [00:32:06] Ok because you are like helping to figure out what the new things are.

ALEX MONRO [00:32:09] Yeah. And what's that? You know, basically what's there.

JVN [00:32:12] Yeah. Tell me about that.

ALEX MONRO [00:32:13] So that. So, um. Well we we do our collecting and then we bring the stuff back here. We compare it with what we've got in our reference collections. And in that way, we identify things which which we know are a new or at least not not known.

JVN [00:32:28] When's the last time you, or you guys like identified like a new fun thing?

ALEX MONRO [00:32:32] So we just came back from Brazil actually in December. I think well, it was a bit of argument amongst us as to whether it was new or not, but we discovered several things which we think are new growing on this kind of limestone blocks, which was a tree in the Custard Apple family. Do you have custard apple?

JVN [00:32:50] I don't know. I'm like for sure not a plant expert on North America.

ALEX MONRO [00:32:55] No. Yeah.

JVN [00:32:55] Or any ever.

ALEX MONRO [00:32:56] You can get it in supermarket sometimes. It's like a big fruit about that big gray green color with lots of segments on the outside and it's a creamy white flesh inside. Really delicious.

JVN [00:33:07] No, I don't think I've ever had that.

ALEX MONRO [00:33:08] It's a really good apple. Yeah.

JVN [00:33:09] Custard apple that sounds like fun content.

ALEX MONRO [00:33:11] So something like-.

JVN [00:33:11] We're going to Google it. So you but so what was the argument? 'Cause like some people are like "no no" that's like-.

ALEX MONRO [00:33:16] So they think. So first, we thought it was new because it has really unusual flowers. And it's just to me, it looks different. And then they kind of think it's something which is already described, but just a really unusual form of it.

JVN [00:33:28] So what do they think it is?

ALEX MONRO [00:33:29] They think it's something, a species which is known, not well-known, but known from a couple of collections about a few hundred miles away. And I think it maybe isn't. Neither of us is specialists in this family. So we kind of you know, that's the one, that's the thing about exploration is you you're very often collecting things that you're not the expert on. So I'm an expert on nettles, but I don't spend all my time collecting nettles. I collect everything. And so when we do these expeditions, we're not necessarily the expert identifying, but we have the expert, expertise here in our collections and also for many plant groups, there are no experts.

JVN [00:34:05] Really?

ALEX MONRO [00:34:05] Yeah, yeah. Tons. Yeah. So some of these, some, you know, groups of trees and there's no experts to identify them.

JVN [00:34:11] Do you think that that, I mean because when we think about in history like plants have been so important to like doing-? Isn't like, aren't there like. Isn't penicillin from plant or something?

ALEX MONRO [00:34:26] No, it was found growing on rotten melons. I'm not sure that counts.

JVN [00:34:29] Oh fun. Well kind, 'cause melons are-.

ALEX MONRO [00:34:30] Yeah, the melons are-. Yeah. You wouldn't have had the fungus, it's a fungus.

JVN [00:34:34] Isn't a fungus a plant or no?

ALEX MONRO [00:34:35] No.

JVN [00:34:35] No, that's another one of the species-.

ALEX MONRO [00:34:37] It's unrelated. Totally unrelated.

JVN [00:34:39] Totes unrelated.

ALEX MONRO [00:34:39] We're closer to fungi. The fungi are closer to us than they are to plants, to green plants.

JVN [00:34:45] Gross.

ALEX MONRO [00:34:47] Yeah.

JVN [00:34:47] But sometimes they interact with each other.

ALEX MONRO [00:34:49] Yeah, but we do as well. I mean, we interact with-.

JVN [00:34:51] Totally.

ALEX MONRO [00:34:52] Plants and fungi as well.

JVN [00:34:53] Ok but wait. Back to nettles. How many places do nettles live?

ALEX MONRO [00:34:57] Everywhere. All the tropical areas and most of the temperate regions. So like, you know, everything from tropics to to cool.

JVN [00:35:04] Are all nettles like kind of like dark greenish color? Or is there ever like different colored nettles?

ALEX MONRO [00:35:09] Actually, that's not a bad question. They are all more or less that color.

JVN [00:35:13] But some are a little and some are big.

ALEX MONRO [00:35:15] Yeah, you get big trees of vicious things, too small, tiny little things of leaves, a couple of millimeters long. The fairly harmless, totally harmless.

JVN [00:35:23] Are some like poi-, like poison ivy-ish to the touch or something?

ALEX MONRO [00:35:28] Well some got really nasty stings but they don't have a chemical that will-.

JVN [00:35:32] It's just if you run into it?

ALEX MONRO [00:35:34] The sting is bad. There's one in I think New Zealand which is said to be able to paralyze a horse. I have no idea if this is true. But I gather if you get stung by your arm will be in pain for weeks.

JVN [00:35:44] What does get stung by a nettle mean?

ALEX MONRO [00:35:46] You brush into it, and the nettle's, the hairs of nettles are designs like hypodermic needles. So when you press them, you kind of, just kind of like squeezing the needle and it just injects liquid into you.

JVN [00:35:58] It does?

ALEX MONRO [00:35:58] Yeah.

JVN [00:35:59] See, we've completely buried the lead.

ALEX MONRO [00:36:01] Did you not know that?

JVN [00:36:02] No.

ALEX MONRO [00:36:02] Oh god, yeah.

JVN [00:36:03] Tell us more about nettles.

ALEX MONRO [00:36:05] So the Latin name for a nettl-, the Genesis is "urtica" and the whole family is called "Urticaceae". An 'urtica" means to "irritate".

JVN [00:36:13] Oh, irk.

ALEX MONRO [00:36:14] And I don't know why.

JVN [00:36:15] But it sounds like "irk". You know?

ALEX MONRO [00:36:17] What does 'irk" mean?

JVN [00:36:18] Like to irk someone.

ALEX MONRO [00:36:19] Oh really?

JVN [00:36:20] Like you're being very irksome.

ALEX MONRO [00:36:21] Irksome. Oh yeah, I've heard that a lot. So then these needles, I mean these hairs if you look at them on the microscope, they look just like needle like at the end of hypodermic. And when you brush into it, the mechanical force of you touching the leaf and its resistance injects the contents and they have this bulb at the base of the hair and it gets injected into you. And then they contain various chemicals, I think, which they definitely contain various chemicals which will cause irritation. This same nettle that you get in the US, in here and in Europe. I mean, it's not pleasant, but it's not like it's not that big a deal. It goes after a half an hour or so. But in Asia and Australia and New Zealand, there are some which, you know, you'll be in pain for weeks from getting stung.

JVN [00:37:03] Interesting.

ALEX MONRO [00:37:05] Yeah. They don't all have the hairs. But but that property's kind of spread around the family.

JVN [00:37:10] How does nettle relate to like what, like what else is poppin' with nettle? Like, is it important, like ingredient in anything?

ALEX MONRO [00:37:16] I have to say I am fascinated by them, but they don't really have anything that kind of life changing or well changing. They just kind of just interesting in their own right, in their own little corner.

JVN [00:37:30] They're just hanging out.

ALEX MONRO [00:37:32] Yeah. Exactly. And they do lots of cool things and they're worth studying and they're worth conserving and protecting.

JVN [00:37:38] Are they having, are nettles like becoming like kind of like. Are they getting sad anywhere because of like climate change?

ALEX MONRO [00:37:45] Yeah. There's a whole couple of groups which live in very deep shade and kind of very wet and quite specific undisturbed environments. And they suffer a lot from deforestation when you open up the canopy and it gets hot and dry. And from climate change to some extent as well as forests are drying out and because these things are just not used to living without moisture.

JVN [00:38:05] How does that work? Like in deforestation, if you like, were, you know, like when deforestation happens, like so a rainforest has like a very dense, like motile layers of like-.

ALEX MONRO [00:38:17] Vegetation. Yeah.

JVN [00:38:18] And so when when it comes into get cleared, 'cause a lot of times it's getting cleared out for farmland. Right?

ALEX MONRO [00:38:24] Yeah. I mean it's generally pretty bad farmlands. The whole deforestation, the Amazon is, is nuts. You know, it's completely crazy because the amazing thing about Amazon is it's incredibly rich forests. You know, big tall trees, beautiful lush, really diverse. It supports a lot of wildlife. And it's and is a big juggling act. It's growing on this wafer thin layer of soil and organic matter in many places. And so it juggles the nutrients as nutrient cycling is really fast and that's how things managed to grow. But when you look at this as an outsider with no kind of understanding of how how things are working, you think, wow, this must be really good land because it's got these massive trees on it. But what will they do? They cut down the trees and they burn the land. So and then all the soil is just gone, that small amount of soil, the whole kind of magical trick of recycling and keeping this dynamic, these nutrients moving, you've just destroyed it and then you're just stuck with this really, really old highly weathered soils.

JVN [00:39:24] So what's nutrient cycling?

ALEX MONRO [00:39:25] So nutrient cycling is the way-. So plants get there, you know, they can't go out and hunt and catch things apart from the things we spoke about. Those plants get the sugar, the carbon they get from carbon dioxide in the air and they get some of the nitrogen that way as well. But they still need other nutrients, minerals. And that's done through. So they, their harness from the soil and then the plant grows and the leaves die and fall off. And the nutrients in that dead material then decompose, get absorbed by bacterial fungi and work their ways back into the soil to be reabsorbed.

JVN [00:40:01] That's the whole like corn getting planted one year and then soybeans the next?

ALEX MONRO [00:40:05] Yeah, exactly.

JVN [00:40:05] Because they like put each other.

ALEX MONRO [00:40:07] Yeah.

JVN [00:40:07] They balance each other or whatever.

ALEX MONRO [00:40:09] Yeah. And in Europe, like we have, we have the frosts like the freezing in the winter, which then liberates lots of minerals in the soil and basically creates a pulse of nutrients. In the tropics you don't have that. You know? You don't have a freezing. So all your nutrients have to be conserved.

JVN [00:40:25] Oh, so all the time.

ALEX MONRO [00:40:26] Keep cycling them. Yeah. You can't really afford to just chuck them, chuck them away. And so plants have the ecosystem and they kind of not individual species, but the whole system has is is cycling things in a very dynamic way so that those nutrients are kept basically in play as much as possible. In Europe, we don't have to do that because we have frost in our soil so much deeper and more nutrient rich. But in the tropics, when European farmers first came to the tropics, they saw these lush forests and they assumed that they were really rich soil. So they cut everything down. That'll grow maize on it. And then you grow a pathetic crop of maize and you're scratching your head thinking, you know what, why is this? What went wrong? And it's because of the way that they, that they do it. And so deforestation is in the Amazon is not really suited for agriculture.

JVN [00:41:14] So. Right. So-.

ALEX MONRO [00:41:17] So the key thing is when you grow crops, you basically take those nutrients which end up in the seeds or the fruit, whatever your eating, and you take them away. So they exit the system. And that's-.

JVN [00:41:27] 'Cause it goes to the food.

ALEX MONRO [00:41:28] Yeah. And then they get exported to wherever. So that's that's kind of totally different to what happens in the system prior, where it was being cycled. And when you, as soon as just taking nutrients out all the time, obviously you kind of deplete the system quite, quite quickly.

JVN [00:41:43] So when we were talking about sugar and how plants get their sugar, isn't there something about chlorophyl and sugar?

ALEX MONRO [00:41:48] Yeah. No, not in sugar. So chlorophyl is the is the K, is, what is it? It's a chemical really that absorbs the energy or helps absorb the energy, capture the energy in sunlight. And then it gets really complicated or complex kind of set of reactions that sugar is passed on and converted into, into the sugars that the plants use.

JVN [00:42:12] So the chlorophyl does have something to do with it. OK. I don't remember this movie, with Adam Sandler in "Billy Madison", honey, and he's in the science class and he's like chlorophyl more like "boreaphyl". And I feel like it gave chlorophyl this like bad name. So like, what the fuck does chlorophyl do?

ALEX MONRO [00:42:28] So as I said, it's a chemical that is able to capture or help capture, because it's a really complex system. But the chlorophyl is the, is like a pigment that can absorb.

JVN [00:42:36] Oh yeah, it's green.

ALEX MONRO [00:42:37] Some wavelengths. Yeah.

JVN [00:42:39] Does nettle have chlorophyl?

ALEX MONRO [00:42:41] Yeah, all green plants.

JVN [00:42:42] All green plants.

ALEX MONRO [00:42:42] So we see chlorophyl as green because it's reflecting green light. So it's not absorbing the green color. That's absorbing the rest.

JVN [00:42:53] Science is so much, right?

ALEX MONRO [00:42:55] Once again, not my, not really my domain. But that's for. It's an amazing chemical. Yeah, it enables you to harness the energy in sunlight.

JVN [00:43:03] So why when they de-, like if you're if you're clearing away, I wonder why you were burning it first.

ALEX MONRO [00:43:10] Because we do everything without thinking. You know? It's so arbitrary what we do and how we, like farming it, if you, farming in Europe evolved in Europe. To deal with the conditions in Europe and it's sustainable, you know, in many parts of Europe. But it becomes a cultural thing. And then you go somewhere else and it's part of your culture, you know, to raise cattle or grow sweet corn or maize. And so you go to another part of the world and you sort of impose this totally ill-suited approach to doing things there. And it doesn't work, you know. And because it doesn't work, you have to get fertilizers and you have to keep clearing more and more forests.

JVN [00:43:47] Oh, yeah.

ALEX MONRO [00:43:48] And rather than stop and think, why isn't it working? What could we do that works? I know there's none of that. We just continue plugging away at trying to farm cattle on land that is just isn't suited for it.

JVN [00:43:59] Isn't that like, it all goes, it's like corporate? It's like money? It's like-?

ALEX MONRO [00:44:02] Yeah, I guess it's money. It's also a total lack of imagination and thought, you know, you just have to sit back and think about it. I mean, you'd probably make much more money not doing that. I often see cattle farmers in, in, in the Amazon and they're doing it because it's a high status occupation, but they're not making much money.

JVN [00:44:19] So when you're talking about like the Amazon not really being well suited for agriculture because of the nutrients and like how it works, like well. So how does like Europe have a deeper soil, but like the Amazon does more like is just because, like, you know, Europe is like colder and has like the whole frost thing?

ALEX MONRO [00:44:36] Yes. So soils are replenished much more, they may be more fertile anyway because they're younger. The Amazonian was are quite old, which means that they've had water flowing through them for much longer periods and they've been losing and they lose some nutrients in that way. Not all of the Amazon. Some of the Amazon has good soil, but the bulk of it doesn't. Which is why when you clear a forest and you start growing a crop, you have it for 18 months or something, and then you have to start thinking about what else to do with that site.

JVN [00:45:03] So again, know this isn't your expertise, can't help it. I just have one more little question.

ALEX MONRO [00:45:07] No, yeah, sorry.

JVN [00:45:07] No, no.

ALEX MONRO [00:45:08] Well, I shouldn't answer it.

JVN [00:45:09] No, this is even another question. No, anyways, so. Like you know how you were talking about the frost in Europe.

ALEX MONRO [00:45:14] Yeah.

JVN [00:45:14] Like is there-.

ALEX MONRO [00:45:14] Well, everywhere, you know, in the USA.

JVN [00:45:16] Well, yes. Yeah. For us, because isn't there like seeds like have to kind of like hibernate like or they just like kind of like?

ALEX MONRO [00:45:21] Yeah.

JVN [00:45:22] And then like the cold, does the cold wake them up, like what's that whole deal?

JVN [00:45:25] So the seeds have different mechanisms for waking up. And different triggers, sometimes it's so it could be a frost if they want to be germinating as soon as the winter starts. Or it could be that they wait for heat in the soil or day length or fire, you know, some seeds, require fire to germinate. It may need to be digested or passed through the gut of an animal.

JVN [00:45:47] Oh, what do that?

ALEX MONRO [00:45:48] So there's quite a few things that say that actually.

JVN [00:45:50] Like mushrooms that grow out of poop or no that's fungus. Ah, get it together, Jonathan.

ALEX MONRO [00:45:54] Yeah. No, there's kind of things which need to be swallowed and passed out in the poop and then they'll germinate from there.

JVN [00:46:01] What about like the poppy? Wasn't that from like, like from like, isn't it like smelling like it's like triggered from like banging on it or something?

ALEX MONRO [00:46:08] I don't know. I, yeah, I mean, possibly.

JVN [00:46:10] I added that on, no big deal.

ALEX MONRO [00:46:11] I don't know I heard that. That's a-.

JVN [00:46:14] Ok, so great. Germination, nettles, chlorophyl, it is not "boreaphyl". So this is the part in our recording where it's like maybe you're an Amazonian expert on nettles and I didn't ask you anything about that. And so, just kidding. But like what do you want? What do people need to know? It's like yogi recess, it's toward the end of our recording like what do you think we should know about? I mean, I thought it was a really interesting when you're talking about the lack of imagination on figuring out how to kind of deal with the sustainability.

ALEX MONRO [00:46:42] Yeah, soI think I'm botanist. Right? I'm not re-, I'm not here to give light or to tell anyone about economic development or the rest of it. But I think it's pretty clear, there are ton, there are like thousands of potential food crops and fruit crops out there growing in the wild we don't use, for cultural reasons mainly. And we could just use everything in a lot, with a lot more imagination and it would be more sustainable, probably economically, productive and easy. Having said that, that really isn't my domain. I think the message I would like to get across from my domain is that there are a lot of species of this, 400,000 species of plant. Just imagine that. That's a lot. Each one of its own unique evolutionary history, doing its own thing and having some kind of specialization. And there are probably about 10 percent of those remain undiscovered. Hope it's, you know, hope it's the Amazon that've never been explored botanically. So we don't know what's there? You know, it's like a big, big gaps on the map and not just in the Amazon, in other places as well. So there's still, there's still a big scope for exploration describing new species. You know, we're kind of trying to keep up with destruction. We're still, we're still trying to describe everything that's there as it's sort of going.

JVN [00:47:49] Before it gets destroyed.

ALEX MONRO [00:47:51] Well, as it's getting destroyed or after it got destroyed as well in some cases.

JVN [00:47:54] Okay wait. I know we're almost done, I just have one. So when's the last time we discovered a new nettle?

ALEX MONRO [00:47:59] Last year we described a new one from, but every year we'd describe some.

JVN [00:48:03] We do?

ALEX MONRO [00:48:03] Yeah. Yeah.

JVN [00:48:04] Because it's, so when you find one when you're out exploring and then you bring it back because like do you guys like run little DNA tests on the nettle to make sure that?

ALEX MONRO [00:48:10] We do some times. So if it looks very similar to something else and we're not quite sure, then we would. It's quite expensive to do the DNA tests and we don't always have access for that. But when we do, we, if it's something we're not sure yet, we definitely do that.

JVN [00:48:23] Do you ever like compare like the toxins in the like irritating chemicals like does like Australian ones have like different ones then?

ALEX MONRO [00:48:30] I should do. I kick myself sometimes. No, I'm sure someone must be doing it. No, I've never, I've never kind of got into that side of it. I'm still trying to get on top of describing everything and identifying it all and knowing what it is and how it should be kind of arranged in the classification.

JVN [00:48:44] Do you ever get together like other fun little botanists who who specialize in nettles, like chat with them like once a year or something?

ALEX MONRO [00:48:50] Yeah, there's about three of us.

JVN [00:48:51] Really?

ALEX MONRO [00:48:53] Yeah.

JVN [00:48:53] There's only three nettle experts?

ALEX MONRO [00:48:54] Well, probably more. Say say there's six. Three of them are retired in their 70s. Ones in his 80s and two in the 70s. And there's myself and there's probably about maybe three more. So we don't meet that often, but we kind of all know who we are.

JVN [00:49:09] Y'all, if you're looking for some job openings it sounds like we need some nettle experts up in here. You know, what I'm saying? Dr. Alex Monro, thank you so much for your time.

ALEX MONRO [00:49:18] No, it was a pleasure. It was a real pleasure.

JVN [00:49:19] I had so much fun getting to meet you. Thanks for having us. I really appreciate it.

ALEX MONRO [00:49:21] Likewise. Thank you.

JVN [00:49:22] Thanks. You've been listening to "Getting Curious" with me, Jonathan Van Ness. My guest this week was Dr. Alex Monro. You'll find links to his work in the episode description of whatever you're listening to the show on. Our theme music is "Freak" by Quin. Thank you so much to her for letting us use it. If you enjoyed our show, introduce a friend and show them how to subscribe, please! Follow us on Instagram and Twitter at CuriousWithJVN. We are officially verified on Twitter, yas. Our social are run and curated by Emily Bossak. "Getting Curious" is produced by me, Julie Carrillo, Rae Ellis, Chelsea Jacobson and Colin Anderson. An actually Emily Bossak also help produce this episode. So thanks for listening, we'll see you next time! Love you, kisses, mean it.