But Why: A Podcast for Curious Kids

Why Are Cactuses Spiky?

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Jane Lindholm 00:21
This is But Why: a Podcast for Curious Kids from Vermont Public Radio. I'm Jane Lindholm. On this show, we take questions from curious kids just like you, and we find answers. In our most recent episode, we talked about how animals get their names, both their common names, which are kind of like nicknames, and their scientific names, which often sound more formal and have two names, kind of like your first name and your last name. The system that scientists use to classify all living things is called taxonomy. And I wanted to remind you of that episode and that word taxonomy, because it comes up in today's episode, too. So listen, for that moment.

Jane Lindholm 01:07
This week, we are moving away from animals into an entirely different kingdom - plantae that that's plants. And we're talking about a specific family, cactacae. You might know them better as cactuses. Or should that be cacti? Or just cactus? What is the proper way to talk about more than one cactus?

Kimberlie McCue 01:31
Oh, that's a great question. And it's one that we actually wrestle with all the time here.

Jane Lindholm 01:36
That's Kimberlie McCue. She works for the desert Botanical Garden in Phoenix, Arizona.

Kimberlie McCue 01:41
My official title is Senior Director of desert horticulture, and conservation. And what that really means is that I am responsible for making sure that all of the plants in our Botanical Garden are healthy, and beautiful and well cared for, but also that we, I oversee scientists who are researching all different aspects of the lives of cactus and other desert plants. And we work to figure out the best ways to make sure that these plants never go extinct.

Jane Lindholm 02:20
So the first thing I asked Kimberly to tell us is the proper way to talk about more than one cactus. And she said, there are three choices. And they're all correct.

Kimberlie McCue 02:29

You can actually use the word cactus to mean one cactus or many cactus, you can use the word cacti to mean many have that kind of plant, or you can use the word cactuses. So all of them are correct. And that's why we argue about it all the time, because everybody has their favorite, which one they like to use to me in the plural of a cactus.

Jane Lindholm 02:58
I'm going to use what you use today. So what do you use?

Kimberlie McCue 03:02
I like cacti.

Jane Lindholm 03:03
Okay, cacti it is, for this episode anyway. Which choice are you going to make? Kimberlie mentioned that the team of people she works with, make sure the plants in their botanical garden have good lives. And they study the lives of cacti in general to know more about how they grow and evolve. Something about the way she talked about the lives of cacti made me think a funny thought. You know, we know that people are born and then they're babies and kids, and then we become adults. And then we become old. We think of a lifespan as having different stages like that. And we kind of think of animals that way too, right? Animals are young babies kind of immature than their adult or mature and then they grow old. But do cacti have lives like that, too?

Kimberlie McCue 03:51
They absolutely do. They absolutely do. And so I'm going to use as an example, what the cactus that most people around the world are familiar with. And that is the saguaro cactus. So that's the one that is standing up straight and then looks like it has arms that are reaching for the sky. And these particular cactus, when they start their lives as a seed, it is a teeny, tiny little seed, about the size of a poppy seed. That's what it looks like. And so when that seed germinates, it's a teeny tiny little green plant. And one of the coolest things to me is that within just a couple of weeks of that seed germinating and the little plant starting to grow, it gets its first spines, so it's this teeny, tiny little green nubbin. And when you look at it really close, it's got all these little spiky things coming out the top. And I think that baby cactus are the cutest ever, but then you think about a saguaro so it starts out like that really, really tiny, and it will take 50 years for it to grow from a baby cactus to being big enough and mature enough before it will make its first flower. And when it makes its first flower, that means it's become an adult. So think about that 50 years before they become an adult, and then they might live another 100 years before they're really really old, and they start to decline and then eventually die. So, so yeah.

Jane Lindholm 05:38

Wow, that's kind of fascinating to think about a plant like that saugaro cactus having a childhood and an old age, too?

Kimberlie McCue 05:45
Yes.

Jane Lindholm 05:46
So you mentioned that a Saguaro will start to get spines really early. Do all cactihave spines?

Kimberlie McCue 05:54
The answer is no. They don't. Most of them do. Most of them do. But some of them do not. It's a very few. And interestingly enough, there are some cacti that when they're babies, they do have spines. And when they become adults, they lose their spines. So it's endlessly fascinating.

Jane Lindholm 06:21
How can they be called cacti or a cactus if they don't have spines? Because it doesn't the word cactus means spiky plant?

Kimberlie McCue 06:29
Yes, it does. And, and the vast majority of them do have spines, and they have the spines all their lives. But for us, biologically, botanically what defines a cactus, first of all is that they are a succulent, a succulent plant. And what that means is that they store water in their tissues. So when you see a cactus, they literally look kind of plump, right?

Jane Lindholm 06:58
Puffy, kind of puffy.

Kimberlie McCue 06:59
They look kind of puffy. And that's because they have water inside of them. plants that are not succulents like, say, a petunia, when you look at their leaves, you know, they're kind of they're basically flat. And if they don't get watered every couple of days, you know, like if you have them in a pot or something, they just start to wilt. But succulent plants like cacti, they don't have that problem because they're storing a lot of water in their tissues. And the reason that that is important is because cacti live in dry areas, right? They live in desert environments where it doesn't rain very often. For us in Phoenix, our average amount of rain is only seven inches a year. That's, that is nothing. So another thing that will help define cacti as cacti is that the way that their bodies work is not like a lot of other plants. Most plants, I would say a good number of plants in the world, they do a lot of their metabolizing that means you know their inner body working during the day. But cacti they do it at night, and there's a very technical

term for that. But basically, for us for humans, you know, we're we're awake during the day and we're doing our thing and we're moving around and our body inside ourselves is having to release energy so you know and digest our food and you know, all of that. And all of that kind of slows down at night for us. But for cacti it's the exact opposite. They start really ramping all that up at night. And part of that is to avoid the heat of the day because it's just easier to do your thing when it's not so hot.

Kimberlie McCue 08:53
So now we know that not all cacti have spines or spikes, but most do. And that's certainly one of the things we think of when we picture a cactus in our heads. Right, all of those spikes. Well, several of you are wondering what the deal is with them, anyway.

Daphne 09:10
Hello, my name is Daphne. I'm five years old. I'm from the Netherlands and my question is why do cacti have have prickles?

Noah 09:19
Hi, my name is Noah. I live in Marion, Iowa. My question is, why are cactuses spiky?

Ryder 09:28
My name is Ryder. I'm five years old. I live in San Rafael, California. And my question is why is cactus sharp?

Kaylin 09:39
Hi, But Why My name is Kaylin and I live in San Diego, California and I'm five years old. And my question is why are cactuses pokey?

Julian 09:53
My name is Julian and I live in New York and I just turned 6. My question is, why does cactuses have spikes?

Bennett 10:06
My name is Bennett, and five and a quarter years old, I live in Eden Prairie, Minnesota. And my question is why do cactuses have spikes and not have none of them?

Kimberlie McCue 10:25
Spines are really interesting and and what they do for a cactus. So first of all, I want to make sure everybody knows that the spines of a cactus are actually what we call modified leaves. So when you look at a cactus, they don't have leaves, like we think of leaves, like on a tree, right. But in fact, Mother Nature has changed what would be a leaf on other kinds of plants and turn

it into a spine. So that's one little interesting piece of trivia. And then what do these spines do for the cactus? They can be a defense mechanism to discourage herbivores, which is what we call animals that eat plants from from eating the cactus. But also, spines create shade. And you might not think that because you think spines are these little skinny things. But actually, when you're covered in spines, as the sun is moving across the sky, those spines are casting shadows on the body of the cactus. And so that is another adaptation that cacti have to help them live in these really dry and hot environments. So they're little shade umbrellas. And then also, and this is so cool. There are some cacti that live in desert places where it never ever rains, it never rains. But where they are, is in coastal areas. So they're near an ocean. So they're near an ocean, but it never rains on land. So how on earth do they get water? Well, the way they get it is that early in the morning, there will be fog that comes off the water and floats across the land. And those spines on the cactus provide a place for the water to condense and form little droplets. And then those droplets can run along the spine and down to the ground to the roots. So the spines of a cactus can do a lot of different things for the plant.

Jane Lindholm 12:40
That is so cool.

Kimberlie McCue 12:41
Yeah, it's super cool.

Jane Lindholm 12:44
So that helps us answer the questions. Why do cactuses have spikes? But Piper in North Carolina wants to know:

Piper 12:51
How did cactuses get their spikes?

Jane Lindholm 12:55
How did cactuses get their spikes?

Kimberlie McCue 12:58
Oh my gosh. Wow, that is a fascinating question. And it's something that scientists study. Many scientists study those kinds of questions and try to answer that, in fact, one of our newest scientists here at the garden, the way she asks it is, how did cactus lose their leaves, which they didn't really because they just turned into spines, right? But they don't look like like normal leaves. And I mean, that's a process called evolution. Every living thing goes through it and evolution, it means change over time. And the change really happens in their DNA in the genetic material. And we all, all of us have that DNA in us. And it has the code, it's like the instruction book that makes you what you are. And just over time changes can happen. And if

those changes turn out to be good for the organism for the cactus in this question, then that will allow the plant to survive, and they'll pass on that new adaptation to their offspring, and so on and so forth. And so over a long period of time, you can get these really, really interesting forms like spines. Now, for us for scientists, a question is when in time did that happen? You know, because we do have a few plants that we think are the ancestors of cacti, and they still have leaves, but they also sort of look like cacti. And so we think those are the oldest in this whole line that led to cactus or cacti. And so what happened, you know what happened in their genes to make that change. So it's it's it's an interesting question. It's one we haven't fully answered. But but actually, the question that was asked is a really good one. And it's one that scientists are really interested in.

Jane Lindholm 15:10
Well, and it sounds like some of our young listeners who want to be cacti researchers, that's an area that they could really do a lot of work on to help us understand why.

Kimberlie McCue 15:20
Absolutely.

Jane Lindholm 15:21
When we come back more questions about cacti.

Jane Lindholm 15:26
This is But Why: a Podcast for Curious Kids. Today we're learning about cacti with Kimberlie McCue of the Desert Botanical Garden in Phoenix, Arizona. That's a place where you can find cacti growing wild. They have to live in dry desert places like the American Southwest. And I asked Kimberlie, where else cacti live,

Kimberlie McCue 15:47
You can actually find cacti as far north as Canada. And yes, in the southwest, like where I am in Phoenix, Arizona, you can find cacti in actually in islands of the Caribbean, like in Puerto Rico, or Cuba, and then all the way through South America. Now, it is true that if you travel around or see pictures from other parts of the world, say like Australia, which is not considered the new world, you may see pictures that have cacti in them. But the reason that those are there is because people moved them. People took them from the new world, their native home, and transplanted them somewhere else. So that's why you will see cactus in other parts of the world today.

Jane Lindholm 16:43
And on kitchen tables and living rooms all over the world.

Kimberlie McCue 16:46
Yes, yes, because they're super popular.

Jane Lindholm 16:50
So we have a question from Gray who lives in Charlotte, North Carolina, who can help us get into questions about different kinds of cacti and how they look different. Could you start by telling us how many different kinds we know about that of cactus species?

Kimberlie McCue 17:06
Well, first of all, let me tell you that we're discovering new ones all the time. So that's another thing for people who are interested in being scientists. Sometimes people think oh my gosh, so much has been discovered. There's nothing left to do. There's nothing left to research well poopoo on that. We do not know everything. Absolutely not. And we are we discover new species all the time, including new species of cactus. So right now we would say around 1200 different species of cacti in the world.

Jane Lindholm 17:42
Wow.

Kimberlie McCue 17:43
Are known, are known.

Jane Lindholm 17:44
How many do you think are unknown?

Kimberlie McCue 17:46
That is like the big question, right? I mean, we just don't know. How do you know an unknown? You don't know?

Kimberlie McCue 17:53
Exactly, exactly.

Grey 17:55
Hello, my name is Grey. My age is five and a half years old. I live in Charlotte, North Carolina. Why are teddy bear cactuses cactuses, but they're not soft, like teddy bears.

Jane Lindholm 18:14
Why are teddy bear cactuses more like their names?

Kimberlie McCue 18:16

Oh,yeah, teddy bear cactus. They're also called teddy bear cholla. They're definitely like, stay away from them. Look at them. They're really cool to look at. Don't even think about touching them. I think that that common name. And that's what that is the common name. People create common names based on what their impression of the plant is, you know what it reminds them of? And I think that in actually in a certain light, like literally, because these plants can be really cool when the sun is behind them, and they kind of glow and they do look kind of poofy and furry. And I think that might be why some time a long time ago, somebody said, oh, it looks like a teddy bear.

Jane Lindholm 19:06
Maybe it was also a bad joke, because you don't want to hug it.

Kimberlie McCue 19:10
Maybe. Maybe.

Jane Lindholm 19:13
I'm really glad you mentioned common names because our in our last episode, we talked about taxonomy and how animals and plants and all living things are classified. And we talked a lot about scientific names versus common names. So that's a really great example of a common name, maybe being quite different than a scientific name and being named in kind of a weird way perhaps.

Kimberlie McCue 19:34
That's right. That's right, exactly. You know,

Jane Lindholm 19:36
there are cacti that look kind of fuzzy or furry that have lots and lots of short little spikes and then there are some that are very tall like the saguaro you were talking about earlier, that are as tall as trees and have long singular spikes. Tell us about the different ways cacti can look just how much variety there is in cacti.

Kimberlie McCue 20:00
Oh, yes, they're incredibly diverse. There are some cacti that never get bigger than maybe a few inches tall. And a lot of them tend to be sort of round kind of forms. And they're really low to the ground. And then it goes from there from that size, all the way up to what the biggest cactus is. And that's called the cardon. And the cardon is a cactus that's native to Mexico. We do have some here in our garden, because we transplanted those, they're not native here. But those are the cactus that can get larger than any other cactus. And then like I said, it's all the way through. And then there are, so like I said, some are like little and round like little balls. So that's one body form for a cactus, the kinds that are like saguaro cactus and cardons. They

grow really tall. Those are called columnar cactus, because they're like a column, there are some cacti that become like trees, like they literally, if they get old enough, it looks like they have a trunk. But then when you look where the branches would be, you see, they're just all of these fairy spiny cactus like parts hanging off of them. So it's just, it's just all over the map of what a cactus can look like.

Jane Lindholm 21:40
Why are cacti important to their environment?

Kimberlie McCue 21:43
Oh, I love that question. Because cacti are an incredibly important part of the environment everywhere that they exist. So all through the new world, no matter where you find them, they are serving multiple purposes. So let me talk a little bit about this saguaro because again, it's it's a cactus that that most people are familiar with, they've seen it in movies or pictures, or you know, what have you. And we call it the cactus hotel. Because it supports so many different kinds of animals. And literally, it can be like a hotel, because there are birds that will drill out holes in the cactus. And they use it as a nest, and it doesn't hurt the cactus. What happens on the inside of the cactus is they form like a scab inside, and it seals off that hole from the rest of the living tissue. And so the birds build their nest inside there, and their babies are born in there. And it's many different kinds of birds that will use those holes. Woodpeckers are the ones that make the holes, and they might use it as a nest site. And then later on a different kind of bird will move in there like an owl, or a Cactus Wren, or something like that. So, so lots of birds will use the swirl cactus as a place to have their babies and raise their and raise their babies. But also, the saguaro flowers are important to a lot of different animals because they rely on them for food. So one of my favorite things in the spring here in Phoenix, is I watch for the arrival of the white winged doves. And the white winged doves they fly up from Mexico. And they time that journey to match up with when the saguaro cactus flowers are going to open, because first those birds will feed on the nectar. And in that process, they're helping pollinate the flowers. So they're helping the saguaro to reproduce. But later, when the swaro produces its fruits, then those birds are feeding on the fruits. So it's super important for those white winged doves that those saguaros. The saguaros are here, that they're going through their lifecycle. They depend on each other. And it well and also, let me also say that for saguaros, bats are another animal that will visit the saguaro flowers and drink the nectar. They will help pollinate the saguaro. But they depend on that cactus too. So think about it. That's just one kind of cactus out of the hundreds and hundreds and hundreds of kinds of cactus that there are and if you start thinking about how every single cactus in their environment is interacting with the other parts of their environment, just how critical that is. And especially because cactus are, are one of the most ubiquitous kinds of plants that you find in a desert because they're so well adapted to the desert.

Jane Lindholm 25:02
And just so people can have that really awesome vocabulary word in their head ubiquitous means common all over the place everywhere.

Kimberlie McCue 25:11
Yes, exactly. Exactly.

Jane Lindholm 25:14
You know, another thing that we might just want to mention is that cacti are really important to humans. In fact, some species of cacti are farmed. Humans eat a lot of different kinds of cacti or turn them into other products. So they're actually really important to humans and to our economy, too.

Kimberlie McCue 25:31
Yes, that is absolutely true. Yes, a lot of cultures and societies are very much tied to cactus. And here in the southwest of the United States, it's a great thing that I loved when I came here, because I like to eat different cactus parts, some kinds of cactus that are called prickly pears, some of those, so they have really flat, we call them pads. Those can be harvested from the plant and you scrape the spines off them. And then you can cook them. And they are really tasty, and they're called nopales. The fruit of saguaro cactus, native peoples to the desert in the southwest, have harvested those for hundreds and hundreds and hundreds, if not thousands of years. They're super important to their culture. And they they will make beverage from them, they actually will use it to feed their livestock. Here at the garden, I have one of my colleagues, he makes saguaro sherbert, with saguaro fruits, so absolutely, yes.

Jane Lindholm 26:40
Are cacti in trouble? Should we be knowing anything about how to help preserve them?

Kimberlie McCue 26:46
Yes. And thank you for asking that question. So there is an organization called the IUCN, the International Union for the Conservation of Nature, which is the oldest and the largest environmental organization in the world. And a few years ago, they did what was called the global cactus assessment. And they looked at all the different species of cacti, to figure out whether or not they were secure in the wild, so safe, or were they threatened. And the results were really stunning. And what was learned from that global cactus assessment was that over one third of all of the cactus species that we know about, are threatened with extinction. And that makes the cactus family one of the most threatened groups of organisms on the planet. So, cactuses, or cacti, as a group are really in trouble. And there are a number of reasons why different things that are causing those threats. But the number one, the biggest threat is people harvesting them illegally from the wild, so poaching cactus, and so what we ask of people here

is, if you're going to buy a cactus, whether it's a small cactus in a little pot, or a big cactus, you know, to put in your yard if you're in a place where where that's possible, is make sure that where you're buying the cactus is a reputable place, that they will tell you where their plants came from, and they can prove that they were not illegally taken out of the wild.

Jane Lindholm 28:43
Kimberlie, this was so much fun. I learned so much about cacti. I really appreciate you sharing your expertise with us.

Kimberlie McCue 28:49
Oh, thank you. I love to talk about cacti. It's it's it. They're part of my world. So thank you so very much.

Jane Lindholm 28:58
That was Kimberlie McCue, Senior Director of Desert Horticulture and Conservation at the Desert Botanical Garden in Phoenix, Arizona. I hope you learned something about cacti or cactus or cactuses in this episode. And now that you know that poaching is a big problem, you can help make sure any cactus plants you buy are sourced properly with conservation in mind. That's it for this episode. If you have a question for us about anything you think we haven't answered yet, from science to history to philosophy to make believe, send it to us! Have an adult help you record yourself asking the question. Tell us your first name, how old you are and where you live, if you want, and then tell us what you'd like us to find out for you. Send the file to questions at But Why Kids.org we can't get to all of your questions but we love hearing from you and knowing what you're curious about. But Why is produced by Melody Bodette and me, Jane Lindholm at Vermont Public Radio. Special shout out and thanks to Elodie Reed and Abagael Giles at VPR for always lending us a hand. Our program is distributed by PRX. And our theme music is by Luke Reynolds. We'll be back in two weeks with an all new episode. Until then, stay curious!