Ask a Biologist vol 033 Topic: Plants Co-host: Taylor Cheatham
Guest: Raul Gutierrez

Wickedly Cool Plants -

Dr. Biology and his co-host Taylor Cheatham from Dunbar Elementary School explore some of the more unusual plants of the desert and beyond. The pair interview biologist Raul Gutierrez who has been studying Devil's Claw. If that is not a wickedly cool name - what is? There is even talk of some plants eating insects. Let's hope they don't get an appetite for larger animals.

Transcript

Dr. Biology: This is "Ask a Biologist," a program about the living world, and I'm Dr. Biology, here with my co-host, Taylor Cheatham. Welcome to the "Ask a Biologist" program, Taylor.

Taylor Cheatham: It's good to be here, Dr. Biology.

Dr. Biology: Well, I'm thrilled to have you here, too. Can you tell me just a little bit about yourself?

Taylor: Well, I go to Dunbar Elementary School and it's one of the best schools. And my teacher is Helen Rentz and she's one of the best teachers I've ever had.

Dr. Biology: Would you say she's awesome?

Taylor: She's awesome.

Dr. Biology: Yes, I'd say so too. All right. In this show we're going to visit with a young scientist-younger than I am, a little bit older than you. He's going to tell us a little bit about some very cool desert plants. And that's kind of neat, because we're talking about the desert, which is hot, right?

Taylor: Yes.

Dr. Biology: Some of these plants have been know to jump. Jump? Wow! While others hunt and trap insects for food. Now, did you ever think about plants hunting and trapping?

Taylor: No.

Dr. Biology: No, I didn't either. We're also going to learn about a special museum for plants called a herbarium. You got to visit the herbarium didn't you?

Taylor: Yes.

Dr. Biology: Is it a cool place?

Taylor: Yes it is.

Dr. Biology: Yes! OK. Well, for someone not familiar with herbariums, they might think that they're dry and boring. And, well, they might be dry, but they're anything but boring. In fact these museums store some of the most beautiful examples of plants, many of them works of art. I thought they were really quite beautiful, didn't you?

Taylor: Yes, I did.

Dr. Biology: And so, if you listen in we're going to give you some of the tips for making your own herbarium. So, you and I are going to help other people learn how to make their own herbarium. Just a few tips. And we actually have a companion website that gives all the details. Is that cool?

Taylor: Yes.

Dr. Biology: All right! OK. Our guest scientist is Raul Gutierrez, who is a PhD student in the School of Life Sciences. Raul is working with a very interesting plant. It's got a really cool name. You and I learned about it earlier today. It's called Devil's Claw. Taylor, I hope we get to learn a little bit about how it got its name. How about you?

Taylor: I really want to learn about it.

Dr. Biology: Yes, that's what I thought. OK. Raul, welcome to "Ask a Biologist."

Raul Gutierrez: Thank you. Thank you guys for having me today.

Dr. Biology: Well, you've been a wonderful host. We got to visit the herbarium, as I mentioned. To start out, Taylor, you have these great notes of some questions that you've been wanting to ask Raul. Why don't you start off with one of your questions?

Taylor: Do plants sweat?

Raul: Do plants sweat? Well, kind of. They do have pores on their leaves, kind of like people have pores on their skin, and they do open up and water vapor comes out. And sometimes actually water droplets do come out. So, they can appear to sweat, kind of very similar to humans.

Dr. Biology: Does it help them cool? When we sweat, that's usually what we're trying to do, is cool off.

Raul: It's not so much a cooling mechanism. It's more of a pulling in water for photosynthesis, which is a process by which plants make food.

Dr. Biology: Oh. Taylor, have you heard of photosynthesis?

Taylor: No.

Dr. Biology: No. OK. Well, that's actually not surprising, you know; you're in third grade. Well let's just let everybody else know real quickly that the neat thing about photosynthesis is, it's taking the energy from the sun and it's converting it into plant food.

And the good thing about that for us, as humans-what do we need? We need to eat that so we have food, right?

Taylor: That's pretty neat.

Dr. Biology: That is pretty neat. Yes. OK. You have a long list of questions here. Let's do another one. That was great.

Taylor: Why does cactus have spikes?

Raul: Good question. Well, cacti have what are called spines, and what the spines do is, they help to protect the plant from hungry animals. So, cactus stores water in its stem, and typically cacti grow in deserts, which are hot and dry. And an animal comes walking along and sees this juicy succulent plant full of water.

It's hot, it's dry outside, and the animal is thirsty. So, he or she might want to take a bite out of that plant. Well, the spines prevent an animal from walking by and eating that plant, because that plant can't run away like animals can.

Taylor: Is the puffer fish related to cactus?

Raul: No, it's not. It's a fish. It's an animal, so it's not related to cacti. They do look alike, but they're not related. But the spines on the puffer fish serve the same purpose. They're to prevent others from eating it.

Dr. Biology: Mm-hmm. Well… Have you ever bumped up against a cactus?

Taylor: No.

Dr. Biology: No. It's not a pretty sight. It's actually rather painful. Taylor, have you heard of jumping cholla?

Taylor: Yes, I have.

Dr. Biology: You have? Have you seen the pictures of them?

Taylor: Yes.

Dr. Biology: OK. Well, I want to know, do they really jump?

Raul: They don't really jump; they don't have a mechanism to do that. What actually happens is, people usually brush up against them. And you don't realize you do because you're usually hiking through the desert. So, when you brush up against it, the joints snap off really easily. So, that's usually why it appears that they jump. But they really don't jump. They just snap off quite easily and get stuck in you.

Dr. Biology: Ah. OK. Well, Taylor, what else do we have to ask Raul?

Taylor: What are those things that look like strawberries?

Raul: On a cactus?

Taylor: Yes.

Raul: Those are the fruits. Those are the edible fruits. They usually are pink or purple, and they're actually quite tasty. That's pretty observant, because they really do look like strawberries-I didn't even think about that-pretty big strawberries.

Dr. Biology: Yes.

[laughter]

Taylor: So, they're edible?

Raul: Yes.

Dr. Biology: Oh. What do they taste like?

Raul: They taste kind of like a mix between a strawberry and a pear, maybe.

Dr. Biology: Really?

Raul: They're really sweet and juicy.

Dr. Biology: You were close there, Taylor. [Raul], you actually study this plant we talked about in the beginning of the show that's called Devil's Claw.

Raul: Yes.

Dr. Biology: And let's get it out so we can look at it, because I thought it was really cool to look at. So, what we're doing in here is we're pulling this out. OK. We'll get it out of the box here. We each get one. This is cool.

Raul: Oh yes, I brought enough for everyone to look at.

Dr. Biology: Oh. How neat. All right. What do you think, Taylor?

Taylor: It's neat.

Raul: [laughs]

Dr. Biology: It is neat. Does it look like a claw to you? I think actually you did say it looked like a claw, didn't you?

Taylor: Yes, I did.

Dr. Biology: OK. Well, we're kind of getting an idea. This is dried right now. When they're not dried do they look like this?

Raul: No, when they're growing, when they're still maturing, they will be green and kind of look like okra.

Dr. Biology: They'll look like okra.

Raul: Yes, if you're familiar with okra, that's what they'll look like. Eventually the outer green part dries up and you're left with this woody inner part, which is what we call the claw.

Dr. Biology: Wow! It really does look like a claw. Hold still here, Taylor. I'll go right after you here.

Taylor: [laughs]

Raul: [laughs] And the tips are very pointed and sharp, and they can cause some damage.

Dr. Biology: Right. Well, it seems like they're about six inches across here, would you say? Yours is actually curved a little more than mine, Taylor, but they do have this really wicked look to them. So, when we said, "wickedly cool plants," I'd have to say this is a wickedly cool plant, wouldn't you, Taylor?

Taylor: Yes I would.

Dr. Biology: All right. I think I'm getting an idea of how they got their name. Is that exactly it, that once they dry they get this claw shape?

Raul: Yes, that's exactly it.

Dr. Biology: How long have you been working with Devil's Claw?

Raul: I've been working on them since 2001, I believe.

Dr. Biology: Since 2001.

Raul: 2001, yes. So, I started off on my Master's project with these, and now I'm continuing on with my PhD.

Dr. Biology: What does a person do when they're studying a particular plant? I mean, that's a fair amount of time to be studying them. What are you doing?

Raul: Part of what I do is look at how many species we have exactly. That's always a good question. Another thing we look at is how they came to be where they occur now. These plants occur in dry and semi-arid areas, semi-dry-areas in the U.S. and Mexico, and then down again in Argentina and Brazil. And so, one of the questions I'm trying to answer is, how did we get that distribution without anything in the tropics in the middle.

Dr. Biology: Oh, right. How did they get from point A to point B?

Raul: Right.

Dr. Biology: There's sometimes a bird or an animal that could walk or fly. Oh. That's kind of cool. Yes. How does a plant travel thousands of miles without having any wings or any kind of way of moving. At least last time I checked plants can't walk.

Taylor: I have no clue.

Dr. Biology: You have no clue. Well Raul, how do plants travel?

Raul: Well, there are several ways. They can catch a ride with other animals. So, if you see the Devil's claw has hooks on the end and will catch onto the ankles of large mammals like cattle, horses nowadays, and they'll be carried across the landscape that way. There are other things that can attach to fur or the feathers of birds that are going to migrate, and so they will get deposited in the new area.

Dr. Biology: So, they're like hitchhikers.

Raul: Yeah, they're hitchhikers. There are other types of fruits that don't need animals that can catch the wind and be carried off by the wind to new areas.

Dr. Biology: I've seen those, like dandelions.

Raul: Dandelions.

Dr. Biology: Taylor, have you ever taken a dandelion and lifted it up and blown it, and they just float off in the air? Have you done that Taylor?

Taylor: Yes.

Raul: That's a great example of a plant that gets carried off by the wind. Those are always fun.

Dr. Biology: All right, so we've got two ways, right Taylor?

Taylor: Yes.

Dr. Biology: They can hitch a ride with an animal, or they can drift on the air. Any other ways?

Raul: Yeah, they can float on the water. Coconuts are a common one that do this. They're hollow on the inside, so they'll float along the water until they hit a new beach and start growing there.

Dr. Biology: OK, so, we've got three ways. Well, Taylor, what other questions do you have for Raul?

Taylor: How small can cactus be?

Raul: Cacti. Cacti can be pretty tiny actually. Some of the smaller ones I've seen are maybe the size of a thumbnail - really, really tiny. And those were recently discovered not too long ago, most likely because of their size, people overlooked them.

Dr. Biology: So, these are mature plants?

Raul: Yeah.

Dr. Biology: Wow. I have a follow-up question for that. If I were to find a saguaro cactus out in the desert and it's been growing for five years, how tall do you think it would be?

Taylor: About probably six feet.

Dr. Biology: About six feet? You know what I would think the same thing, about six feet. Raul, how tall is that cactus going to be?

Raul: Well, after about five years, you'd probably measure it in inches. They're not going to be very big. It's going to depend on certain factors like temperature, how much moisture they're getting, maybe if they're under a nurse plant that's going to protect them when they're small. So, it's really going to depend, but they're not going to be very big at all.

Dr. Biology: They're really, really tiny. They really don't grow very fast. So, when you see the really tall saguaro, some of them are what?

Raul: Easily 100-200 years old.

Dr. Biology: So, they're usually 100-200 years old. Great. What other inquiring mind question do you have there [Taylor]?

Taylor: Do some plants give us medicine?

Raul: Yes, plants are a great source of medicine. A common early one is aspirin; everyone takes aspirin for headaches and for pains. That actually comes from willow trees and that's where it was first discovered. But yes, we do have tons of medicines that come from plants.

And the sad part is we're losing a lot of our plants really, really quickly, especially in the tropics, so fast we can't identify them. They're gone and we can't test them for possible uses for medicines.

Dr. Biology: So, we're actually harming ourselves, as well as the plants themselves.

Raul: Oh yeah.

Dr. Biology: Wow, like I said, Taylor has this great list of questions. Let's do one more.

Taylor: What would the world be like without plants?

Raul: Well, without plants, I don't think there would be any living organisms on the Earth. Plants, remember we talked about photosynthesis. Plants photosynthesize and make food for all animals - animals can't make their own food. Humans would definitely not be here without plants.

Dr. Biology: The other thing that's interesting about plants, Taylor, is that what do we breathe in?

Taylor: Oxygen.

Dr. Biology: Right. And do you know what we breathe out, by chance? It's called carbon dioxide. Guess what plants breathe in?

Taylor: Carbon dioxide.

Dr. Biology: Exactly. And what do you think they do by taking the carbon dioxide out of the atmosphere? It helps us because they're like the balancing act for humans, or for other animals, right?

Taylor: Yes.

Dr. Biology: You don't see her, but she's got this great big smile on her face, and I think it's because she's also looking at her questions. You must have another really cool question in there.

Taylor: In Arizona, are there any plants that we should avoid?

Raul: Well, a favorite of mine when we're out hiking is always poison ivy - that's always one to avoid. It will give you a nasty rash for a couple of days. Stay away from cacti. Those also cause some pain if you get too close to those.

Dr. Biology: Right, and some infections too because the barbs don't always come out, right?

Raul: Yeah, the spines don't always come out. They're barbed and so you think you removed them, but they'll still be under the skin for some time.

Dr. Biology: Well, we got to visit a herbarium. Raul did a very nice job of saying it's a library of plants. And it turns out the School of Life Sciences has an excellent herbarium. It has over 270,000 specimens, pretty cool. So if we describe it - and I think Raul actually brought one in; he's going to go get one of the plates. Remember the plates we looked at? Were those pretty?

Taylor: Yes.

Dr. Biology: Yeah, that's what I thought. Now I'm going to hold it because we have another little guest in the studio too, so that we can look at it. So, I'm holding one of the plates here. Actually these plates are about 12x17 [inches]? Is that they're usual dimensions?

Raul: 12x18 or 12x17[inches].

Dr. Biology: 12x18[inches]. There are pressed parts of plants on it, so they're very dried and they're pressed very flat. Why are they pressed flat, Taylor?

Taylor: So that you can stack them on top of each other.

Dr. Biology: Yeah, that's right; we need to store a lot of them. She's a new budding scientist, as you can tell Raul did a great job. I think that they're just really beautiful works of art. Do you?

Taylor: Yeah.

Dr. Biology: Now, one of the things that I've always been curious about is how do you make your own herbarium. Would you like to try that Taylor?

Taylor: Yeah, I would.

Dr. Biology: That's good. Well guess what, on "Ask a Biologist," we have a perfect place to go. There's an article out there called "Smashing Success," and it talks all about making your own herbarium. It has all the diagrams, all the pictures and all the information you need to make your own herbarium. And the good news is that it doesn't cost much, does it?

Raul: No, it doesn't cost very much at all.

Dr. Biology: What are the materials you need?

Raul: Well, to press the plants, you just need a stack of cardboard and some newspaper to put your plants in, and maybe something a little stiff on the side, like a piece of plywood to apply some even pressure to the plants.

Dr. Biology: Yeah, and that's exactly what we have. And I guess the important thing is to get all the water out?

Raul: Yes, try to dry them as quickly as possible, or they might mold on you.

Dr. Biology: We don't want any mold.

Raul: No.

Dr. Biology: So, don't forget to go up to the website, and I think Taylor's going to even try it out. At least I hope she'll even try it in her classroom. She could actually get her awesome teacher to help her do that. And I didn't even mention one of the coolest things is the fact that you can go into one area where we have a microscope and there's a flower underneath it, and you can actually change the magnification, and then at one point, you can actually label the flower parts. Does that sound like a cool thing?

Taylor: Yes.

Dr. Biology: All right. The other thing we wanted to talk about, before Raul gets out of here, is something about plants that hunt insects. Does that sound cool to you?

Taylor: Yes.

Dr. Biology: Yes. Do you like insects?

Taylor: Yes.

Dr. Biology: Yeah, some of them. Matter of fact, you got to look at some ants earlier today, didn't you?

Taylor: Yes, I did.

Dr. Biology: Well what I want to know are there really plants out there that are hunters?

Raul: They don't hunt and chase down prey, but they do lie in wait for a tasty meal to come by, and they'll trap it and go ahead and eat it.

Dr. Biology: And, of course, one of the nice things about that is we have a couple examples right here. And probably the most famous of all - we have a two little examples here in front of us - are Venus flytraps. What do those look like to you?

Taylor: Like a mouth.

Dr. Biology: Yeah, it looks like a mouth. And they've got these little almost bristly edges to them. They're pretty amazing so how do they work?

Raul: Well, what happens is that little pad opens up. I think it kind of looks like a taco with teeth. [laughter] That's what I like to call it. So, the little pads open up and there are hairs along the inside of it.

When a fly lands on the pad it trips one of the little hairs and the whole pad snaps shut and traps the fly in there. Then it starts to release juices and digest the fly and all that nasty stuff.

Dr. Biology: OK, well, what about this other example over here. This one is much bigger. What's it called?

Raul: That's a pitcher plant and it's called that because part of the leaf folds up and looks like a water pitcher.

Dr. Biology: OK. So, what's so dangerous about that for an insect?

Raul: Well, an insect gets close to the edge and it's slippery in the inside and if the insect goes too far into the leaf it slides down to the base of that where again the digestive juices are at the bottom waiting for the insect.

Dr. Biology: Oh, the poor fly, right? [laughter] Taylor's smiling. I don't think she likes flies. I think she's OK if the pitcher plant gets them.

OK, there's one other plant that we talked about a little bit earlier and that's one that smells like rotting flesh. What's up with that?

Raul: Right, there are some flowers that do smell like rotting flesh and that's because they're pollinated by flies.

Dr. Biology: Oh, OK, that way it attracts them.

Raul: Right, it tricks them into thinking there's a rotting piece of flesh and the flies land, they pollinate the flower, and the flower's happy.

Dr. Biology: All right. There are three questions I always ask every scientist that's on this show. You want to share these with me Taylor?

Taylor: Yes.

Dr. Biology: OK, well then I'll tell you what. I'll do two of the questions that I know people like to listen to but I'm going to save one of them for you that I know all our listeners love to hear about, OK?

Taylor: OK.

Dr. Biology: So, I'm going to start and the next question you're going to ask. So, the first question is: Raul, when did you first know that you wanted to be a biologist or a scientist?

Raul: Oh, probably when I was a kid and I started collecting fish and plants and anything that I could cram into my room. I've always liked living organisms, so biology was just a natural course for me.

Dr. Biology: Did you have a very, how do we say, understanding mother?

Raul: Yes, I did. Both my parents humored me and let me get into my little phases but I'm grateful for that, yeah.

Dr. Biology: Excellent. Let's do another one.

Taylor: If you weren't a biologist, what would you be?

Raul: Well, I really like working in museums so I think I'd be an archeologist or some sort of historian and still be able to work in a museum collection. That fascinates me, too.

Dr. Biology: Do you have any hobbies?

Raul: I go out plant collecting whenever I get a chance.

Dr. Biology: Wow, OK, that's dedication. I have one last question.

Raul: OK.

Dr. Biology: What advice do you have for young scientists? As a matter of fact, we have a young scientist here. Taylor, you're planning on being a biologist, right?

Taylor: Yes.

Dr. Biology: Yes, and is it because of your trip today or were you going to be a biologist before?

Taylor: I was going to be one before.

Dr. Biology: Yeah, I thought so. But that's OK. We don't care how we get biologists, as long as we get them. All right, so what tips do you have for Taylor?

Raul: First of all, never stop asking questions. I think that's what drives most of us is we always want to know more and I think that's what gets us into problems sometimes is we ask too many questions and we can't come up with answers fast enough. Never stop asking questions.

Dr. Biology: Do you think you'll ever stop asking questions, Taylor?

Taylor: No.

Dr. Biology: I don't think so either, because from the list I see here you must have, it looks like at least two pages, at least two-dozen questions. So, we didn't get to go to all of them. Is there another one on here that you would really like to ask?

Taylor: Can plants grow on dead plants?

Raul: Yes. Sometimes trees fall over and that's a perfect spot for moss for some ferns to start taking root and start growing off of that. So defiantly, they will even grow on other living plants while the tree's still alive.

Dr. Biology: Very cool. You got another one?

Taylor: What is pollen made of?

Raul: We usually don't look at pollen for identifying plants.

Dr. Biology: Right. I'll tell you what, Taylor, one thing that's cool is "Ask a Biologist" has a mystery imaging area, did you know that?

Taylor: No.

Dr. Biology: Well, if you go up to the mystery image area, there happens to be a couple images of pollen under the microscope. They're very cool because one looks like a puffer fish with all the things that stick out, and the other one looks like maybe something from a brain. Yeah I know, you didn't see it but her face, she just gave this look of "ick."

Well, they're really cool images so you can go see them. One of the things that's surprising is the one that looks like the puffer fish, a lot of people realize that pollen causes you to sneeze, do you have allergies, Taylor?

Taylor: Yes.

Dr. Biology: Well, they think the spine, the little sticky things are what make you sneeze. But they are only there so that the pollen, remember we had seeds that catch a ride? Well that's the same thing with the pollen so when bees or a fly or something comes in to the flower it gets stuck on their legs. So they catch a ride and that's how the different flowers get pollinated. Did you know that?

Taylor: Yes.

Dr. Biology: You did! Cool, see she is going to be a biologist.

Raul: Well, there is a chemical that is also found in the pollen it's called sporopollenin and it's actually a really tough substance. We actually really don't know what it is made of at this point because we can't break it apart. The good thing is it lasts forever so we find a lot of fossil pollen from the sporopollenin that doesn't degrade very easily.

Dr. Biology: Wow, does that also cause some of the allergies?

Raul: It contributes to the ornamentation on the pollen grains themselves, but I'm not sure if it does that.

Dr. Biology: All right, well with that, Raul Gutierrez, thank you for visiting with us.

Raul: Thank you for having me again.

Dr. Biology: And Taylor, thank you for being a co-host on "Ask a Biologist." It's been fun for me. I want to know has it been fun for you?

Taylor: Yes it has.

Dr. Biology: OK, you ready to do it again?

Taylor: Yes.

Dr. Biology: Yes? What's the best part of being a co-host?

Taylor: That I got to see all different kinds of stuff, like plants and animals and birds.

Dr. Biology: Right, visiting all those labs. That was pretty cool, wasn't it?

Taylor: Yes.

Dr. Biology: All right, well thank you again for being here.

Taylor: Thank you.

Dr. Biology: You've been listening to "Ask a Biologist" and my guest has been Raul Gutierrez from the ASU School of Life Sciences. My co-host has been Taylor Cheatham from Dunbar Elementary School in Phoenix, Arizona.

In case you want to learn more about how to build that herbarium, see our website which

is the "Ask a Biologist" site and just search for smashing success. You can actually do that with Google and it will come up as well, if you use those key words.

The "Ask a Biologist" podcast is produced on the campus of Arizona State University and is recorded in the Grass Roots Studio housed in the School of Life Sciences, which is an academic unit of the College of Liberal Arts and Sciences. And both the School of Life Sciences and the College of Arts and Sciences provided funding for the co-host contest. That was pretty good, wasn't it Taylor?

Taylor: Yes, it was.

Dr. Biology: Remember even though our program is not broadcast live, you can still send us your questions about biology using our companion website. The address is askabiologist.asu.edu. Or you can just Google the words "ask-a-biologist." I'm Dr. Biology.

Taylor: And I'm Taylor Cheatham.

Dr. Biology: And if you're a student in the Phoenix area and you'd like to be on the "Ask a Biologist" audio show, just head up to our podcast area. The address is askabiologist.asu.edu/podcasts.

There you will find information about submitting an audition recording, and hey teachers this is also a great project to do in your classroom or in your school. We have all the information about the contest and how you can create a contest in your own school.

We have details about the equipment, the software used to create podcasts, and much of the equipment, by the way, and software is inexpensive and in some cases free.