Ask a Biologist vol 032 Topic: Spiders Guests: Eileen Hebets & Lisa Taylor

Spiderwomen -

What would have happened if poor Miss Muffet had not been frightened away by the spider that sat down beside her? Dr. Biology talks with two scientists that certainly were not frightened away by spiders. Listen in as biologists Eileen Hebets and Lisa Taylor talk about their passion for these cool creatures.

Transcript

Dr. Biology: This is "Ask-a-Biologist", a program about the living world, and I am Dr. Biology. Hey, do you remember this short nursery rhyme? "Little Miss Muffet sat on a tuffet, eating her curds and whey. Along came a spider and sat down beside her and frightened Miss Muffet away."

For many people this rhyme is so well known that they can recite it from memory. But what if it hadn't ended with Miss Muffet being frightened way? The story could have been so much more interesting. Today, we get to sit down with two guests that have been studying the lives of spiders, including the way some of them pick a mate.

I've heard that some of the spiders use some of the same things that you and I would do when we're looking for a perfect partner. Some dress up, others display colorful designs and patterns. Still, others dance and drum just to attract the mate. To get the scoop on spider mating, we have two guest scientists.

Eileen Hebets is a professor in the School of Biological Sciences at the University of Nebraska, Lincoln. We are fortunate to have Dr. Hebets here this week because she was giving our weekly lecture in the School of Life Sciences and it was on the topic of, guess what? Spiders...

Our other guest scientist is Lisa Taylor, a PhD graduate student in the School of Life Sciences who works with a very fun and colorful spider called "jumping spiders."

So, listen in as we learn about these eight-legged animals and some of the very cool things they can do. And maybe we'll learn what might have happened if Miss Muffet hadn't been frightened away.

And while we're thinking about Miss Muffet and the type of people that typically study spiders or at least we think are the typical people that study spiders... As a matter of fact, we had Norman Platnick here just on Monday.

Eileen Hebets: Oh really?

Dr. Biologist: He's great. But he is, I would say, the stereotypical male nerdy guy studying spiders. He's older than a Toby Maguire but the character that he plays, definitely they fit in that realm, right? OK. I have two women here, both of them study

spiders. My wife would run the house along with my daughters. OK, that might be a slight exaggeration, but it's pretty close.

So, Eileen, how did you get started studying spiders? I mean, is this something that you always had an interest in?

Eileen: So, I've always liked animals, I've always liked invertebrates in particular. As a kid, I used to collect whatever I could. But I never particularly had a fascination with spiders. But as an undergrad, I needed to do an honors thesis and I went to a very small school with only a handful of biology faculty. One of them studied spiders and she had just taught invert zoology, which I loved.

And so, I asked her if she would be my mentor and she said: "If you work on spiders, I will." And I said: "OK. I don't really know what I want to work on." And so, she happened to have a grant at that point through the National Geographic Society to do work in Mississippi and I was fortunate enough to get to go down and work with her one summer and within a couple of days, I was hooked.

So, I was mostly doing video recordings of matings of different species and almost everyday, she'd come in and say: "No one has ever seen this before. That video that you just got right now, you're the first person potentially ever to see these two species court and mate." And that, to me, was just... I had needed to do that.

Dr. Biology: I am laughing because I'm showing them both that I have goose bumps on my arm right here. And that's it, because this is exciting. This is the part about science that we do a really bad job of explaining or letting people know. We didn't get into it because it's hard or it's something that you have to be super smart. It's the thrill, it's the exploring and you just nailed it, just exactly what happens there.

And you also said that your mentor is a female so maybe I'm completely wrong about who studies spiders. Maybe there are just as many women out there as there are the men, right? Lisa, what got you started?

Lisa Taylor: I actually have a very similar situation. As a kid, I also liked to collect things. I liked to collect worms and butterflies and just kind of watch them in the lab. But when I got into high school, my guidance counselor said: "Oh, you can't really study zoology as a profession unless you want to teach" and I was like: "Well, I don't know. I'm more excited about just looking at things."

I ended up in college, I took a class, also by a female professor and it's called "Biology: Life on a Silken Thread." We learned all about spiders and it was just an absolutely fascinating class so it was kind of the same story, I just got hooked there and started doing some research in the lab and yeah, I just kind of got sucked in and found out you could make a career out of just watching things and studying things and writing about them.

And actually, there is a lot of teaching involved now, but it's not the same kind of teaching I thought originally. Now, I'm actually really excited about just teaching people about science because I'm excited about it.

Dr. Biology: Perfect! You want to get people excited about science and biology, that's what we're for. Now, one thing I want to talk about real quickly is the word "invertebrate." Most animals actually on this planet are invertebrates. We're one of the animals that's an exception to it. So, basically any animal that doesn't have a backbone fits in this category called an invertebrate. There are a lot of other differences, but mainly, think about the fact that if you have this internal skeleton and a backbone, you're not going to be an invertebrate, you're a vertebrate.

One other thing we need to talk about, spiders are not insects.

Eileen: Correct! That is probably one of the biggest things that people always lump them together and they're not, they're actually in a completely different group. So, insects have three body parts, they have six legs, they have antennae. Arachnids actually have two body parts, they have eight legs and they do not have antennae. Those are kind of the main differences, if you were just to go out and pick something up and say: "Is this an arachnid or is this an insect?"

Dr. Biology: All right. Both of you study spiders but you don't study the same spiders right now.

Eileen: Correct.

Dr. Biology: Eileen, you do wolf spiders?

Eileen: Right. Well, that's what I talked about today, right.

Dr. Biology: Right. And Lisa, you're doing jumping spiders?

Lisa: Right.

Dr. Biology: OK. And both of you, I have a list of questions. But there's one question I've been wanting to ask Lisa for a long time.

Lisa: OK.

Dr. Biology: Well, actually multiple questions, I suppose. One is, how high do jumping spiders jump? And when I say that, put it in relationship to a human.

Lisa: Well, I'd probably have to do some math to figure it out. A lot of jumping spiders are just a few millimeters long, definitely less than a centimeter and they can easily jump probably 15 centimeters.

Dr. Biology: Wow!

Lisa: Yeah. So, if you get our your calculators, you could figure that that's...

Dr. Biology: 15 times their body length. Is that about right? Did I do that right?

Lisa: Yeah.

Dr. Biology: And if it's a human... Let's just make a human five-and-a-half feet tall. If I do my math here... I don't have a calculator but I have paper. 5.5 X 15 is 82 feet. That's pretty impressive. Even if you do some quick calculations, I think that's probably a six or seven story building, if you're also able to jump that high as well and as far.

Lisa: Yeah. And in the field, if a spider has to jump off the edge of off a leaf, off of a tree, it can jump and kind of ride on a silk thread all the way down to the ground. And so, that would be I guess equivalent of jumping off a cliff with a rope.

Dr. Biology: So they're kind of the bungee jumpers of the spider world?

Lisa: Right, yeah.

Dr. Biology: Why do they jump?

Lisa: They jump for a lot of reasons. I guess probably the most important thing would be getting away from predators, but they also jump to catch prey. Those are probably the two main reasons.

Dr. Biology: OK! Wolf spiders... Now, I see wolf spiders everywhere...

Eileen: Right.

Dr. Biology: And I love wolf spiders. I tell the story that I always capture the spiders and take them outside and I told this to Norm. And he says: "Well, that's great, except, why don't you leave them in the house. It'd be good in there" and I said: "Because if my wife or my daughters find them, they're going to be pancakes." And he said: "OK. Well, in that case, it's all right."

So right now, Eileen, you're working with wolf spiders.

Eileen: Right.

Dr. Biology: Why wolf spiders?

Eileen: Well, first of all, for one of the reasons that you just said is that most often the spiders that people get really scared of that they find in their bathtub or in their house are wolf spiders. And the reason for that is because they're everywhere.

They're really abundant, they're very common, and they're very diverse. So they're actually an incredible group to work on because I can get really large numbers. I can collect them almost anywhere. And the particular genus, the group that I'm working on, displays just tremendous variation in how they look, specifically how males look, and the dances that they do for females.

Dr. Biology: Dancing spiders?

Eileen: Dancing spiders, exactly. [laughs]

Dr. Biology: Wow! Now that's really neat. You also talked about spiders and ornamentation. Humans do the same thing. You could think of jewelry or makeup or some cultures, including ours lately, we've been getting into tattoos.

What are the kind of ornaments that spiders like to use?

Eileen: So the ornaments that you just described, in humans it tends to be females that are putting on jewelry or makeup and things like that. In the spider world, it's the males that are producing these ornaments.

And so the biggest ornament in my group is that these males in some species have big brushes of black hairs on their first pair of walking legs that when they do their dances, they wave these legs around in front of females, trying to impress them.

Dr. Biology: Up in the air?

Eileen: Up in the air, yep.

Dr. Biology: OK. What else do they do?

Eileen: They also produce seismic signals. What I mean by that is they actually produce vibrations that they can pass through what they're standing on. So for example, if a male and female are sitting on a leaf, a male can produce vibrations that he sends through the leaf to the female. And so she is impressed, hopefully, by both his visual dancing and his acoustic accompaniment.

Dr. Biology: OK. So he's just kind of a drummer in this case?

Eileen: Yeah, in some cases there are some species that do actually drum. And they'll take their modified legs and actually hit them on the ground just like a drum.

Some of them can be heard even without any kind of recording device, so you can just stand there, put them on a leaf and you can hear the drumming.

Dr. Biology: Hear the drumming. Now you said you put them on a leaf, so that's their favorite surface is a leaf?

Eileen: Most species of the group that I work on tend to prefer leaves, yeah. They transmit these vibrations very, very well and so it's a good surface to drum on.

Dr. Biology: I know that you work on several different kinds of spiders, but for the wolf spider, what's the name of the genus that you work on?

Eileen: It's the genus Schizocosa. And then I work on several species within that genus.

Dr. Biology: Within that genus. Can you describe them to me?

Eileen: They're brown and they're hairy, the typical spider that people are afraid of. They're about the size of a nickel, most of them. There are members of the family that get much bigger than that, but the group that I work on, they tend to be on the smaller side.

They are mostly brown, they have very beautiful black stripes on top of them, so when you're looking down on them, you can see some striping on their body. And again, in some species, the males have different ornaments on their foreleg. So in some species, you'll have a male whose femur...you can think of the body parts similar to human body parts. So his femur will be jet black and then the rest of his leg is a lighter brown.

And in this particular species that I'm thinking of, it's *Schizocosa retorsa*, the males will wave that leg up in the air really rapidly and it actually has a strobe effect. It's a really beautiful thing to look at.

And then in other species, they have these big brushes of black hairs on their legs. And then in other species, males actually don't have any ornamentation, and they try to impress the females just with the vibratory component of their courtship.

Dr. Biology: So they're using both sight and sound. Why both ways?

Eileen: Well, that's what my whole research program is attempting to answer is why do they have these two different components. And we know that their ancestors, that all of them have a vibratory component. Ancestrally, that is thought to be enough to convince females to mate, but yet we have these species now where males have these visual signals where they wave their legs and they have the ornamentation to go with it.

And there's a lot of different ideas out there on why this might be the case, so some of them relate to maybe the vibratory component tells the female one thing like, "Hey! I'm the right species." And the visual signal might say, "And I'm really a great male. I forage really, really well. I've had a great history of eating and look at how big my brush is."

Dr. Biology: [laughs]

Eileen: And so in some cases, it may be that the female's getting more information from a male and two different kinds of information based on these two different signals. Another common idea is that maybe it's just that they both say the same thing, but it allows a male to court under different environments.

So if a male courts during the day, a female might be looking at his visual signal, but if he courts at night, she can't see that. And so if he produces a vibratory signal, then he could also get matings at night.

Dr. Biology: So if he's trying to woo a female spider and he does it at night and he's doing it visually, she's not going to see it, so that's not any good.

Eileen: Exactly.

Dr. Biology: He's into the drumming mode. And during the day, maybe the drumming could still be done, but she's going to be more interested in what he can do with his brushes or his dance, right?

Eileen: Right.

Dr. Biology: Lisa, your jumping spiders, what's the genus of those?

Lisa: The genus is *Habronattus*. They're also known for a lot of ornamentation. And also like the spiders that Eileen studies, they have a lot of visual displays and they also do some abdominal drumming.

Dr. Biology: OK. Describe your species.

Lisa: So the ones that I study have a bright red stripe on their face. They have bright green front legs that they wave at the female. And so it's just kind of a Christmas effect. You've got the red and the green and it's really bright and they do a little dance and they move back and forth and wave their legs.

They're just gorgeous little spiders.

Dr. Biology: If I recall, they also have a particular way they produce the colors. At least you think they do, right?

Lisa: Yeah. There's a lot of different species of *Habronattus* jumping spiders that just have a huge variety of colors. And some of them, like the bright reds that you see, are produced by pigments. And then you see other colors that are really shimmery and shiny and those are actually produced by tiny little structures that reflect the light in different ways.

Dr. Biology: Now you're describing iridescence, right?

Lisa: Right, right.

Dr. Biology: And iridescence is really a pretty cool way that some colors are made. Iridescent objects, depending on the angle you're looking at them, or the direction the light is shining on them, can change color and actually quite dramatically, say from a blue to a yellow or a bright red, right?

Lisa: So some common examples that people would probably recognize are something like a hummingbird. You look at it from one angle and it's bright pink, and then you turn it a little bit and it kind of goes from pink to orange, and then you eventually turn it a little bit more and it goes to a bright green.

Dr. Biology: That's really very cool. And I'm thinking wouldn't it be fun to have some iridescent room paint so that depending on the time of day and where you're standing, the walls could be a different color?

Lisa: Yeah. Automobiles sometimes actually have an iridescent effect. So from one angle, just the brightness and the hue of the color changes a little bit.

Dr. Biology: You actually were part of a group of graduate students that was funded by a new program the School of Life Sciences started. It's called the Frontiers in Life Sciences. And you used this funding to host a conference and workshop on the topic of iridescence, correct?

Lisa: Yep. So there's a big group of us here who all study some aspect of coloration, and in each of our study species there are a few examples of iridescent coloration.

We decided to invite experts from around the world just to come and give talks so we could all learn a little bit more about it, and bring together people who studied the physics of the color, people who studied evolution of the color, artists who use iridescence in their artwork. We had some fashion designers come and give a fashion show.

Dr. Biology: Really?

Lisa: Yeah, and it was real great. It really brought a lot of people together from different disciplines and just all surrounding iridescence and this really unique type of coloration.

Dr. Biology: Right. Another kind of ornamentation, right?

Lisa: Yep.

Dr. Biology: Spiders, what do they like to eat?

Eileen: They'll eat anything. Most spiders at least are generalist predators, so they'll eat cockroaches, crickets, any small critter that's either for web-building spiders the ones that are flying through the air, and for non-web-builders whatever's crawling along the ground.

Dr. Biology: The key to that is if we didn't have spiders in this world, we'd have a real insect problem, wouldn't we?

Eileen: Yes.

Eileen: We definitely would.

Dr. Biology: OK, remember that. Take the spiders outside. Don't kill them. And if you can live with them in the house, keep them there.

I've also heard, and I want to know if this is true or just one of these urban myths, that female spiders mate and then kill their male mate. Is this true?

Lisa: Well, it depends on the species. So, like Eileen just said, female spiders are just hungry voracious predators and they'll eat anything. That includes a male who's just sauntering up. Even if he's just doing his display, if a female is really hungry, he's just as good for a meal. If she doesn't want to mate, she might as well eat him. So, yeah.

Dr. Biology: Wow, that's a pretty tough crowd.

Lisa: Right.

Dr. Biology: So are the female larger than males in most spiders?

Eileen: Yes, they are. In most spiders they're are slightly larger, and then there are some species in which they are significantly larger. For example, the black widows that many people, especially around here I'm sure are familiar with, females are significantly larger than the males. In fact, if you saw them side by side you would never even think they were the same species. They look completely different.

Dr. Biology: Wow. Do the males have the venom that females have, or are they different?

Eileen: I believe that with the black widows they are slightly different. I know that most bites occur from females. Males in general tend not to be interested in biting. When they're mature, they're just looking for females. And so, the female is the one you really need to watch out for.

Dr. Biology: Right. And they're a little bit larger too, so they probably penetrate the skin much better.

Eileen: Exactly.

Dr. Biology: All right. Do spiders have good vision?

Lisa: It depends what spiders you're talking about. So, jumping spiders, yes. In the spider world they're probably the best. They have color vision, which is unlike any other spider. They can see from the UV all the way up into the red. But a lot of spiders who sit in their webs, a lot of orb-web spiders which are pretty common, don't really use visual information at all. They just kind of sense things through vibrations in their web.

Dr. Biology: That actually brings out something I've also wanted to know about. Anybody get a spider web on them? You can't get it off. You can shake your hand here, but it just doesn't want to go away. You finally have to get somebody to drag it off. So, it's really like a super-sticky glue. That's probably why Spiderman is so good about that. How do spiders walk along the web and don't get stuck?

Eileen: They can actually produce several different types of silk, is one answer. The silk varies in how sticky it is. I've actually never worked on web-building spiders, so I can't say this firsthand, but my understanding is that when you look across webs, there are different types of silk that make up different parts of the web.

Some spiders will actually put droplets of sticky glue at different points, and so they traverse across their web in a way in which they know where the sticky silk is, where the non-sticky silk is. And I think they can move pretty easily in such a way to avoid getting stuck on the sticky silk.

Dr. Biology: Hmm. Kind of a web landmine of sticky stuff that captures their prey. Now, how long have you been studying spiders?

Eileen: Oh, boy. Let's see. I started in 1993.

Dr. Biology: OK. During this time have you gone out on collection or expeditions to collect spiders in different places, or are the spiders so easy to find you just go in your bathtub and find them?

Eileen: Oh, no. In fact, right now is the only time I have ever been able to go out in my backyard in Nebraska and collect them, so I almost always travel to collect them. And part of it is because I love going out into the field, and so I purposefully pick species that force me to go some place and work.

Most of my wolf spider stuff is actually not as exotic. Most of my work is done in Mississippi and in the Southeast which actually for the states is very tropical, and the diversity down there is absolutely incredible, so that's where I do most of my wolf spider work.

But, I actually work on other arachnids that have taken me to places like Puerto Rico and Costa Rica and the Florida Keys, so I do try and pick groups that allow me to travel to exotic places because that's one of the things I love about being a biologist. - is being in the field. There is nothing like being in the field.

Dr. Biology: Any interesting stories from your expeditions?

Eileen: Oh, I have so many. [laughs] My best story from working in the field is actually from when I was in Costa Rica. There's a lot of poisonous snakes in Costa Rica, especially at this particular field site, and there's one in particular called the *terciopelo* or the fer-de-lance. It's a very aggressive poisonous snake and is very common.

I was out by myself at maybe eleven o'clock, midnight, very far from the lab, and I was walking along approaching a tree to survey it for the presence of my animals and I heard a noise on the ground. I stopped and I looked down and I didn't see anything. And so I took another step and heard another noise and stopped again and looked, and sure enough there was a snake. And it was a fer-de-lance, and it was a foot from my foot coiled up in strike position, actually facing the same direction as me so he was not facing me.

So, I saw the snake and stopped and kind of the dialogue went on in my head, "Do I keep going towards this tree and try and survey it, or do I just run?"

Dr. Biology: Run.

[Laughter]

Eileen: Exactly. And I didn't have time to finish the internal dialogue before the snake struck. So, it was facing the opposite direction of me, and in one split second it was flying a foot off the ground towards me. I jumped backwards; I don't even know how far. I'm

sure further than I would ever be capable of jumping again and just turned around and ran. It was adrenalin pumping, and I ran all the back to the field station.

From that point on, they implemented a system in which people who went out in the field at night needed to take a radio with them.

Dr. Biology: A very good idea. And jumping, that's interesting. You probably were what, 30 times your body...

Eileen: Exactly. I was just like a jumping spider.

Dr. Biology: Lisa, how about you? Do you have some interesting collection stories?

Lisa: I don't have anything as scary as that, but I do have an interesting story about a jumping spider that I also found in Costa Rica. So, I was out collecting a bunch of different species trying to find some really colorful ones to do an experiment, and I found this one little jumping spider that was about two or three millimeters long and it was an immature male.

It kind of looked like a normal jumping spider to me. I brought him into the lab. I put him in a vial, and I fed him a fruit fly and I left him overnight. I went back the next day, and he had matured. Just in one night he had developed these enormous jaws that were almost the length of his entire body.

Dr. Biology: Woah!

Lisa: It was amazing. I had to go back and look at my notes and make sure it was the same spider because it was just unbelievable.

Dr. Biology: That's cool.

Lisa: So I think that was almost the most amazing jumping-spider transition I've ever seen.

Dr. Biology: That brings up another really important point or discussion: how do spiders grow larger? We can grow because our internal skeleton grows, builds more bone, and we basically add more skin and we just keep getting bigger. Spiders are a little different, right?

Eileen: They're very different. They have this hardened outside structure that actually can't expand at all. And so in order for them to grow, they need to get rid of this. So what they actually do is they go through what's called a series of molts where they shed their skin.

So they shed this outer, hardened cuticle and then they pump themselves up when they're still soft and then it hardens again.

And so one of my favorite stories about that is I had a tarantula in college and went away for a summer to do research and left it at home for my mother to care for, and she called

me one day frantic and said, "Oh my goodness! The spider multiplied! There are two tarantulas in the cage now!"

And sure enough, it had molted. And sometimes the molts are almost completely intact and can look exactly like a live spider.

Dr. Biology: Wow. That's pretty cool actually.

Eileen: [laughs]

Dr. Biology: This program, one of the favorite parts for almost all the listeners and for myself are three questions I ask every scientists. And actually, I'll ask Lisa the first question.

When did you first know you wanted to be a biologist or a scientist?

Lisa: I have to say it was sitting in an animal behavior class in college. This was when I realized that you can actually make a career out of just watching animals and thinking about questions about why animals do certain things and designing experiments to test your hypotheses and...yeah, once I figured out that that was a possible career path, I was definitely in.

Dr. Biology: You were hooked.

Lisa: Yeah.

Dr. Biology: That's great. Eileen?

Eileen: Actually, as far back as I can remember, I wasn't as practical as Lisa and wasn't thinking about career paths, but I loved biology and I knew that I wanted to be a biologist without any knowledge of what that meant. And so I think as far back as I can remember, I wanted to be a biologist.

Dr. Biology: Hmm. Not too uncommon. But now I'm going to take it all away. You've built this wonderful career in biology and you're a scientist. I'm going to take it all away. You can't be a biologist, you can't be a scientist. What would you be if you couldn't be that?

Eileen: I can actually answer this because we did this in grad school. Everyone at some point in grad school thinks about dropping out, and so we actually had a party whose theme was come as what you would be if you were not a graduate student.

And I don't know if you'll allow me this, but I think what I would be is I would try to get into outreach with science. And I think my ideal job outside of being a biologist would be putting together nature shows and doing outreach with interviewing scientists, exactly what you're doing, Dr. Biology, actually. Kind of getting at it that way and trying to relate to the general public the thrill of science.

So if I wasn't able to do it myself, I would want to do it kind of through other people.

Dr. Biology: Hmm. I like it, I like it. You know what? Maybe we can get you as a reporter in the field...

Eileen: [laughs]

Dr. Biology: ...and you can report back, and we can have you on the "Ask-a-Biologist" program. How about that?

Eileen: That would be great.

Dr. Biology: All right, Lisa, what would you be if I take it all away; no science, no biology?

Lisa: Well, one of the things that got me interested in jumping spiders specifically is just their beauty and just the colors and just the amazing beauty of them. So I would probably have to say I would be an artist. I probably would be a starving artist, but... [laughs]

Eileen: [laughs]

Lisa: I don't know. I'd probably paint jumping spiders.

Dr. Biology: An artist, great. And painting giant jumping spiders. That actually sounds fabulous. I could see these in galleries around the world.

All right, Lisa, I have one last question. And since you're a graduate student, you're a little bit closer to some of the students that might be listening in on this, or even the people that are thinking about shifting careers. What advice would you have for someone who wanted to get into the world of science or become a biologist?

Lisa: My best advice would be to take some time to figure out what you want to do. So I've known for a while that I wanted to be a scientist, that I wanted to go to graduate school, but after finishing college, I took about five years off and worked different jobs.

So I had the opportunity to go to Australia and study some birds over there. And I worked in a lab where I studied spiders in Kentucky. And I worked in a lab where I studied food webs in Maryland. And so I kind of tried out all these different things and was able to really develop a project that I was really excited about.

And so what I'm doing now is definitely what I think I'll be doing for a long time, and I've really kind of put together a project based on all of my interests over several years. And you can do that in biology. You can kind of like, yeah, create a project just based around your interests and do whatever you want to do. And it's really exciting.

Dr. Biology: It is, it is. And the neat thing about it is you get into your career, it's not like work anymore.

Lisa: Yeah.

Dr. Biology: If you're doing what you love, how good does that get?

Lisa: [laughs]

Dr. Biology: And you get paid for it, that's even better.

Lisa: Yep.

Dr. Biology: It may not be the same as a Bill Gates or something, but hey, you know, if you get to be paid to go travel...

Eileen: Exactly.

Dr. Biology: ...even if it is with scary snakes.

Lisa: [laughs]

Eileen: [laughs]

Dr. Biology: Eileen, what advice would you have?

Eileen: You know, I would say especially for listeners that aren't in college yet or are in elementary school or junior high or high school, that the best thing that you can do right now is if you're interested, contact a scientist. Write a letter, write an email and see if you can go visit a lab.

Often I've had high school students work in my lab before. Just try and get involved and see what it's really like and see whether it's something that you want to do.

I'm actually running a spider camp this summer at the University of Nebraska. And it's the first time it's going to be run, but it's for ninth, tenth, eleventh and twelfth graders. And it's a week-long camp where during the day they're going to be in the lab with me, we're going to be running experiments, we're going to be collecting spiders in the field.

And there are actually opportunities like that out there if you look.

Dr. Biology: It sounds great. Is there a way for them to find out about your camp?

Eileen: You know, I don't know the website right now, but it's called "Big Red Summer Camps." And so if you go to the University of Nebraska-Lincoln's website and just search for "Big Red Summer Camps" you'd be able to find it. And it's called "Discover Spiders."

Dr. Biology: Love it, I love it. Eileen Hebets and Lisa Taylor, thank you so much for being on the "Ask-a-Biologist" program.

Lisa: Thank you.

Eileen: Thanks. It was great.

Dr. Biology: You've been listening to "Ask-a-Biologist", and my guest scientists have been Dr. Eileen Hebets, professor in the School of Biological Sciences at the University of Nebraska-Lincoln. Our other guest has been Lisa Taylor, a Ph.D. student in our very

own School of Life Sciences.

In case you'd like to learn more about spider camp, you can type "bigredcamps" as one word, followed by "spiders". Use those words in any search engine and it should show up in the first few links.

We'll also have a direct link to the website from this show's companion web pages on the "Ask a Biologist" website. The "Ask-a-Biologist" audio podcast is recorded on the campus of Arizona State University in the Grassroots Studio, housed in the School of Life Sciences, which is a division of the College of Liberal Arts and Sciences.

And even though our show is not broadcast live, you can still send us your questions using our companion website. The address is askabiologist.asu.edu. Or you can just Google the words "Ask a Biologist." I'm Dr. Biology.