

Entomology with Lila Higgins

Ologies Podcast

December 4, 2017

Heeeey... And welcome to another episode of the Ologies podcast. I'm your host Alie Ward, and my name is Alie Ward, and this is the Ologies podcast. So, last week I did not put up an episode, I just took a week off and kind of caught up from a holiday break and squirreled away some more episodes for the future like li'l winter acorns. Thank you guys for being patient. Also, for anyone in the L.A. area I'll be doing a really, really quick, short live show. I'm just doing a storytelling show for Public School on Wednesday, December 6th, and R.S.V.P. at PublicSchoolShow.com. It's at the Virgil, and I'll just be doing a quick storytelling show, just like five minutes, but they just asked me to do it and I said, "sounds fun!" So if you're in L.A. Wednesday night, then PublicSchoolShow.com has more information on that. Come say hi, perhaps you'll meet some fellow Angeleno Ologites. I have no idea what story I'm going to tell because I said yes about two minutes ago, so we'll see how it goes. Anyway, that's Wednesday December 6th.

Okay, on with the episode. This episode, Mom, Dad, don't listen. We're going to talk about bug mating and it gets real candid, okay? Cool. See you next week.

Okay bugs, bugs, bu-bugs bugs. You may not know yet, I'm really nuts about bugs. I love them, I had a fascination as a kid, and I got bug books for every holiday, every birthday, and my walls were covered in bug posters and dead things. So this week's topic is one of my favorite ologies of course, but more importantly, this particular ologist honestly changed the course of my life! She was just a friend of a friend at one point a few years ago, and she invited me one day to the merry bowels of the L.A. County Natural History Museum, in this lab that was off limits to the public. It was an insectary. This room is like a really well-lit *Silence of the Lambs* set. It's a bug lover's dream - there are terrariums of millipedes and cockroaches, there's butterfly chrysalises hanging like these tiny chandeliers, there's dragonfly naiads in gurgling tanks, there's a freezer full of sadly passed tarantulas.

I was going through a really rough time in my life a couple years ago - my dad was just diagnosed with multiple myeloma, I was going through a breakup that was just the saddest thing ever, and not knowing any of this, this entomologist casually suggested that I volunteer at the museum. And I did, which is so weird because I could never commit to anything, but I just wanted to find some way to cheer the fuck up, and volunteering for zero dollars an hour, no stakes, talking to kids about bugs, one morning a week, was the only thing that seemed to help. It totally changed my life, no joke. After doing it for a few months I somehow was offered a job as a science correspondent for CBS. I'm doing exactly what I wanted to do since I was 12, all because I took this tour at an insectary.

So, I recorded this episode of Ologies first. This is the first one ever recorded, in a sound studio with mics that were a little too good. I wanted her to be my first ologist because it was so special to me. Now I'm having her on, I think this is, like, the 10th episode. I kept holding it because I just was afraid the episode wouldn't honor her enough and honestly, I hadn't re-listened to this since we

recorded it months ago. At the time we recorded it in the sound booth, drinking celebratory, terrible champagne. Listening back, I realized I loved this interview. It's one of my favorites. I can also tell I was trying to sound a little more cool than I felt inside. Now that we're a few episodes in, I just.. I don't play it cool. So you're welcome, and I'm sorry.

Now, entomology, the study of bugs. Sometimes called bugology but, come on, no one calls it that. The etymology of entomology is Greek. It means 'to cut up into little pieces' - which is not what you do when you find a bug in your face, but rather it's a reference to an insect's body being cut or segmented, so having a notch at the waist, there you go. This guest is an entomologist. She's now the manager of Citizen Science at the Natural History Museum in Los Angeles. So get ready to hear about bugs, Hare Krishnas, we'll talk about some terrible mating behaviors, licking cockroaches, what is Citizen Science, how to be an amateur scientist, and why bugs should be your friends. So please ready your heart and your ears for Lila Higgins.

Alie: If someone at a cocktail party were like, "What's your deal?" what would you tell them?

Lila: Hmm... well that depends on how many cocktails I'd had at said cocktail party, but usually, you know, I'm like, "I'm a bug geek." Usually there's no children at cocktail parties, but sometimes there are and then they're like, "Oh I'm going to go hang out with the children now and talk all about bugs for the next, you know, couple of hours."

Alie: That's actually a good question I have - I just complimented my own question [*laughs*] - this is an important question I have: why are kids so into bugs and adults are like, "Kill it with fire"? What happens?

Lila: I was really into bugs as a kid. I grew up on a farm in England and I dug up ant nests trying to find the queen, I would put glasses over bumblebees to observe them, I would try to follow the butterflies down the lane and see where they were going.

Alie: That sounds idyllic as fuck. Following a butterfly down a lane in England, are you kidding me?

Lila: To the woods, basically. Not the scary woods. There were badgers down there.

Alie: So your biggest childhood predators were badgers in England?

Lila: Basically, yes.

Alie: No clowns?

Lila: I don't think I ever saw a clown.

Alie: So what happens? Do people go through puberty and they decide that they hate spiders?

Lila: I think some people do. I was thinking a lot about my trajectory and I totally, kind of, fell off the wagon in high school. I was trying to remember if I had any memories of insects from high school, and the only things I could think of were the hip-hop. *[laughs]*

Aside: Lila was really into this band called Digable Planets, and they had members who were called Butterfly, Ladybug, Doodlebug, and she also liked Wu-Tang's *Killa Bees*.

Lila: That's like literally the only things I can remember from high school to do with insects.

Alie: You didn't listen to the Beatles or the Scorpions or anything? *[ba-dum-tsh! followed by DJ airhorn]* At what point do you remember being like, "I'm going to be an entomologist."?

Lila: I didn't even know there was a thing as a kid. My dad went to agricultural college for a hot second. I'm sure he got kicked out for doing naughty things. My parents were Hare Krishnas.

Alie: What? What?? *[Lila laughs]* For how long?

Lila: Undetermined, because I think my dad still is partly involved.

Alie: What does it mean to be a Hare Krishna? I feel like there's just a lot of brown rice and singing but I don't know.

Lila: I never ate brown rice through Hare Krishnas. I always ate white rice through Hare Krishnas so...

Alie: Well, then I'm wrong.

Lila: But there's a lot of really good food. There is a lot of singing, and little mini finger cymbals, and incense, and worship, and chanting. But my mother was like, "No, I want you to go to regular school," and I'm like, "thank you mummy."

Alie: Yeah, I was going to say it sounds more like a lifestyle than a religion. It sounds aromatic.

Lila: People asked me a lot of questions about, "Well what are the tenets of the religion?" and I'm like, "I don't really know." I know some things.

Aside: I knew nothing about Hare Krishnas. Nothing. So I Googled, "What are Hare Krishnas?" Okay, so I'm going to give you a rundown. It's the International Society for Krishna Consciousness, that's the other thing it's called. It's a type of Hinduism and it was founded in the mid '60s in this exotic place called New York City. It has four regulative principles: No meat-eating, including fish or eggs; no gambling; no intoxicants; no illicit sex, including that which is not for the procreation of children, including in marriage. So, it sounds like a party. I was still convinced that Hare Krishnas eat a lot of brown rice, and I looked it up, and the first search return was, "brown rice is

for the animals.” So, okay I was off the mark there. P.S. George Harrison went to their temple. Okay!

Lila: I was a teenager and I didn't want to be there, and I was really annoyed at my dad. You know, typical teenager crap.

Alie: I think most teenagers get annoyed that their dads are Hare Krishnas. *[laughs]* I think it's really common. At what point did you decide to take this path? Also, if your parents were, kind of, in this alt religion, was it weird to be a science kid?

Lila: I remember when I was like, “I'm going to be a scientist,” but at that point I didn't realize that entomology was an option. I had this teacher in high school in England, and high school starts a little earlier than it does here in America...

Alie: Because you guys are nine hours ahead? *[laughs]* Starts nine hours earlier?

Lila: Eight hours. I forgot his name, but he had, kinda like, crazy Einsteinian hair that was all over the place. He would wear a big, velvet, purple bow tie. He had the sports coat that had the corduroy elbow patches. One day he took me aside and he's like, “Lila, you're good at science. You need to study science.” And I was like, “Oh yeah, I do, I love science. I love dissecting daffodils.”

Alie: Quick question, was he Willy Wonka? Was he *actually* Willy Wonka? *[laughs]*

Lila: He literally looks like Willy Wonka in my head but he looks a tiny bit different because he's not Gene Wilder.

Alie: Okay, so you were touched by the hand of a science angel. And he said, “You're good at this.” And you were like, “You're right, I'm amazing.”

Lila: *[laughs]* I don't think I said that, but it was right around the same time when they're telling us that we had to pick careers and I had literally been looking at being a hotel manager.

Alie: Oh fuck that. I mean, it's good if you can do it but...

Lila: *[laughing]* I'm pretty happy with where I am in my career, and if I was a hotel manager I don't think it would be as fulfilling for me.

Aside: Then when Lila went to college she got back into entomology and she ended up at UC Riverside and found out that they have a really great program where she could study bugs for four years, and she was like, “Oh dude it is on!”

Alie: What is the most fulfilling thing about having studied bugs?

Lila: Well, getting to work at the Natural History Museum, and being around other bug geeks, and getting to go into the collection and pull out drawers and see these spectacular specimens from all over the world. Whether they're, you know, the big showy things that are the crowd pleasers or whether it's the hundreds of tiny little wasps or tiny little flies.

Alie: Is it like when you see bad rom-coms about women in jewelry stores drooling, do you feel like that with bug collections?

Lila: Yeah. I definitely would not be sitting in a jewelry shop looking at rows of diamond rings and being like, "I want that one or that one..." I'm definitely looking at the bugs and like, "Oh my gosh look at this beetle! Look at this other beetle with its elytra!"

Alie: Elytra being...

Lila: It's the hardened, sheath-like wing coverings, the outer wings of a beetle.

Alie: I have a question. What's a showstopping bug? When you say the showstoppers, what are you talking about?

Lila: Goliath beetles or Hercules beetles, some of these beetles that are almost the size of our fist.

Alie: Yeah, they're huge.

Lila: Giant. Then when holding one of those large beetles in your hand, you're just like, "Oh my god it's so much stronger than I thought it was going to be!" It's a little bit scary.

Alie: Stronger? Have any tried to use their huge jaws, powerful jaws to say "Hello!"?

Lila: I'm pretty good about not touching that end of ones that have large mandibles, especially large slicey mandibles.

Alie: [*laughs*] Slicey mandibles? That's the technical term?

Lila: Yeah, keep away from that. You were saying that entom, "thin waisted," so beetles don't really have a thin waist, they're pretty fat around the waist.

Alie: Yeah, they've got a bedonk-a-donk.

Lila: So you hold them on that fat end, you're keeping far away from any mandibles that they might have that might want to bite me.

Alie: I have a question about... Insects are what, half of all species of living animals on earth, something like that?

Lila: I just know there's about a million described species, but they estimate that could be up to, like, ten million. Yeah.

Alie: So they outnumber mammals and fish.

Lila: Waaay. And birds, etc.

Aside: So in 1949, John Burdon Sanderson Haldane was a British evolutionary biologist, and he was credited as noting that God, if one exists, has an inordinate fondness for beetles. He actually laid it out and said, "The creator would appear as endowed with a passion for stars on the one hand, and for beetles on the other." God is just in a shack in the backyard tinkering over and over being like, "Man! Cannot get enough of these beetles! Can't stop making 'em! I can't stop, I love them so much! Guess I should stop wars from happening, but I'm gonna keep making these beetles."

Alie: So how do you go about studying that if there is such biodiversity with insects? There are so many different kinds, they have so many different habitats. How do you tackle that when you're studying it?

Lila: It's hard because there's only so many scientists, and there's only so many scientists who end up going into entomology or choosing that as a career. We don't have that many people doing it. We need more people studying bugs to help figure out what's here. If we don't know what's here, how can you work to protect it? We have, again, an amazing entomology department at the museum, and our curator Dr. Brian Brown, he's a fly expert and one of the leading fly experts in the world.

Alie: That's hot.

Lila: Right, it's pretty amazing.

Aside: Okay, so Dr. Brian Brown studies this type of humpback fly that hardly anyone else studies. During his career path he was like, "You know what? I'm going to look at flies, this is kind of a way for me to distinguish myself." Now he's one of the leading fly experts and has discovered 42 or 43 new species of phorid flies here in Los Angeles, which is a big deal!

Lila: That was through citizen science, having traps in people's backyards, that said, "Yeah sure we'll have this trap, we'll host this trap in our backyard." It's called a Malaise trap, not because anyone is in a bad mood or anything, but the guy's name was Malaise.

Aside: René Malaise was Swedish, and in the 1930s he invented a death chamber for bugs, but an important tool for fellow entomologists. A Malaise trap... I've seen them, they look like a really shitty tent. They have netty sides and kind of a white canopy. Bugs get trapped and they try to fly out the top but they're funneled into a trap which is usually a jar filled with ethanol, which is the scientific term for Everclear. They die in the worst version of college 'jungle juice' possible.

Also, I just looked up Everclear. Not pure ethanol. It's 95% alcohol by volume, and it's illegal in a bunch of places because it's probably very dangerous. But in some states you can buy 94.5% alcohol, which is totally fine.

Lila: So it's a capital M. You always see Malaise trap with a capital M.

Alie: That's a terrible last name, [*Lila laughs*] and especially if your legacy on Earth is that you invented trap that kills and collects insects. It's so perfectly named.

Lila: [*Laughing*] I think it's amazing. I love explaining the name.

Alie: I wish it were called a whomp-whomp trap. It sounds like such a bummer. [*sad trombone 'whomp-whomp' cartoon failure sound, followed by pretend tiny bug, "Noooo...!"*]

Going a little bit back to school, what are some of the first things that an entomologist learns? Let's say you're going to be one, do you start with chemistry, do you start with ecology?

Lila: It was a lot of chemistry, a lot of biology, a lot of physics.

Alie: Do you gravitate more towards science with living things, like you can look at behavior and patterns?

Lila: A hundred percent yeah. That's part of what appeals to me about entomology, is that I can talk about really inappropriate things but it's science so it's okay.

Alie: When you're gravitating toward a certain bug to study, do you go for, like, really gossipy behaviors? Are you like, "Oh my god, this wasp is such a dick. Why are wasps such dicks??" They're parasites, they infect people like zombies, they sting people, they don't even make honey, what's the deal with wasps?

Lila: Well, the wasps that I actually studied and worked on right after I graduated from UC Riverside... That's my alma mater, UC Riverside Entomology Program. Amazing place. I studied biological control and I think that I was really into that because it was, "Oh we don't have to use so much pesticides out in the world, we can use insects." I mean, there are other creatures you can use for bio-control but I was obviously focusing on insects as bio-control agents.

Alie: And bio-control is when you release an insect to kill another insect instead of spraying everything with Agent Orange or something.

Lila: Basically. That's a great lay-definition for sure. So I worked for the California Department of Food and Agriculture and worked on the Glassy-winged sharpshooter project, which is a tiny little plant hopper, you know, about two centimeters. Oh, what is that in inches?

Alie: Don't worry about it.

Aside: Okay, are you guys ready for some serious insect gossip? I hope so. She was working on this project with the Glassy-winged sharpshooter. They're not native to Southern California. They come from the Southeast United States but they love to hang out on citrus and grapes, which is annoying because they poop everywhere, but also they spread this bacterium, and this bacterium is bad news. It causes diseases such as... you ready for this? Sweetgum dieback, cherry plum leaf scorch, and phony peach disease. These are awesome names. Glassy-winged sharpshooter is already badass.

Anyway, it spreads all these diseases, so what do they do? Well, Lila was working on this project where she was helping introduce a wasp that would eat the eggs of the Glassy-winged sharpshooter so that the Glassy-winged sharpshooter wouldn't spread the bacterium. Pretty cool. Also these wasps have the cutest name ever. They're like little tiny superheroes.

Lila: And they're called fairy wasps.

Alie: Oh, stop it!

Lila: And they're tiny. They're, like, one to two millimeters long.

Alie: [*in baby voice*] They're da babies!

Lila: Some of them are kind of golden. So it's like these little literally really beautiful gossamer wings. They sound really beautiful and amazing right? The only problem was I was literally collecting these wasps on a daily basis, and they're tiny, and you use a little thing called an aspirator. So you've got a little tube that goes in your mouth, then you suck on it and then the little wasps go into the into the vial and there's a little screen so you don't suck them in your own mouth.

Alie: So it's like a proboscis for humans?

Aside: Now, a proboscis is tubular mouth part, like if a crazy straw grew out of your face.

Lila: Yeah!

Alie: [*laughing*] A prosthetic proboscis?

Lila: [*laughs*] But we did have ones that you could go to a vacuum cleaner. So you didn't even have to use your own sucking power.

Alie: All due respect, that's so weird that you had a tube that you would suck up fairy wasps.

Lila: As an entomologist you carry them around your neck and that's almost like you're wearing a necklace. So I had to aspirate hundreds and hundreds and hundreds of these tiny wasps. I would have dreams and then wake up in the middle of the night being like, "One, two, three, four..." And it was like, "Oh my gosh! No, I love insects, but I'm hating them right now."

Alie: That used to happen to me when I played *Magic the Gathering* a lot. I would be falling asleep and I'd be like, "How much manna do I have to tap to brush my teeth?" [*Lila laughs*] You're just used to it. How much of your career has been spent in the field versus in a lab?

Lila: That's a great question. Not long after that, that repetitive nature of aspirating the fairy wasps, and then going to the same field sites every month...

Aside: The field work was starting to wear on her so Lila decided to take a little bit of a detour.

Lila: I had also, kind of, figured out right before that I was better at communicating about science and getting other people excited about insects, and I got my first job in a museum and my whole life changed.

Alie: Really? So now you work in museums and you, kind of, facilitate people getting stoked about bugs.

Lila: I mean, the bug stuff, I just get so excited when I get to have someone send me a bug picture.

Alie: How does that happen? Do you get texts at like two in the morning, being like, "What the fuck is this?" And it's a potato bug or something?

Lila: I totally have texts from people at all times of the day and night from different time zones, different places. And it's not just text messages, it's like Facebook messages, Instagram messages, a few ones through Twitter. But that's my favorite thing. I'm like, "More people, send me all your bug pictures!" I get so, so excited!

Aside: Lila and I have also attended, again on a Friday night, a bug meet-up called the Lorquin Entomological Society, which is a bug society. This bug society's legit. It's not like your aunt's book club that met twice. These people have been meeting every Friday night for, like, a hundred years. It literally turned a hundred a few years ago. They meet now in the back of a bug warehouse in Compton. It's called BioQuip. It rules. The first time I went, I went completely alone by myself on a Friday night and I sat down, and someone turned around and introduced themselves as Jeff, "I'm kind of a katydid guy." And I was like, "These are my people, and BioQuip is my heaven."

Lila: The best bug warehouse where you can buy the best bug geeky equipment, and books, and everything that you could ever, ever want.

Alie: They have bugs socks, they have butterfly nets, they have books about bugs, they have framed bugs, they sell live bugs...

Lila: Videotapes, VHS tapes...

Alie: They have ties with bugs on them, that like, you know that you a weird uncle to give it to.

Aside: Okay, quick shift from bug socks to something grosser.

Alie: I have a question. How many bugs live on our person? How many bugs are living on me right now? Like, not me, I did not wash my hair today, [*Lila laughs*] so for the average person.

Lila: I don't know. I know there's the mites, which aren't technically insects, in our eyelashes and eyebrows. I am not an expert. I literally don't know.

Aside: Okay, so check this out. About 90% of the cells that are walking around, that you call "you" and that share your social security number, are actually other creatures. They're microbes, mites, et cetera. Now, we're going to cover this in more detail when I have a microbiologist on, but I just want to know that you're covered and full of organisms. So, you're never alone. Feel free to use the second person plural from now on, as the royal 'We' refers to trillions of other persons who have hopes and goals and dreams, such as to live in a pore near your nose. Do you hate this podcast? I hope not.

Lila: I remember when I was a teenager moving to America. On the way here, I was in the Philippines... This is a gross story but I'm going to tell it anyway. I was in the Philippines and I was like, "Oh my God! I've got pubic lice!" And I'm like, "Oh wait, it's an ant." [*laughs*] I'm like, "How did an ant get in my crotch??"

Alie: Can I tell you secret? An ant bit my buttcrack once. [*Lila laughs*] So I get it. What is it with ants? Why are they so social? Maybe they were lonely. What is the deal with bees and ants being social insects and the rest of them being like, "Fuck all y'all, this apple core is mine!"

Lila: Some bees, ants, and wasps, they're Hymenoptera, there are many of them that are social insects, but there are wasps and bees who are not. Carpenter bees are more like solitary bees, and you see the black ones flying around, which are the females, and the kind of tan-colored ones are the males. We call them teddy bear bees.

Alie: They're huge! They're so pretty. I once didn't know what it was, and I tried to kill one, which I shouldn't have. But the joke was on me because I used a rolled-up magazine and I blew out a window and then I had to pay for the window in college. [*Lila laughs*]

Lila: Yeah, so they're solitary. A lot of people expect that most bees and wasps are social but there are some that are solitary and don't do the whole social thing.

Aside: To determine if an insect is social or solitary, what a lot of researchers do is administer this test to the specimen, and it's called, 'This Awkward Small-talk Quiz Will Reveal Your Introvert Type,' which is available at *BuzzFeed.com*

Lila: But there are obviously benefits to having that kind of social life because they protect their sisters.

Alie: But they're usually ladies though, when you see a huge colony, they're usually sterile ladies, right?

Lila: If we're talking about the bee hives, like the European honey bees, which are the bees that we see all around here. Again, not a species that is from North America, they're from Europe, it's mostly females. But then there are the drones, but you know, they're not doing as much work as the women are.

Alie: Right, they're just flying around trying to have a gangbang with the queen, right? [*clip of Alie saying "Heeeeyyy!"*]

Lila: I was going to bring that back up. [*Alie and Lila laugh*]

Alie: But their job is to fly as fast as they can in the air, get a quick noogie with the queen, try to have one million babies with her and then die. Is that correct or is that wrong? [*Lila laughs*] I'm paraphrasing.

Lila: Paraphrasing. I think, you know, it works for the lay audience.

Alie: Right, okay. But drones don't sting, males don't sting.

Lila: No, because it's a modified ovipositor. That is what the stinger is for a bee.

Aside: An ovipositor is kind of like this pointy tube structure at the end of a lady insect butt and she uses it to lay eggs. It's kind of like a t-shirt gun, but for your babies.

Lila: So the males cannot do it, but they do the trickery. A male bee could land on you and then still pump his abdomen. Not in a sexual way but like, "Oh I could sting you!" But unless you're looking really closely, and most people don't. They'll go, "Aghhhh!" But if you can see that it's a drone, you know they can't actually do anything.

Alie: And drones have bigger eyes?

Aside: So drones do in fact have larger eyes and they don't gather nectar or pollen or do really any work. Their primary goal is to mate and die. They are nature's doe-eyed gigolo.

Alie: This is literally all of my knowledge of drones, but I didn't know that a bee stinger was a modified ovipositor.

Lila: Yes.

Aside: So let's go back to Lila's job at the NHM. Citizen science is essentially non-scientists helping collect data and observations for research. If you're like, "I'm not qualified for that," just know that scientists are like, "Either you help me, or this shit never gets done. So please, thank you." Also, no, you don't have to be a citizen of anywhere, that's a bit of a misnomer.

Lila: Some people call it community science, some people call it civic science, some people call it public participation in scientific research, PPSR. That's not exactly one of those things that's going to be like, "I want to be a PPSR-er!"

Alie: Yeah, no that doesn't have a good ring to it.

Lila: And you know, there's a lot of other countries that do citizen science besides just North America, and in some of those other places the word 'citizen' isn't quite so polarizing. But I get that that's a thing, so I just want to make sure that that isn't lost in the scheme of things. Ultimately citizen science is a way to democratize science. Who owns the data isn't just large corporations and the government anymore. People of the community, citizens of the country, of the world, can own that data.

Alie: And so do you think as we're coming upon, we'll just call it a post-truth era, what do you feel like your role as someone who advocates for citizen science could be in, kind of, keeping science alive and respected?

Lila: Again, I think there's a lot of people who don't really understand how science works because it has been a bit of a black box. Citizen science is a way to get people involved in the actual scientific process and so can help to then demystify. Science isn't that complicated.

Alie: How do people get involved in citizen science? Let's say you've got really shitty karma, you cheated on your taxes, your wife, how can you get involved in citizen science and redeem yourself?

Lila: [laughs] Obviously there's citizen science that we do at the museum, and you can get involved in those projects that are very L.A. and Southern California-centric. And they're obviously focused on, mostly right now, the kind of urban, terrestrial fauna that lives around here. We've got a snail and slug project called Slime, we've got a reptile and amphibian project called Rascals, and we've got a squirrel project which is squirrels and chipmunks because they're all in the same group. You can take pictures of any of those creatures; snails, slugs, reptiles, amphibians, turtles, newts, squirrels, chipmunks, anywhere in southern California and submit them to the *iNaturalist* website, which is also a free app on your phone. Anyone can join.

Aside: Okay, what if you don't live in L.A., like most people on the planet who can afford housing and don't wear SPF 70 in the winter?

Alie: Then across the country people can maybe, what, just look up citizen science?

Lila: There are so many different projects and you can go to a website called *SciStarter.com* and you can then find a project that is in your area and that you'd be interested in. There's projects, really cool projects, online where you can literally sit in your pajamas and do human computing using your free time to help a project on this platform called the *Zooniverse*, and you can go to a project and literally code the different galaxies.

Alie: What?? Coding galaxies? I have no idea what you're talking about. Is it cool?

Aside: Okay, this has absolutely nothing to do with bugs, but it's awesome. Go to *GalaxyZoo.org*.

Lila: So you go to the *Zooniverse* website, and I think it's called *Galaxy Quest*, and you literally look at pictures of galaxies. Imagine a telescope taking all the pictures of galaxies, hundreds and hundreds and hundreds and hundreds. And maybe the scientist doesn't have an algorithm that could go through a computer yet to figure out what it's looking at, and the human eye plus our human brain together, we just have this ability to recognize patterns. Computers, we can teach it how to do that based on what humans do, but at first, if there's no pattern how can you teach a computer to do it? We can have humans do that, so that's called human computing.

You know, how much time do people use on things like *Angry Birds* or whatever the new *Candy Crush Saga*. I don't even know what the new one is, there's probably a new one. But hundreds of thousands of hours people use on these things and some people decide to instead of doing *Angry Birds* or *Candy Crush Saga* decided to go on to *Galaxy Quest* and to look at different galaxies and code them. Literally, people have found new galaxies, citizen scientists have found new galaxies.

Alie: Are you allowed to brag about that? Do they send you an email like, "Yo, hey Roger, you found a new galaxy."?

Lila: I believe there was this woman called Hanny, and she found this thing called, I'm going to fuck up the name, like Vorveldt or something, vorwerp, I don't know. I think it's the word for "thingy" in a Scandinavian language.

Aside: Okay, I looked this up it's called *Hanny's Voorwerp*, and it just means "object," aka "thingy." Voorwerp is my everything now.

Lila: So 'Hanny's thingy,' not a dirty thingy, a galaxial thingy, and it was something that she'd been doing it so much, she was like, "that's a weird thing right there, that's a thingy, it's a weird thingy, maybe it's something significant." Then the scientists looked and were like, "Oh my gosh, this is a whole new thingy that we never knew about!" Also, I love that in Britain and Europe people are like, "Yeah thingy, that's a totally good word. We're going to use it. Anything with a 'y' on the end, thingy, a hundred percent."

Alie: Americans don't use thingy or the metric system enough. Both of those things are sorely lacking. *[laughs]*

Lila: Right?? It would make us all a little bit happier people, I think.

Alie: I have some questions that people wrote in. Can I rapid-fire question you?

Lila: Oh my gosh, yes!

Alie: I'm going to rapid fire, just whatever answer, if you don't know you could just be like, "Pass." Shawn Paul Caldwell *[phonetic]* wants to know: What's the visible difference between dragonflies and damselflies?

Lila: Dragonflies usually hold their wings out to the side of the body, whereas damselflies hold them, I'm doing it, *[laughs]* but you can't see this, no one can see this because it's a podcast.

Alie: I feel like that's a yoga pose that I don't know the name for. *[laughs]*

Lila: Yeah, damselflies hold them together over the back of their body. Also dragonflies have eyes that usually meet in the middle to some extent and damselflies have eyes that are more out to the side, a little bit like hammerhead sharks. And damselflies are very petite and slender. There's a scientist called John Acorn the Nature Nut from Canada, he calls them flying neon toothpicks because they're very slender whereas dragonflies are more stout-bodied.

Alie: Nice! Way to go Canadian bug guy! He's like, "watch me coin this!"

Lila: *[laughs]* Yes, John Acorn!

Alie: Okay, I Dave Long wants to know: What's with all the legs?

Lila: The six legs, three pairs of legs? Well, they're in the arthropod groups which is jointed-legged creatures and insects have six, verses like the arachnids that have eight, versus some of the other creatures like crustaceans that have seven pairs and what not. Why do they have six verses that? I don't know the answer to that, but obviously those legs help them to get around. And some insects don't have wings, they de-evolved wings like Madagascan hissing cockroaches per se. But those legs, this method of locomotion, on land that works really well for them.

Alie: So it gets them around, crawling-wise. That's a good answer.

Lila: Some of them have saltatorial legs, which are for jumping, good for jumping. Some of them have fossorial legs, which are good for digging. What are some of the other modified legs? I'm going back to all my undergraduate classes.

Alie: Are pedipalps on the front? They look like legs, but they're not?

Lila: That's more of the arachnids have the pedipalps, like the scorpions have pedipalps. Oh my gosh, I can't believe I don't remember another!

Alie: It's okay, it's rapid fire. We got more for you. Is it true that exoskeleton rigidity is why insects could not maintain their massive prehistoric sizing? Brandy Demore [ph.] wants to know this.

Lila: Yes, so the largest insects we have right now in our current climate with our current pressure on the planet is about the size of a fist, which are those giant amazing beetles. But back in the day when there were different climate conditions and pressure conditions on the planet there were some giant - oh my gosh I wish I could go back in time - giant dragonflies that had like a foot-long wingspan.

Alie: Whaaaaat? How loud were they, do you think?

Lila: I can only imagine. You know when a hummingbird comes, like, right behind your head? Imagine that, multiplied by ten. I don't know, I mean, that's an extrapolation. Who knows?

Alie: David Hisaka [ph.] wants to know: Why do fleas exist?

Lila: The same reason that humans exist. They just want to carve out a living. They want to find food, shelter, water, space, pass on their genetic material. How are they any better or worse than us?

Alie: They're just living their lives. Let 'em bite you and live their life! [*Lila laughs*] Can't a flea make a living, you dick!

Lila: I mean, you could compare some fleas to certain human beings in the world right now.

Alie: Parasitic human beings? Aren't we all just parasites of something, like consumerism?

Lila: [*laughs*] Agghh... Friday night in Los Angeles!

Alie: [*laughs*] I mean I feel like bugs are no more terrible than a human being. Everyone's just trying to fuck, and eat, and die.

Lila: Like I just said, food, water, shelter, space, pass on your genetic material. We human beings, we've got a lot of judgments about things.

Alie: We do. Eric Martin wants to know: What is the white goo that comes out of a bug when you squish them?

Lila: White goo or yellow goo? Because, you know when you're driving down the road, and there's a windshield, and a bug splats on it? If it's a lot of yellow, that's usually the fat

body of a female insect that maybe got all this stuff ready for her eggs. I don't know about the white stuff though.

Alie: Maybe they mean the yellow, like you know when you smash a thing and it looks like Twinkie filling comes out? You know what I mean?

Lila: I don't know about the whole white thing. I haven't squished that many bugs, surprisingly.

Alie: I think he must be talking about fat.

Aside: Okay, sorry, story time. Quick diversion from the rapid fire.

Alie: This one time, when I was taking an animal bio class, I had to dissect a cockroach. And we had dissected all kinds of stuff. We had dissected pigeons and fetal pigs that were the size of a puppy, and incredibly heartbreaking. But it was time to kill a cockroach, you had to go to this tank full of cockroaches.

Lila: Which less people cared about.

Alie: Nobody cares about. I mean, they set up a terrarium and it's full of empty toilet paper rolls, and apple cores, and some sad carrot shavings, and it's just essentially like a Skid Row for cockroaches. So, you had to go in and pick one up and then you had to kill it in alcohol, and then you had to dissect it. And I had this lab partner who I had been eyeing all semester, his name was Ted. He had, like, really sheepish adorableness and messy hair, but I thought he was really cute and he asked me to be his lab partner for this one and I said yes. So I got my dead cockroach, and we started dissecting it, and something happened where it wasn't quite dead yet or the nervous system reacted to a scalpel. And it grabbed onto my hand, and then I moved my hand up, and I hit Ted in the face with the cockroach on my finger. We never worked together again.

Lila: Was this an American cockroach?

Alie: No, I think it was the Asian cockroaches, the wingless ones, I think. I don't know, maybe it was an American, I can't remember. All I remember is that Ted and I never worked together and I had to look at him from the back of the room. But I remember slicing it open and a lot of these feathery fat deposits came out.

Lila: The spiracles inside of an insect... insects do not breathe the same way as humans do. They don't breathe through their mouth, and then the oxygen goes through the lungs into the circulatory system. Instead, insects have these things called spiracles along the side of their body which are tiny little holes, and then oxygen is brought in through those holes, through these like very white... When I've dissected some insects, those tubes, kinda like white and opalescent, kind of pop out.

So again, I'd have to see with your eyes, which I can't mind meld to get inside your mind and be there with Ted, and maybe Ted and I had a thing, who knows? *[Alie laughs]* But yes, they just breathe in this whole different way. And also if it was a Madagascan hissing cockroach, those spiracles are the same things that when they breathe out, when they exhale air – exhale, again, not with the same terminology as us humans - when air is let out through those holes, fast, like when you're blowing through a straw very fast, it makes that hissing sound.

Alie: And that's to say, "Yo, back off jerks."

Lila: Well, they can also be doing it for like, "Heeey ladies!" There's multiple communications for the hissing.

Alie: It's like, "Hey, you hissed at me, do you want to have 10,000 babies in the dirt?"

Lila: I mean, obviously, as a handler of hissing cockroaches, a lot of times it's like, "Dude, stop touching me!"

Alie: But I have heard that if you have a hissing cockroach as a pet, after a while it gets used to you and stops hissing because it's like, "Oh it's you."

Lila: Totally.

Alie: Really???

Lila: That happens. Yep, our live-animal keepers and the people who look after the insects at the museum, yeah the cockroach is like, "Oh, there's no threat here, why would I bother hissing at you?"

Alie: What if you came in with a Freddy Krueger mask or something else scary? No?

Someone named Cloudburst [ph.] asked if they are legit not-lethal ways to keep common bugs away from their spray-happy Dad. This person says, "I'm a Buddhist, I don't want anything dead." This person's dad thinks that spraying them with soapy water and plain water is friendly, but how would you get rid of crickets, ants, and roaches without being too big of a jerk? *[Lila heaves a big sigh]* I know, yeah.

Lila: I mean personally, I'm all about integrated pest management, IPM. So, one of the cultural and mechanical methods of excluding them from getting into your house in the first place... Admittedly, if you get into gardening, it's a whole other thing. I've been a gardener, so... If they're coming in your house, obviously we talk about this in the museum field a lot, IPM is a big deal. You don't want bugs coming in and eating your collections that are in your care and we're supposed to be keeping in perpetuity. Obviously, things are going to degrade over time but you don't want insects coming in and eating your mammal collection.

Alie: Right, like a carpet beetle will just chew the hell out of a hide, right?

Lila: Oh my gosh! Yeah, those carpet beetles, dermestids, are amazing. And that's the same beetle that is used to basically skeletonize specimens.

Aside: Carpet beetles are great when you need to clean flesh off of bones, let's say in a museum setting, please. You don't want to sit there with tweezers, and a toothbrush, and bleach, and Q-Tips trying to get every bit of flesh off of, say, a skull. So you dump it in a bucket full of a bunch of carpet beetles and they are like, "Nyum num num num." And they eat off all of the flesh and they give you in return... poop. But they love it. Now, that's great when you need a skull cleaned, but it reeeeeeally sucks when they get into hides, or fur, or leather, or whatever in your specimen collection.

Museums do not like carpet beetles getting in where they're not supposed to be, and if you listened to the ornithology episode, and you remember I asked the ornithologist the worst thing about his job? The worst. And he said carpet beetles. And this is a man who's been held up at gunpoint on the job. So... mmm... carpet beetles.

Lila: And those in museum collections equals very frickin bad news. So yeah, in your home I would go around and make sure that you have sealed up every single entrance point. Where are those ants coming in, where are those cockroaches coming in?

Alie: Do you have any bugs that you're afraid of? Like for me, I love bugs. I'm wearing a shirt that has bugs on it that was made for me. But a cockroach is no friend of mine, and I can't really explain it. If I see a cockroach in my house, or especially inside, I get terrified, but I can hold up a spider on my face and not care.

Lila: So you wouldn't hold a cockroach? *[laughs]*

Alie: I could hold a cockroach.

Lila: Sorry, I'm just laughing because I've licked a cockroach in front of children before to show them it's not dirty. *[Alie laughs]* I was like, "You know how people think cockroaches are dirty, kids!" This was literally in a museum program a number of years ago. "Cockroaches aren't dirty! This cockroach lives in the jungle from Madagascar." And I was like, "They're not dirty!" And I literally licked it in front of children.

Alie: How'd that go over?

Lila: They thought was amazing! They thought I was the coolest person that ever existed, until they went home.

Alie: *[laughing]* I don't know... I know that they're really fastidious, right? They're really in-depth groomers?

Lila: Yeah, having particles on their body isn't necessarily going to feel great to them, so yeah. I've seen our cockroaches really going to town, cleaning themselves.

Alie: Grooming, right?

Lila: Yeah. The Madagascan cockroaches we have in the museum, they live in these amazing little habitats that we create for them, and we feed them all these little vegetables, sweet potato, and little bits of mushroom, and corn, and all this other stuff.

Alie: Honestly, they eat better... they live better lives than I do. Let's talk about debunking some flimflam. Is there any myth about insects or entomology in general that you just wish that you could debunk?

Lila: [*heaves big sigh*] Oh myths, myths...

Alie: All spiders are venomous? People do say poisonous spiders, but really it's venomous, right?

Lila: Well yes. Okay the whole poison versus venom thing, we liked to debunk that as a thing. Yeah, poison is something you ingest, versus venom is something where you are getting injected or envenomated by a spider. You could literally eat a black widow spider, and because it's going through your digestive system, the digestive juices are breaking down the proteins that are in the venom, it's not going to affect you the same way as if it's going into your blood. There's a whole different route of action.

Alie: So if you eat something and it kills you, it's poisonous. If something stings you or bites you, it's venomous.

Lila: Exactly, and things that have venom that you would eat sometimes may not affect you at all. Other creatures can also be stung or bitten by something that's venomous and it not affect them the same way as it affects humans. From what I remember, dogs... black widow bites... not a big deal.

Alie: Really??? But they can't eat chocolate? Get it together, dogs! Make up your mind!
Should we be eating bugs?

Lila: Oh, entomophagy! That's what eating bugs is. I love eating bugs. [*Alie laughs*] I know I've invited you to the museum and you've eaten bugs there with me, and then you were our official judge at the 30th Annual Bug Fair this last year.

Alie: Yep. I ate a tarantula. I felt bad because it takes a while for them to get to that size! So I felt bad about that, but I ate crickets and some mealworms, I think.

Lila: Were there grasshoppers too? And I think you also ate a toe biter.

Alie: I ate a toe biter. A toe biter's like a really big water bug, right?

Lila: Yes, and then also I think you ate some odonate hors d'oeuvres, so some tempura-battered dragonflies?

Alie: Yes. This is all coming back to me kind of like a bad dream. You know what's weirder to me, though? Really quick on the topic of eating bugs before we wrap up, is honey's weirder to eat because it's bee vomit. Isn't that weirder to eat than the actual cricket or the actual bee?

Lila: [*sighs*] Well, there's the whole vegan thing, where, "We're not going to eat honey because we're subjugating bees." With commercial hives, there's a whole bunch of shit there too. Hives are taken out of hibernation early, or are put into hibernation early, trucked across the country on flat beds, fed corn syrup, all of this stuff. There's a whole bunch of research that people can do in that. I think that there's so many feral colonies of bees, and there are beekeepers who are collecting those feral colonies, and then keeping them in their own backyard, and taking some honey and trying to be responsible beekeepers, and not taking too much, and leaving enough for the bees to be able to sustain themselves over a winter.

Alie: But we're going to be eating bugs in the future because they're easier to farm, right?

Lila: Well there's a lot of great protein, there's lot of great vitamins and minerals...

Alie: [*repeats British pronunciation of vitamins in high squeaky voice*] Vitamins!

Lila: ...vitamins and minerals in bugs, and meat production is hard on the planet. I think there's going to have to be some reduction of meat. Again, my parents were Hare Krishnas so I grew up vegetarian. I eat a little bit of meat now and then. Oh God, I hope my dad doesn't hear this because he will be like, "I did not know that!" [*laughs*] Sorry, Dad! So yeah, I definitely eat bugs. I am more than happy to eat protein bars and other things that have insect flour in it.

Alie: Cricket flour is a thing.

Lila: Cricket flour is a thing. And again, you could use up so much less space than you would need to, obviously, raise a cow.

Alie: So get used to it, world! Do you have any closing advice? If someone wants to become an entomologist, if someone's interested in the field, what advice would you give to a future entomologist? Find your niche? Study the unglamorous flies no one cares about?

Lila: Well, first of all there's just not that many entomologists in the world. There's just not that many out there who have the entomology focus and background, and I've literally worked at so many different places and been the only entomology expert there. At the museum there's a bunch of other entomology experts which is awesome because I get to

hang out with all these bug geeks. But yes, if you are going to be an entomologist and be a research scientist, focus in on something that has been a little bit less studied.

Alie: I hope one day there's some kind of insect named after you, Lila, because I feel like you deserve it. I feel like you deserve it. Thank you for talking bugs with us!

So what did we learn? Pick weird bugs to study, don't inhale them, and never ever, ever feel alone. Also, volunteer somewhere you love if you're bummed out, and Google Lila Higgins and follow her on social media. She just did a TedX talk. It came out a week ago. She kiiiilled it! If you have 18 minutes, look that up, "Learning to love nature in a big city," so good! Ologies is on Instagram and Twitter at just Ologies, now, thanks to the wonderful Sarah Hamilton. Now, she had been sitting on the Ologies handle on Twitter, so I had to go as OlogiesPod. She recently contacted me, voluntarily turned it over to me, in an exchange that was thrilling. So now my Instagram matches Twitter! Now I'm just @Ologies on [Twitter](#) and [Instagram](#). If you're already following me, you're still following me, don't worry just handle change, very exciting. Also, it turns out Sarah Hamilton is a really, really, really good graphic designer. She lives in St Louis. So Google Sarah Hamilton and 'Dribble' and you'll find her design page. She's really good! She's also an American hero. Thanks for the handle, Sarah!

And thank you to everyone supporting the podcast on [Patreon](#) and all the cool folks who love to gab about the episodes, and science, weird stuff, in the [Ologies podcast Facebook group](#). Tons of non-assholes in there. I love them, they're good people, it's really great. If you want shirts, or mugs, or merch, head to [OlogiesMerch.com](#). Plenty of really cool stuff there including holiday leggings, and wintery cool stuff. Tons of pins, and hats, and shirts, get up in it.

Thank you to Shannon Feltus and Boni Dutch for helping me so much with merch, Hannah Lipow and Erin Talbert for running the Facebook group. There was production help by Jason Scardamalia, and the theme song was written and performed by Nick Thorburn, who is of the band Islands, so check out his music too. And stay tuned for next week's episode with another smart person who I will barrage with sometimes dumb questions because that's how I do it. Okay. Byyyyye!

[*outro music*]

This episode transcribed by Wendy Fick, who would probably lick a cockroach if she had ingested enough alcohol first... otherwise it would really bug her. I hope I'm not being too much of a pest. (Apologies to Helen Zaltzman if she's reading this.) Also, are fairy wasps just little carnivorous Tinkerbells? I hope so.

Some possibly helpful links:

[BioQuip](#) entomology supplies and microscopes and weird socks

[Glassy Winged Sharpshooter](#)

[Fairy Wasps](#)

[UC Riverside Entomology program](#)

[LA County Natural History Museum](#)

[Natural History Museum Volunteer application](#)

[Look for new galaxies!](#)

[Lorquin Entomological Society](#)

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