

Scorpiology with Dr. Lauren Esposito: Encore Presentation

Ologies Podcast

December 21, 2020

2020 Alie: Just a quick note up top: This Scorpiology interview originally aired a year-and-a-half ago. But thanks to a very kind and generous write up about *Ologies* in this week's *New Yorker Magazine*, (what!) I wanted to give it an encore, because the article's author, Rachel Syme, said that this was the episode that got her hooked. So if you're here because of the *New Yorker*, Hi! Hello. If you have already heard this episode, I promise it's worth a re-listen because it really is chock-a-block full of weird facts. And Dr. Esposito made a return appearance, and gives us some updates about her life, as well as has a message for *Ologies* listeners. So, here we go.

2019 Alie: Oh heeey, it's the lady in front of you at the checkout with 26 items, who doesn't realize she's in the express lane, and is fully oblivious to your glares, Alie Ward, back with another episode of *Ologies*.

So, congrats for not skipping this one. You did it. If it's on auto-play and you're like, "NOOOOooOoO, don't play the scorpion one." It's too late, bitch. It's playing. You're in this now. Don't press stop. Don't! This one is amazing. I promise there are facts in this episode that you will drop in conversation and it will make you un-fucking-forgettable.

Okay, first, really quick, thank you patrons for making this show possible via Patreon.com/Ologies. For as little as a dollar a month, you can submit questions to the ologists. And buckle the hell up, because I'm about to record like 10 episodes in the next few weeks. There are *so* many questions you can submit, so hop on board. Thank you to everyone in *Ologies* merch, available at AlieWard.com, and for tagging #OlogiesMerch so I can repost it on Mondays.

Also, thanks to everyone who makes sure that they are subscribed and leaves a rating and a review. You know I read them, and I pick a fresh one each week.

2020 Alie: This one, from Museum Eve, who said:

If you want to learn how to love hagfish, and be comfortable with death, and see the beauty in moss and spiders and everything else, listen to this podcast. It will change your life.

Thanks, Museum Eve!

2019 Alie: Okay, scorpiology. Hell to the yes. This is a real ology. It's a subset of arachnology, arachnids. 'Scorpion' comes from the Greek - are you ready for this? - for scorpion! Okay, that is not something that made me say, "Oh my god."

This ologist, I met under very, very weird circumstances. Two years ago, in a dusty field, in the middle of nowhere, at a festival for Burning Man-types, where we were both speaking on a panel about science. We were a little wide-eyed and just kind of sussing things out. I dug her immediately, I wanted her on for so long.

Scheduling was difficult, but she was in LA for a 500 Queer Scientists conference and to accept the 2019 Walt Westman Award for her support that she provides LGBTQ people in STEM. This is where we're going to throw in some airhorns. I think we need some airhorns for that. [DJ *airhorns to an EDM rave beat*]

Now, I went to her hotel, just giddily, and I asked her one million questions. We covered: myths about scorpions; what big pinchers mean; movie magic; how lethal are these critters; where is their

butt?; do they make out with each other?; parables about scorpions; glow-in-the-dark magic; getting stung; and also why hiding under a rock is beneficial for some insects but can be very difficult for people, emotionally. So bust out your blacklight, keep your ears on alert, for STEM advocate, science communicator, researcher, expedition leader, and curator at the California Academy of Sciences, Scorpologist, Dr. Lauren Esposito.

Alie Ward: Okay, so you are... I looked this up. You're an arachnologist, but I saw that there is a subset that is scorpiology.

Dr. Lauren Esposito: There is.

Alie: *[high pitched squeal]*

Lauren: I'm, technically-speaking, a scorpologist. But I've been trying to broaden my horizons and be an arachnologist and study more kinds of arachnids aside from scorpions. So, I'm a budding arachnologist, let's say, and an accomplished scorpologist.

Alie: Your business card should say, 'Accomplished Scorpologist'. Now I met you a couple years ago, in the deserts, at a festival, a Symbiosis Festival.

Lauren: Yeah, I was, like, shellshocked, I think, when I met you. I was like, "I don't know what's going on. There's so many people and I'm pretty sure they're all high on drugs."

Alie: *[laughs]* There were so few pants and shirts worn.

Lauren: I remember, in the middle... Was it the middle of our panel? I gave another little talk so I can't remember which one it was, but a fully-naked guy just walked into the tent, and he was so high, and he just walked up to the front of the stage and was standing there mesmerized, fully-naked. *[clip of a hippie meditation circle]*

Alie: It was one of the stranger places that we've communicated science.

Lauren: But it's good right? You gotta get it in there whenever you can.

Alie: If you've got a captive audience, talk to them about scorpions! I remember meeting you and you told me you were a scorpion expert, and I was like, "How many scorpion experts are there?" And you were like, "Not many." And I have bragged about you so many times, where I have said, "I met a scorpion expert! There's like 10 in the world!" How many people study scorpions with the depth that you do?

Lauren: There's definitely not many of us. And I would say, like, people who have a PhD in scorpions? A dozen at most.

Alie: Oh my god! Are you ever in the same room?

Lauren: Hmm, rarely. Scorpion biologists are kind of like scorpions, not really particularly keen on meeting each other. Slightly combative, but incredibly intelligent and persistent. I mean, present company included, I guess.

Alie: What drew you to scorpions?

Lauren: This is such a complicated question. Like, nothing really. It was kind of like serendipity. I grew up in the desert southwest, so I saw scorpions certainly as a kid, but I wasn't

particularly intrigued or wanting to dedicate my life to the study of these animals. But I was super into nature. And I loved turning over all the pavers in my mom's garden and looking for cockroaches, and earwigs, and stuff. Which she didn't love, and especially didn't love when I brought them inside alive. And my mom's a biologist and eventually she taught me to make a killing jar so instead of bringing her live cockroaches, I would bring her euthanized cockroaches.

Alie: What is a killing jar? Is it just a cotton ball with ethanol?

Lauren: Cotton ball with fingernail polish remover in an old peanut butter jar.

Alie: Oh my god. A killing jar sounds so much more...

Lauren: Grotesque and morbid.

Alie: Yeah!

Lauren: Like, "Here, take this killing jar, daughter, and take it out into the garden." But it's euthanasia, it's a humane way of quickly euthanizing insects. So, my mom taught me how to make one of these and I would collect insects from the garden and make an insect collection in old egg cartons.

Alie: Cool!

Lauren: But then I grew up and forgot that I liked that stuff because I was a teenager and was mostly into doing what teenagers do.

Alie: [*jokingly*] Causing trouble? Causing raucous?

Lauren: Yeah, like rabble rousing.

Alie: Getting on people's lawns, turning up the music too loud?

Lauren: Yeah, like toilet papering and those kinds of things. [*laughs*] And then halfway through college, I took an entomology class, and was like, "Oh my god, I love this." And then I applied for a summer internship at the American Museum of Natural History, not knowing that it was going to be an internship studying scorpions. Which it was. And I got it, and I showed up, and they dumped me into the lap of a new curator at the American Museum, Lorenzo Prendini, who would later become my PhD advisor.

Aside: So, she and this new curator spent the summer figuring out a research system, and then for newbie, Lauren, the New York City subway system probably. When the internship was over, she realized she loved science, but she didn't want to go into medical school like she thought. She'd rather be outdoors and studying nature. So she thought, "Graduate school!" So she contacted her curator from the internship and he said, "Yo, come back! Get your PhD working with me and these fricken scorps! So *sick!*" And she was like, "Toight!" I think that was the convo.

Lauren: Move to New York and do a PhD? Absolutely, I'll do that!

Alie: Are there even scorpions in New York?

Lauren: There are no scorpions in New York.

Alie: I didn't think so.

Lauren: None at all. There's a museum full of probably the world's greatest collection of scorpions, but certainly no living scorpions. But the good news is you can hop on a plane from New

York to just about anywhere in the world relatively quickly, and I did. It was scorpions or die.

Alie: I feel like scorpions do have a high-stakes reputation, pretty much like that.

Lauren: I think scorpions, even more so than spiders, everyone's like, "They're *definitely* going to kill you. Any encounter will be lethal for you. For sure."

Alie: Yeah, if you see a scorpion from six feet away, [*humorous hyperbole*] you will drop dead later that day, even if you have no contact.

Lauren: [*picking up the joke*] It's gonna jump across the room and go flying. Wings are gonna come out of its body and it will try to kill you no matter what. [*"They are ruthless, secretive, and highly organized."*]

Aside: They are not. We will address this later.

Alie: Now, at what point when you were studying them did you say, "Holy shit these are cool!?"

Lauren: You know it started when I was doing that undergraduate internship and I realized, like, "Man, scorpions are amazing for so many reasons."

Aside: Hooooooooo boy howdy. Get ready for this. Oh hot damn. Here we go. Here we go.

Lauren: One: They were the first terrestrial arthropod predators. So, before anything else was on land, scorpions came on land, these little beasts. They weren't little then; the ancestors of scorpions were like a meter long. They were huge.

Alie: Three feet?!

Lauren: Three feet. Yeah, maybe even bigger, maybe five in some cases.

Alie: Holy shit! That's crazy!

Lauren: And they were these underwater marine predators and they were, like, ruling the oceans at the time. And some people have hypothesized that because we found these ancient trackways alongside rivers, of scorpions... their little footprints embedded in rock... well, it was mud that turned into rock over time. They've hypothesized that they actually became amphibious and were coming up on the land to eat spawning fish. Like grizzlies, you know how grizzlies come in the river to eat the spawning fish? They were doing the same thing, but they were like the size of grizzlies, but they were scorpion ancestors. [*ominous voice: "When it comes to scorpions, the bigger the better!"*]

Alie: Oh my god. I'm literally having vertigo. I can't... Just imagining a scorpion the size of a kiddie pool. Like an alligator!

Lauren: Basically like an alligator, they were called eurypterids, ancestors of scorpions. And eventually the gills that they had to breathe underwater were internalized and that allowed them to live on land. So the scorpions of today, they basically look identical to the scorpions of 450 million years ago. They've been on Earth forever, so we can ask all kinds of questions about what happened on Earth in the last 450 million years by trying to understand the evolutionary history of scorpions.

Alie: And so how do you think they got littler and littler?

Lauren: The main driving factor behind why insects and arachnids are not as big as they used to be, as big as the fossils we find, is because the oxygen percentage in the air, in the

atmosphere. Because scorpions, and spiders, and insects, all basically passively respire. They don't have lungs where they're breathing in and out. And they don't have closed circulatory systems, they just have blood that gets pumped around by a heart that's open in their body. And so the rate at which oxygen can get to all their tissues that they need for walking around, and moving, and eating, and doing all of the things, is limited by how much concentration of oxygen there is in the air. And over time, the oxygen concentration has gone down.

Aside: So, Lauren explained that when life started coming on land and there were more and more air-breathing critters, the carbon dioxide output increased and the oxygen levels went down. So, when you have less fuel, you downsize. So, think of trading in a Hummer for a Fiat, but slowly, as a result of evolution, and all of your relatives dying off before you. Okay, so apart from the last 450 million years of history, where can we find scorpions?

Alie: So where do scorpions live? Clearly not in New York City.

Lauren: They live basically everywhere that there's not major freezes for long parts of the year. So imagine a place [*"Scorpions, in your underwear."*] and there are probably scorpions there. They're not in Antarctica because there's really nothing aside from penguins, and things in the ocean, and bacteria. They're also not in the Arctic because it's cold and there's snow on the ground all year round. But they are in places like the Alps; you wouldn't expect them in the alps. Or the upper reaches of the Andes like in Argentina, there are scorpions.

My real area of specialty is the neo-tropics, so I go to the Caribbean, Central America, South America. But I've been to places like islands off the coast of equatorial Africa, southeast Asia. I don't know, I've been all over the world looking for those little buggers.

At the point when I decided to do a PhD, I think that was part of the intrigue for me. The potential to travel the world doing science, incorporating two things that I love, which is traveling and science.

But you know what's kind of funny, is that recently I remembered this thing that happened to me when I was a kid. It was in the 6th grade, and I had a homeroom teacher who gave us this assignment. The assignment was to write an essay about what you want to do when you grew up. Pretty straightforward, right? I feel that happens all the time in school. But I was so upset about it because I didn't know what I wanted to be.

I remember crying at home over this assignment because it was so frustrating for me that I had to write and know at this age of 11 what I should do when I grow up. I knew lots of things that I *didn't* want to do, but I didn't know what I did want to do. And eventually, I settled on... I wasn't sure, but I knew I either wanted to be a rocket scientist or a hobo. And I mean hobo in the sense of train traveling, seeing-the-world hobo.

Alie: [*laughs*] Yeah! Just freewheelin'.

Aside: Quick aside to learn ya on some hobo facts, cool? Cool. The word hobo is of unknown origin, but it may be from *homeward bound*, or it may be from *homeless boy*, or from hoe-boy, meaning a farmhand who would travel, riding the rails, looking for jobs. Can I just tell you a little more about hobos? Okay, great.

They had specialized lingo, such as for example: to 'flip' meant to board a moving train; a mulligan is a type of community stew created by several hobos combining whatever food

they had into one big pot; a jungle was a big hobo camp; and to 'catch the westbound' meant to die.

Is that not poetry? Catching the westbound! Also, they made a code of conduct for hobos at the National Hobo Convention in 1889 and the code of conduct is legit. Starting with:

1. Decide your own life. Don't let another person run or rule you.
2. When in town, always respect the local law and officials. Try to be a gentleman at all times. (Sexist, but a good rule.)
3. Don't take advantage of someone who is in a vulnerable situation; locals, or other hobos.
4. Always try to find work even if temporary. And always seek out jobs nobody wants.

They also had codes of conduct to stay clean and report anyone who harms children. We should all be as decent as hobos. Also, they had these symbols they would leave to guide other hobos. This led me to a webpage for the National Cryptologic Museum in Maryland, which yes, I now have to do a cryptology episode so bad. So, in closing, hobos are clean, kindly, respectful folks who travel for work and see the land. So for Lauren, it was either that or be a rocket scientist.

Lauren: I feel like I hit that intersection. I'm doing science. I'm using technological tools like genetics and genomics, and at the same time traveling the world. I'm like exactly at the middle of rocket scientist and hobo. Nailed it!

Alie: So, tell me a little bit about the basic structure of a scorpion. What are we dealing with? Because I feel like they've got crab in the front, snake face in the back with the venom.

Lauren: They've got the business in the back. It's like a mullet, right? Scorpions, like all arachnids, have two primary body parts. They have the prosoma which is the head, and opisthosoma which is the body. So, picture a spider, they have two main chunks. But scorpions have a little extra business, which is the tail. And the prosoma and the opisthosoma are kind of fused, so there's not a real delineation between the head and the body.

Then up in the front they have two pairs of appendages. They have chelicerae, which are the mouth parts, the chewing mouthparts they use to basically to rip up meats [*French accent: "It is raw meat."*] before they get it down their gullet. And then they have claws that they use mostly for grabbing onto prey. In some scorpions they just use the claws to grab their prey. They don't ever actually need to sting them because they have these big chunky claws. Picture the big black Emperor scorpions you see in the movies all the time. They have these huge claws up front, and they almost never use their tail, and their venom's not very toxic.

But other scorpions have these really slender, thin claws and they really just use those for manipulating prey items, and mostly use the tail and really powerful super toxic venom for disabling their prey and escaping their predators. [*Joker from Batman: "Stabby, stabby!"*]

Claws in the front, tail in the back, and at the very end of the tail is the stinger. The stinger looks like a bulb, like a lightbulb, and at the end of that is a hypodermic needle. Inside of the bulb is a layer of secretory cells, cells that secrete toxins, surrounded by muscle that allows them to squeeze those toxins out of the cells and into the hypodermic needle that they use to inject into their prey.

Aside: So, their venom bulb is kind of like those squirty things you would jam into your ear hole to flush out funky chunks, only it's a nerve toxin, made by DNA that they probably had for something else but evolved it to become venom. So, what is in this exactly?

Lauren: The really crazy thing is that their venom is not just one thing. It's actually a complex cocktail of all sorts of different components. They have things like antimicrobials in there, enzymes that break open tissue and help them digest. And they also have these complex neuropeptides. Neuropeptides are basically things that, when they interact with your nervous system, they tell your nerves to either send a signal when they're not supposed to be sending a signal or they inhibit the transmission of signals between cells.

Aside: Neuropeptides, by-the-by, are chains of amino acids that form these protein-like molecules that your nervous system uses to communicate. The neuropeptides bind to receptors and activate a bunch of events inside a neuron. The neuropeptides in venom can jack that system by cutting off the neurons from talking to each other or sending signals when they shouldn't be talking. So, venom is like when someone grabs your phone and starts DMing people it shouldn't. Or withholding a text from your boss. Okay, what if you're a cricket and you don't have a boss or a phone?

Alie: Oooh, what does it do if you're prey?

Lauren: If you're prey, what it might do is disable you, keep you from moving, send you into a seizure, really just incapacitate you very quickly so you can be eaten and make baby scorpions with the energy you get from your prey. But if you're a predator, what it does is sends pain signals to your brain, telling your brain that you're on fire [*man screaming: "Oh my god! We're having a fire... sale."*] when you're really not. And that pause, that signal interruption, caused by the scorpion venom allows the scorpions a moment to escape while the predator is reacting to the signal that it's forcing its body to send itself.

Alie: What types of scorpions have venom that is powerful enough to, say, incapacitate a dog or a human? How much do they get a bad rap?

Lauren: Yeah, well they get a bad rap overall. So far we've discovered about 2,500 species of scorpions give or take, and about 25 of those are a concern for a healthy human. And you know, there's maybe a dozen or two more that are a concern for people that have a compromised immune system, or are elderly, or very young. The majority of scorpions... Less than 10% of all scorpions are something really dangerous that we need to be worried about. That being said, all scorpions do have a stinger and they can jab it into your body. And they can inject things that are in their venom, but oftentimes those things are more mild than a bee sting or a wasp sting.

Alie: Oh, okay! What happens if you do get stung by a scorpion? Has that ever happened to you?

Lauren: It happened one time. For a long time, I got to say no. I'm a professional, I take precautions.

Alie: [*teases*] Suit of armor.

Lauren: But, like a year ago now, almost exactly one year ago, I was at this event and I was passing scorpions around that I had found in the forest to little children for them to hold. [*Alie: "As one does..."*] And I was passing a scorpion from one child to another and it got grumpy, like I think it had had too many grubby kid hands on it, and it stung me. And I was almost confused when it was stinging me. I was like, "What are you doing?!" Because I'd handled

these kinds of scorpions many, many times. It's a scorpion called the Pacific Forest scorpion. We have them all throughout the Bay Area and northward.

And I was like, "What are you doing? What is happening? This is not normal!" Then my finger kind of throbbed for maybe 10 or 15 minutes, and it felt like if I had jammed a thumbtack in my finger. Like if you jam a thumbtack into your finger, it would throb. But then it went away and there were no long-term consequences.

Let me step back and say there are two major groups of scorpions. There's a group called the Buthid scorpions. It's one of the oldest lineages of scorpions and it also has the greatest number of species compared to all of the other lineages. And those ones all make neurotoxins that affect mammals. So, they make neurotoxins that interact with our nervous system.

Aside: Again, these are the Buthids. I looked everywhere to see where the name Buthid comes from and I *think* it's from the Greek for ox or cow because their stings were thought to be real cow killers. Again, Buthids.

Lauren: And so, all of those have a more painful sting, or the ones that are potentially lethal to humans belong to that group, the Buthids. And all the other scorpions are non-Buthids, all the other groups of scorpions. And all of those guys typically don't make neurotoxins that affect mammal nervous systems.

Aside: Considering the reputation of scorpions, they do carry some dramatic names, like the Black Spitting Thick Tailed Scorpion, or like the Man-Killer, or Deathstalker. These kind of sound like 1970s carnival rides. So bitchin'!

PS, when I googled 'scorpions with cool names', I pulled up an article entitled, no joke, from a baby blog, "10 Fierce Baby Names for Your Scorpio." Given that I'm a Scorpio, I had to read it. And among the suggestions for your autumn infant, who will undoubtedly cause drama, are the names Crispin, Evening, Steel, and Nyx. Not unlike scorpion venom itself, this article caused some involuntary sweating and gagging.

Lauren: But scientific names are dreamt up by the scientists that first recognized that species as being a new species.

Alie: Have you gotten to name any?

Lauren: I have, yeah!

Alie: What?!

Lauren: Yeah, we discover new scorpions all the time. There's like maybe 50 or so added a year to our knowledge.

Alie: How do you decide how to name them?

Lauren: Well, different people have different approaches. And a name is really something considered something 'in honor of', so if you use a person or a thing, you're naming it in honor of that person or thing. Oftentimes people take the approach of naming it something that describes its physical attributes, so the name has Latin words for slender, or pale, or yellow, or whatever. Other people use names that come from Indigenous languages where they're found, which is one of the methods I like to use because I feel like it's honoring the place where the scorpion is from and integrating the Indigenous knowledge.

Alie: That's great! Ask me how many species I've discovered.

Lauren: How many?

Alie: None!

Lauren: Oh, well we could fix that if you want.

Alie: Can I come to the desert and turn over some rocks and be like, “Do we know this guy yet?!”

Lauren: My favorite place is the tropical jungle, so you can come to the tropical jungle and do that.

Alie: Oh my god, sign me up. Large luggage, put me in it. When you’re discovering scorpions, I understand that there are blacklights involved.

Lauren: There are, yeah.

Alie: Tell me everything about why they fluoresce under blacklights. Every time I see it I feel like I’m looking at a Bob Marley poster and I’m on drugs and in college. [*stoner voice: “That is so trippy.”*]

Lauren: You might be. So, all scorpions fluoresce. It’s a trait universal to scorpions. What fluorescence means is that there’s a pigment in the exoskeleton of scorpions, it’s embedded in there. It’s called coumarin.

Aside: Side note: coumarin is often found in plants, and according to this Wikipedia prose, “It has a sweet odor resembling the scent of newly mown hay.” It’s also found in cassia cinnamon, in fake vanilla, and in perfumes. Oh, and it makes venomous arthropods glow like ravers. Also PS, I never did drugs in college. I was a straight-edge goth with like 5 jobs and a bunch of science lab homework. But my roommates owned a 6-foot bong, so I observed a lot of blacklight staring. Anyways, coumarin.

Lauren: What it does is take in light waves, just from ambient light, and it excites those light waves and it projects them back at a higher wavelength. That’s what causes the fluorescence. It’s not a reflection, it’s actually like an excitation of light beams. So, they all fluoresce this bright, neon, toxic-sludge green under an ultraviolet light. We don’t really know why they have this feature.

There’re a few possibilities. One, it’s just a byproduct of how their exoskeleton forms, like the process in which they form their exoskeleton creates a fluorescence. Or, alternatively, it has a function that’s helpful for them. There’re a few possibilities. One thing that’s been proposed is that it’s a whole-body light detection system, so it allows them to detect when there’s light. I think it could very well be, but also they have eyes, so typically they can *see* if there’s light outside, or not. It could be another function as well.

The other functions that have been thought up are that it’s a way to tell other animals that they’re dangerous. Like bees are black and yellow; black and yellow is a sign that they’re dangerous. Scorpions are active at night, and at night colors don’t show up very well. Things that are active at night can’t see very well in color. Many things that are doing things at night have evolved greater UV capabilities. Flowers that bloom at night have a UV pattern that attracts pollinators.

So, scorpions that are active at night might want a UV pattern to say, “Hey wait! I’m dangerous and you should stay away from me.” Like a warning color. Or they’re actually trying to mimic something else like a flower and attract things so they can eat them. So those are all of the possibilities.

Alie: Do you think that their ancient ancestors that were ginormous could fluoresce?

Lauren: Well, a geologist mentioned there are some really well-preserved fossils that preserved cuticle and the cuticle fluoresces.

Alie: Oh my god!

Aside: So, side note: this is due to their glowing hyaline layer in their exoskeleton. Also, did you know that horseshoe crabs also glow under UV light? And so do proteins in human saliva, sweat, urine, and semen, just in case you like checking hotels rooms for secretions.

Alie: How many blacklight flashlights do you have?

Lauren: You know what, I go through them like candy. I can't even keep track of them 90% of the time. But I do have 2 that are really nice ones that I spent a lot of money buying from a company that, like, crafts them. And those ones are my babies. I know where they are at all times.

Alie: If someone wanted to go out and look for critters at night, do you think getting a blacklight and just checking things out...?

Lauren: Yeah, in some place they sell them at Home Depot and you can go on a scorpion hunt. The trick is to go out at night because, one, you can't really see anything with a blacklight during the day because the blacklight isn't a bright wavelength of light so it gets washed out by daylight. And two, scorpions are nocturnal so they're active at night, not during the day.

Aside: And in case you're looking for a blacklight bug hunt or a Guess That Splatter Game [*squishy splat*] in your hotel, you can get a UV flashlight for around \$10. But then, I was really curious as to how much a really good one costs. I searched on Amazon the highest to lowest price. There's one on there that's a 400-watt ultraviolet LED emitter, it's \$6,000! Then they jump down to a couple hundred.

Also, at this point, we talked a little bit about zodiac signs for Scorpios. It's like, "Okay, if you're born in a certain time of the year, there's a little connect-the-dots with some stars, it really could have been anything." Sure, does the constellation look a little bit like a scorpion? Maybe. It also looks kind of like a Bissell steam cleaner. So, who knows. Instead of a Scorpio, I could have just been a carpet cleaner.

Alie: Now, what about scorpions in movies or pop culture? Is there any movie that really does a good job with scorpions or one that really gets your goat?

Lauren: You know, the problem I have with movies and scorpions is that they're always very inaccurate. Like, why in every single movie does it have to be the emperor scorpion? Emperor scorpions are from tropical Africa. They most definitely do not live in deserts. There are definitely no black scorpions living in a white sandy desert. That doesn't exist. They want to blend in with their environment, they're not trying to stand out like black on white background. So, why? Why? I just don't understand it. Can they consult with a biologist and figure out what the appropriate-colored species is for the place that they're shooting?

Alie: Are emperor scorpions easier to handle?

Lauren: Yeah, they're really common in the pet trade. And for that reason they are the only scorpions that's considered threatened or endangered because they have been over harvested for the pet trade, because of all of those movies.

Aside: Some researchers think that scorpion venom may have cancer-fighting properties or could be used to develop anti-inflammatory drugs. It's reported that a gallon of scorpion venom is worth - are you ready - 39 million dollars! \$39,000,000!! A year or two ago, there was a get-rich-quick scheme that started to spread in the Middle East to countries like Iran, and it was just promising a fortune to anyone who could poach, or raise, and milk scorpions of their venom. But it turned out to be a total bust. So, labs are not interested in amateur venom milkers.

What are they gonna do with all these scorpions now? I guess just release them, they're saying. Or perhaps, sell them as food. Scorpions can be like eating tiny land lobsters. But before you fasten a postage stamp-sized tiny plastic bib, Dr. Esposito says that most scorpions don't even reach sexual maturity until the age of 5 or 6, so she gets a little sad thinking about crunching and munching them.

Lauren: They can live to be 25.

Alie: Yeah, lay off the scorpions.

Lauren: Yeah, lay off of them. And the other crazy thing about scorpions that I was struck by when I first learned about them, is that the moms give birth to live babies.

Alie: That was my next question! I've seen a picture of scorpions that just have a backpack full of baby scorpions. What is happening there??

Lauren: The courtship starts by what we call a *pas de deux*. They actually dance. They do like a ballroom dance. They're actually quite refined animals. So, the males approach the females and grab onto her hand, they face her and grab on to her hands. And they do this dance back and forth where he leads her back and forth. And he does this thing called cheliceral massage, which means he touches her mouth parts with his mouth parts. It's basically like scorpion kissing.

Sometimes, in some species, the male will sting the female in a particular place on the body. And we don't know what they're doing. They're probably injecting some sort of pheromone or some kind of slight, very mild sedative to keep them from getting eaten because usually they're generally smaller. And if he does the dance well, she likes his moves, she likes his ballroom dancing, then he'll deposit this gelatinous stalk on the ground. It's like a thing made out of a jelly sort of material. [*Paris Hilton: "That's hot."*]

And at the top of it he puts a little sperm packet, and he leads her over it, and she'll pick it up with her genital opening. And she stores the sperm in this specialized structure in her body and decides when she wants to inseminate herself and also with whose sperm.

Alie: Does she have different pockets? Like, "This is Jules's... This is Kevin's...?"

Lauren: It's unclear how they differentiate once they've been inseminated, if they have a way to separate the packets, or if the packets stay... That part is unclear. We don't quite know.

Alie: It's her business!

Lauren: But at the point when she does decide to inseminate herself she has this complex ovariuterus system. In many species it looks almost like a figure eight, and there's little spaces within that ovariuterus, where the embryos start to develop. Once they reach parturition age, she gives birth.

Aside: Gestation period you ask? 7-9 months! Similar to a human. Or up to 14 months for an emperor scorpion. Just think: they have *eight* ankles that could swell up,

walking around pregnant. What troopers! Some female scorpions are just pregnant most of the time. Just most of their life, kind of like my Catholic grandma who had 11 children.

Lauren: And little baby scorpions come out of her birth canal.

Alie: Oh my god, is that vi-vi-paris?

Lauren: Yeah, the viviparous. [vi-VIP-ah-rus]

Alie: Oh, viviparous! Clearly a word that I read more than I say.

Lauren: There's viviparous and ovoviviparous which is where you internalize eggs and when the eggs hatch you give birth. But scorpions are fully viviparous, so they actually connect the same as humans. Their embryos are connected to the mom via a membrane, so they're receiving nutrition directly from her. And they come out and they're kind of in, like, an amniotic sac, sort of, and it's clear, and once they give birth the babies break the sac and climb up onto her arms.

While she's giving birth, she does this thing called a birth basket, where she arches her back up... because the opening is on their stomach. She arches her back up and makes her arms into a circle, like touches her hands together and makes a circle. So the babies will crawl up her hands onto her back and they'll stay up there... depends on the species, but they'll stay up there until they've molted for the first time; when they've shed their exoskeleton and gotten a little bigger. And in that first period, they almost look a little larval still, like they don't look like a normal scorpion. But as soon as they have that first molt, they look just like a tiny miniature scorpion.

Aside: Did I just watch several macro-videos of baby scorpions being squeezed out of a scorpion vagina while sipping my morning coffee? I sure did. It looked like if you were to squeeze unpeeled shrimp through a drinking straw. Just one after the other. Like coming through a water slide. Like bloop, bloop, "Ahhhhh!" Then they just climb up on the back and they live there like people on the deck of a yacht until they molt.

Alie: So, they just hop off and be like, "Too-da-loo!"?

Lauren: Yeah, they'll kind of start coming off her back and getting back on for a little bit. At some point she hasn't eaten in months and months and she's hungry so she'll just eat those little suckers if they don't leave her alone.

Alie: Oh my god!!

Lauren: But in some species they do live semi-cooperatively. Like, they're still living together in the same area for a long period of time. The mom will live in a burrow with the babies, I don't know, like months, years maybe? And they'll just live around each other and they tolerate each other really well.

And she gives birth anywhere from two to... I think the upper limit that anybody has ever recorded is like 140, like high 140s. Let's say 150, to call it even.

Aside: *[in a faraway and bewildered voice]* 150 babies!!

Lauren: That would be like a lot, and they all pile up on her back.

Alie: What a party!

Lauren: Yeah, a scorpion party.

Alie: Have you ever seen one in the wild that's covered in tiny babes?

Lauren: Yeah, to find scorpions, I go out during the day and flip over rocks, and logs, and things they like to hide under, and oftentimes I'll flip over a rock or a log and there will be a mom with babies under there, in the right season like spring.

Alie: Is it always a special treat to see one?

Lauren: Yeah, and you know, I collect scorpions and euthanize them in order to study them. I always leave the moms. I don't wanna take those moms and all those little babies. There's no need for that.

Alie: Is it hard to collect them and euthanize them for research? Or do you feel like the more we learn about them the more we can, kind of, conserve them as a species?

Lauren: Yeah. I mean, certainly for me that's the rationalization. For most scorpions, we don't know basic natural history information; how long they live, how many babies they have, how they mate, what they eat, what eats them. We don't know any of that information except for like half a dozen species.

Aside: So we have the lowdown on only six out of around 2,500 species. Future scorpilogists: the world is your oyster, which is actually a mollusk, so I guess the world is your arthropod. [*ba-dum-TSH!*]

Lauren: The more information we know, the better we can protect them. And the truth is they're really environmentally sensitive. Most scorpion species, as soon as an environment gets disturbed by humans, can't survive there anymore. [*"There goes the neighborhood"*] So they're good indicators of the relative health of an ecosystem.

But yeah, I'll say that I didn't get into the business of studying scorpions because I love killing them. Unfortunately, they're not that cooperative sitting under a microscope alive, and the only way to identify species and study things like venom or reproduction is to look at them under the microscope.

Alie: I think all entomologists have to.

Lauren: It's definitely a struggle.

Alie: You can't exactly look at them through binoculars and observe them for 10 hours like wolves or something.

Lauren: Yeah. And unfortunately, with most invertebrates, we're nowhere close to where we are with vertebrates in terms of knowing how many species are out there and what they're doing. Maybe once we get there, we can switch to the binocular model. We would need some really strong binoculars.

Alie: Now, what is some flimflam about scorpions that you would like to debunk? What are some myths that you're like, "Let's get the record straight, people!"

Lauren: Well, here's a few things you need to know about scorpions. 1; They can't jump.

Alie: Oh!! Okay.

Lauren: It's just a thing. They don't jump. They can't walk... They can walk on some vertical surfaces that are grainy, like a rock that has little micro-areas to step on, but otherwise something that's slick like windows, they could never walk on a window. So, they're going to have a hard time getting to you. If you see it three feet away, you don't have to run away, it's not going to be able to grab you.

Aside: With the exception of Arizona some parts of southern Nevada, and some parts of western New Mexico, Lauren says:

Lauren: In the US, there are no scorpions that you have to be concerned about.

Alie: Oh, okay!

Lauren: Worst case scenario, it feels like a wasp. Even those ones in Arizona, if you're a healthy adult, you don't have to worry. It's not gonna kill you, it will just hurt for a little bit. It'll feel more like an electric shock than a wasp sting. But if you're a child, you want to be safe and not be playing with scorpions in Arizona, rule of thumb. So that's a thing.

Alie: You have a lot of cool tattoos; do you have any scorpion tattoos?

Lauren: I do not.

Alie: You don't? Have you thought about it?

Lauren: I'm scared about getting a scorpion tattoo because... I don't know, like, I don't want to go with a cartoon one because I feel like it would bug me, and a real biologically accurate one, what if something came out wrong? And what if the drawing was wrong to start with and I didn't notice it? I would have to look at it for the rest of my life. Also, I do sometimes hate them because research is really hard and I have those days like, "I HATE YOU! I don't want to look at you!" I look at you all day, and then I'd have to go home and look at it? Taking a shower and look at that scorpion? I don't want to see those things.

Alie: I have so many questions from listeners. Can I ask you?

Lauren: Yeah.

Alie: It's kind of like a lightning round.

Aside: Hooooo boy, so before we get to your Patreon questions, a few words from the folks who sponsor the show. One thing about having ads is, I get to approve everyone I endorse. And also, it makes donations to a cause of the ologist's choosing possible. So, this week it's so dope to donate to Islands & Seas. This a nonprofit that Lauren founded with Eric Stiner. Islands & Seas is building these small field stations that serve as research facilities for scientists in the area. They also serve as centers for science in environmental education for nearby schools. These stations are carbon-minimal, they reuse gray water, they harness green energy; they offer outreach programs for schools, internships for teenagers interested in science, field guide training. Ah! So good. IslandsSeas.org.

Thank you Lauren and Eric for starting that. What total badassess with huge hearts and great brains. A donation is going to Islands & Seas; now a few words about sponsors making that donation and the production of this very show possible.

[Ad Break]

Okay, back to your questions.

Alie: This is kind of like a lightning round. Sonya Karp wants to know: Should they be kept as pets, and if yes, do they make good pets?

Lauren: I'm gonna say yes. There's no reason they *shouldn't* be kept as pets, but like all things that are kept in captivity, I think it's really important to have captive bred ones because then that keeps people out of the natural ecosystems, from overharvesting, over-collecting for the pet trade. There are a quite a few species that are really common in the pet trade that are bred in captivity. If you want a scorpion as a pet, don't go get it out of your backyard,

leave it there. It's doing something important in the ecosystem, rather buy one that's been captive bred by a breeder.

Alie: So, it's the opposite of dogs.

Lauren: Opposite of dogs.

Alie: Don't rescue one out of the wild.

Lauren: They don't need rescuing, they're just fine on their own.

Aside: I was like, "How much do scorpions cost?" And I found myself on a website selling medium emperor scorpions for \$49.99. And they have a Live Arrive Guarantee. Which I guess, when you think of it, it's really an elite selection of people, who when mailed a box of scorpions, would be disappointed to find that they are not alive scorpions.

Alie: Alyssa Katehis wants to know: Why is it "in the scorpion's nature to sting the frog"? Have you heard that fable?

Lauren: Yeah, there's that fable where the scorpion is on the frog's back... the scorpion convinces the frog to give it a ride across the river and says like, "Oh no, I'll never sting you because if I sting you then we're both gonna die." And then, stings it in the middle of the river and the frog says, "Why?" and it says, "Because I'm a scorpion and it's in my nature." Ehhh... Uhhh... I mean, I guess the point of the fable is to say that people are who they are and they don't change.

Aside: That's the philosophical answer. Let's look at this practically though.

Lauren: But a scorpion sitting on a frog's back would never sting the frog because they have all their eyes on top of their head and they wouldn't even know what they're doing.

Alie: *[laughs]* Their eyes are on the top of their head?

Lauren: Yeah, like facing up towards the sky.

Alie: How many eyes do they have?

Lauren: That depends. They almost all have three sets of eyes. Two in the middle and then a set of three to six in each corner of the front of their head. They're arranged in a triangle. Some people have hypothesized that they use the triangular array of eyes to look up in the night sky and navigate by the night stars.

Aside: Oh, my stars! For those that enjoy a good crossword puzzle or are choked for conversation on a long car ride with your in-laws, navigating by stars is called 'astromenotaxis'. Astromenotaxis: you know that now.

Alie: Nelson Chan has a question that I think you are going to enjoy answering.

Lauren: Okay, I'm ready.

Alie: Are all scorpions poisonous? And I know there's a poison/venom discussion to be had.

Lauren: There is. No scorpions are poisonous, because poison is something that is secreted and then when something else eats that thing, it makes them ill. All scorpions are venomous, which is something that is secreted and then injected into the destined host, like another animal, so there's a delivery apparatus for the venom. So, all scorpions are venomous, not all scorpions are venomous to humans because they don't necessarily have that mammal neurotoxin but they're all venomous to something.

Alie: If you ate scorpion venom, would it be poisonous?

Lauren: No, it's a protein and your stomach acid would denature it.

Alie: Ahh, so if you ate a scorpion, unless it stung you on the way down, you're good to go.

Lauren: You're good to go.

Alie: And then it would still be venomous because it wouldn't be digested. So, poison versus venom.

Lauren: But I would not recommend eating a thumbtack. So, in that sense maybe not eat the stinger just because it's sharp and I don't know what it's going to do in your stomach. It seems like a not a good look for anyone.

Alie: And also, let them live. Let them live. "Can I live??"

Jordan Jarrett wants to know: What is your opinion on the scorpion in *Honey, I Shrunk the Kids*? They say, "I love animals but scorpions are the one animal that just creeps me out." Did you ever see *Honey, I Shrunk the Kids*? Is there a scorpion in that?

Lauren: Yeah, here's what I'll say about that scorpion. Scorpions are opportunistic predators so they'll basically eat anything they can get their hands on. They don't forage during the day, and I want to say when that happens in the movie, it's daytime. [*clip from Honey, I Shrunk the Kids: "Run! Get out! Quick! Get away!"*] So that's inaccurate.

It's also an inaccurate species for where it was. But for sure, scorpions will eat anything they can get their hands on, and that includes like if they can get a tiny gecko that they're bigger than, they'll eat it. If another scorpion comes along, they'll eat it. If it's a cricket, they'll eat it. If it's a moth, they'll eat it. But they have a really low metabolism, so that's another thing that makes them good pets. They have one of the lowest metabolisms. So, if you forget to feed them for, like, a year, they'll be okay. If you forget a week, they're going to survive.

Alie: I didn't know that. They're like camels, kind of.

Jay Owens has a question: If you remove their tails is it true they die from constipation? And what is the mechanism if that's true?

Lauren: So, maybe? I will say that there's some truth to that in that their anus is actually at the end of their tail, right before their stinger.

Alie: Really?

Lauren: So, their rectum goes all the way through their entire tail and then... they have just, like, a single cloacae thing that excretes everything. They don't have a separate pee and poo situation. It all comes out from right before the stinger. Maybe they could die of constipation? Because it would be ruptured and broken? But I think they'd probably just die of blood loss, to be honest.

Alie: That was actually Emmalee Hocking's question: What is the waste management system of a scorpion like? Where is the butt? Do they pee? Now we know.

Lauren: They do, they excrete uric acid, same as other things, and other waste products come out of their butt.

Aside: There's this one researcher Camilo Mattoni in Argentina who has observed that some scorpions will voluntarily break off their tails to escape. And yes, in that case, in

the absence of an anus, poo will just build up like emails you don't want to check. But sometimes, they can break off *another* tail segment to get rid of the poo and then continue to live just long enough to mate again. Like, [*flirtatious*] "Heyyyy, yeah, hi. I don't have a stinger. I do have this stumpy column of impacted poo happening. I got scared once and broke off part of my body. But I would love a chance to just get to know you better. Maybe have several dozen babies."

Alie: Wade Lee... [*Hi Wade.*]

Lauren: Wade! Hey!

Alie: Hi Wade! Wade wants to know: Is it true smaller scorpions are more venomous in general? ☺

Lauren: It depends on where you are, so it's not a simple yes or no answer. In some places, smaller scorpions belong to that one group Buthidae, so they're more venomous. But in general, a better frame of reference is if they have thin hands, and either a really long or a really fat tail, they're probably more venomous. If they have big fat hands and their hands are much broader than the width of their tails, then they're less venomous. So, it's not like the overall body size, but the proportion of hands to tail situation.

Aside: So, counterintuitively: big pinchers, less scary. [*"You know what they say about men with small hands. You can't trust them."*]

Alie: Dori Grijseels, there's a lot of constants in that and I don't know if I said that right: Not scorpion-related, but can you tell us about the 500 Queer Scientists initiative? Why did you start it, why do you think it is important? Future plans? And Caroline Swift has the same question, and says: As a queer scientist, I'd also love the answer to this. And a huge thank you to both Dr. E and you, and Dori for asking it.

Lauren: Well I am queer *and* I'm an arachnologist, and I think for most of my professional career and student life I kept those two aspects of my identity really separate. And when I started my position, I realized I was the only queer faculty member at my institution.

Alie: Really?!

Lauren: Yeah, and I'm in San Francisco! Like, that is really gay.

Alie: I was gonna say, you're in San Francisco!

Lauren: San Francisco is the gay mecca. So, I'm the only queer faculty member, and to my knowledge I'm the only queer faculty member in the history of the institution.

Alie: What??

Lauren: First of all, we're a small institution, so it's not like a university that has hundreds and hundreds of professors. We have 15 faculty.

Alie: But still.

Lauren: But still, it's San Francisco, right? And so I started thinking that if I feel this way, I feel like those aspects of my personality are separate, I'm in a really queer-friendly place and I'm the only queer faculty member, I feel kind of isolated in that sense. There must be people out there in parts of the world where being LGBT is not a protected class for jobs, like you would be fired if people found out at work that you were gay. Or if you're just in a place where culturally it feels unwelcomed to be out in the open. Surely if I feel this way in San Francisco, there must be other people in other places.

So, I decided that I would start a visibility campaign. It's called 500 Queer Scientists, and we have a website and also social media accounts on Twitter and Instagram. And we take user-contributed stories of scientists and science students at all levels. Undergraduates all the way through deans of universities have contributed their story. And it's really just people sharing their stories of what they do in STEM, and their identity as an LGBTQIA person, and how those things fit together.

I think it's been great for the community to be able to identify each other because often it's one of those attributes that's hidden, it's quiet, but it's a really strong part of your personal identity. So it's hard to identify others that you can commiserate with, or have as role models, or as colleagues that you feel comfortable sharing that part of your identity with. So, I think it's been a great way for the community to find each other and connect with one another.

Alie: How long ago did you start it?

Lauren: We launched last June. I had collected 50 bios of people by email. Like, emailing all my friends and asking them to email all of their friends. Two weeks later we had 500. And now we're 8 months in and we have 850, and we've had over a million interactions on social media in those 8 months.

Alie: And you started it?

Lauren: Yeah, I started it. I started it with the help of others. But certainly it was my little brainchild and I'm really happy with what it's become.

Aside: So, you can find 500 Queer Scientists @500QueerScientists on Instagram or go to 500QueerScientists.com. And you can read first-person stories, such as Charlotte, who says:

I am a lesbian and a chemistry student. I made the decision to return to education after spending a long time selling phones for a living. For me, studying chemistry is the most wonderful thing I have ever had the opportunity to do. It started when my wife and I returned from our honeymoon in New Zealand; all we could think about is 'how do we go back there?' We considered the usual ideas of learning a trade or something similar, then one day I woke up and it hit me... I nudged Bex and said "I want to go back to school" she asked why, I told her I wanted to study chemistry, she replied "what for?", "so I can teach it". She simply replied "well go do it then," rolled over and went back to sleep. And so here I am, a mature-ish student at the University of Manchester, chasing after an interest in radiochemistry and a dream to teach at the academic level.

Or Alexi who writes:

I am bi and I am a wildlife educator, animal trainer, and artist. I floated through college, studying Biology and Social Psychology, not knowing what I wanted to do. In an interview where I uttered the phrase "elephant diaper" the managers of the local zoo's education department saw something in me that I didn't know was there. As someone who was impacted by David Attenborough I never expected I could be doing the same for kids of color (and all kids in general) on the ground. But here I am: educator, trainer, scientist; and mentor to several queer, teens of color.

So, if there's something missing from your day and that something is crying with pride for total strangers, and/or making some new friends, do check out 500 Queer Scientists. And if you are a queer scientist and you're looking for a place to find some community and

maybe share your story, look no further, fam. Follow the folks on there. Fill your feed with really great scientists, fill your heart with joy and admiration.

Alie: How has it changed your life having started it?

Lauren: I think for me, the biggest change has been just been realizing other people that were not necessarily in my field... Although I have met a few people now in the field of arachnology who are queer – but in the greater field of entomology, which is the study of insects, doesn't really include arachnology but they allow us to participate, it's close enough. So, I've certainly met lots of entomologists, but I think also I've just realized how meaningful it is for people to realize that there are others out there. I've heard over and over from so many people at this point that prior to this campaign, that they had never met any other scientists in their field that was LGBT. So, I wasn't alone, certainly. And I think that's the reassuring part of it, that you're not alone. There're others. They're out there. They're just maybe not as visible as we'd like them to be.

Alie: Anything you would suggest for people to keep an eye on, or anything people can do to up the inclusion, anything people could do to be allies, any advice for people who are like, "Oh I'm not quite sure what I could do to help."?

Lauren: Some simple ways are just acknowledging people in the workplace or in your student community and asking, like, point blank if there's ever anything that they can do. Or if you are witnessing something that would make them feel uncomfortable, or you perceive that they're uncomfortable, to speak out so they don't have to speak out. I think that that's huge. Also, for me, that's been one of the really great things about having run this campaign, by talking about it this much, this aspect of my identity, this much around my colleagues who are heterosexual, non-transgender, gender-conforming, whatever, they've become much bigger allies for me, like, huge advocates. And they have expressed their desire for advocacy in a way that prior to this they would have never done.

So, for all the people who are LGBT out there, taking the step of putting yourself out there and expressing your needs to your colleagues, and telling them point blank how they could help, is scary. It's terrifying. But when you do it, they're really appreciative of that because they don't necessarily know how to help you and how to be an ally. So just asking, which is... I think it's always hard to ask for help no matter the context, but if you can find the courage to do so, it makes a huge difference.

Alie: You're changing so many lives. It's amazing!

Lauren: Oh, I don't know about that. It's not me, it's the community. Those 850 stories, only 1 of them is mine. But I'm happy to be the spokesperson for the community whenever I can because I am in a place of privilege where I can talk openly about my identity in my workplace and not have any fear of retaliation or retribution and have the full support of my institution. So, I'm happy to do that work for the community when I can.

Like there's not that much information out there about the experience for LGBT people in the workplace in STEM, but the few things we do know, about 40% of queer faculty members in academia and in industry are not out. So, there's a lot of people out there who are not comfortable expressing that part of their identity because of fear of retribution. Which is a valid fear, because surveys have shown that of faculty members that are out, 70% of them have been made to feel excluded or harassed at work by their colleagues.

So, there's like a huge motivation not to be out, even though being out is great for the community, it's great for future students, it's great to be a role model. But there's so many

reasons not to do it because you're going to be uncomfortable at work, it's going to be terrible. You don't want to do that. So, I think it's hard to feel that you're in a space that's comfortable enough to be out and to be visible.

Alie: So they can commiserate and hear other people's stories. That's amazing. I'm so glad that you did that. You're doing so many good things!

Lauren: Scorpions and queer people. Who knew? That's a thing. I don't know of any queer scorpions.

Alie: Oh, there's got to be some of them out there.

Lauren: Maybe, there's lots of examples of weird things in nature.

Alie: They're just under a rock! They're so much more fluidity in nature.

Lauren: So much gender fluidity, right? And yet as humans we want to dichotomize it, it's so crazy.

Alie: I know! The snails episode, we talk a lot about, you know, BYOG, bring your own gennies.

2020 Alie: Is now a good time to hear from Lauren again? I vote yes. So, she very kindly phoned in with some updates since this last aired a year-and-a-half ago.

2020 Lauren: Hey, all you *Ologies* fans. This is Dr. Lauren Esposito, checking in, reporting for duty. I got some updates for you all, just things happening in the world of scorpions. Let's see... First, my graduate student, Aaron Goodman, published a paper last year documenting the first ever arboreal scorpion. These are scorpions that live entirely up in the canopy in Mexico and parts of Central American, they live in tropical rainforests. We think that probably the reason that they have taken to the treetops is to evade being eaten by other scorpions, because scorpions are cannibals, which is super gnarly. They'll eat each other, and if you're a tiny, little, skinny scorpion and you're trying to get away from big beefy scorpions down on the ground, it makes a lot of sense to make your way up into the treetops and hang out there forever.

2020 Alie: But not just her lab is busy. How are the nonprofits?

2020 Lauren: In the world of 500 Queer Scientists, things are moving along. We are no longer 500. Now we have over 1,300 contributors that are able to share their story of being LGBTQIA+ people working or studying in science, technology, engineering, and mathematics. That is incredible, and inspiring, and makes me feel happy every day. We also just launched our newsletter this December, and our newsletter is sharing some of these stories more in depth, letting our contributors really talk about themselves and all the amazing things that they're doing.

Last month, we featured some content makers, so folks making really LGBTQ-specific podcasts, starting their own very specific organizations that are focused on, for example, polar researchers that are queer, which is amazing that there's enough polar researchers that are queer to make your own group. That's so awesome.

2020 Alie: I will link this newsletter on my website. Look out for a podcast all about Queer chemists called, appropriately, *My Fave Queer Chemist*, and an interview with an NYU Associate Professor Jon Freeman, whose paper, "Measuring and Resolving LGBTQ Disparities in STEM," raises some critical issues of queer scientists leaving their professions because the environment isn't the most friendly place for them." This is an area of research that Dr. Esposito says is very data deficient, which matters because:

2020 Lauren: We really want those perspectives because those perspectives are so important for advancing our scientific knowledge. In my Islands & Seas world, that's the nonprofit that I started a few years ago with my best bud, Eric Stiner, we are just about to finish our inaugural field station in Baja, California Sur. It's a totally off-the-grid field station to support researchers, but also to support the local community in their scientific learning endeavors. So we're really trying to connect the local community with researchers that come down to study this place, to make more impact on conserving it.

Our field station is 100% off the grid, all solar. We have satellite internet, which is amazing because we can actually go down there and, like, send emails, which was something unheard of just a couple years ago. All of our water comes from a local spring, and we are about ready to start hosting groups of scientists and students. We're hoping people just mob us with requests to come and study the Vizcaino desert, which is one of the most amazing deserts in the world.

So, I guess that's it for me. I have been overwhelmed with the amount of love that came out of the airing of my first *Ologies* episode, and so I just want to say thank you for loving scorpions, but also a huge thanks to Alie for thinking that scorpions are interesting enough to make an -ology episode about them.

2020 Alie: I'm such a fan of Dr. Esposito. Thank you, Lauren, for letting me ask so many questions, including the last two:

2018 Alie: The last couple of questions that I always ask: What's the worst thing about your job, or the most annoying thing about scorpions? What's the shittiest aspect about being a scorpologist?

Lauren: You know, I think, the hardest thing about working in science in this moment in time in this country, especially, is the funding, it's so tough. And I think in the field that I work in, which is evolutionary biology, the successful funding rate to the main place that we apply for funding, The National Science Foundation Government Grants... The success rate is about 4%.

Alie: Oof.

Lauren: So as an early career scientist, breaking into that... because you know, almost certainly that 4% is not evenly distributed across all genders, ethnicities, and stages of career. It's certainly biased because the people who are more senior, are more established, tend to be more white, more male, and are better at getting grants. So, to be an early career researcher trying to break into a 4% funding rate is daunting and hard, and it makes it really hard to find enough money to do the thing that you want to do and feel is a really important contribution to society.

Alie: Do you have to write all of your own grants?

Lauren: I do. I submit, probably, three or so a year. Each of those take months and months to craft, and it's time away from research which is what I really love and really want to be doing.

Alie: Yeah, oof. And now, best thing about scorpions, best thing about your job? What do you love the most?

Lauren: You know I love my job because I get to wear so many hats. And I'm at an institution that was such a good match for me, which is why I wanted to work there. The California Academy of Sciences is an incredible museum because it's equally committed to science outreach, which is something I really love doing, and really high-quality science research.

So, for me those two aspects of my work life, I always felt like I was going to have to give up one for the other. Like in a faculty job at a university, I was going to have to give up the outreach because that's like extracurricular. It's not something that's considered in your annual review or your job performance.

Or doing science outreach, I would have to give up science because there's very few science outreach jobs where you can still engage as much as you need to in the science research itself. But I found a really great fit, and I think for me that's the great thing about going to work every day. They love all of the things I'm doing including running a little nonprofit that's focused on conservation and doing a visibility campaign for queer scientists. And it's nice to be somewhere where I can bring all of me to the job.

Alie: It's a *beautiful* place!

Lauren: It is. Going to work every day, it's not so bad.

Alie: Oh man. If you're in San Francisco, go, go, go. It's just... Ah, I could just spend days there.

Lauren: I just, like, walk through the park to work in the morning. I see coyotes, and there are crows quaking, and red-tail hawks soaring through the air. It's pretty amazing and special. Lately we have a turkey that lives in our business entrance, and she just hangs out in the little walkway, fluffing up her feather and walking around. There's lots of different names for her. Everybody's got a different name for her.

Alie: What do you call her?

Lauren: I call her Bernadette.

Alie: Okay. [*laughs joyously*]

Lauren: Bernadette. I didn't make the name up, someone else did, but that's my favorite one. I feel like Bernadette's a real turkey kind of name. She's a pretty turkey too.

Alie: It is a very good turkey name. Oh my god, I need to come back and visit. Thank you so much for doing this.

Lauren: Ah, thank you! This was great.

Alie: I have been gently prodding you for too long.

Lauren: We've been like ships in the night. We could never manage to meet up, huh?

Alie: I'm so excited we did it.

Lauren: We did it!

So, ask smart people stupid questions because how the hell else would we ever find out that scorpions are 450 million years old, and were once the size of, like, a couch. What?? What?! To learn more about Dr. Esposito's endeavor you can find her on [Twitter](#) @ArachnologyNerd, or on [Instagram](#) @Caribales. I will put links in the show notes. Her education nonprofit again is Islands & Seas, [IslandsSeas.org](#). You can go to @500QueerSci on [Twitter](#), on [Instagram](#) they are @500QueerScientists, and it's [500QueerScientists.com](#). More links will all be up at [AlieWard.com/Ologies/Scorpiology](#).

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[Patreon.com/Ologies](https://www.patreon.com/Ologies). You can get merch at [OlogiesMerch.com](https://www.OlogiesMerch.com) or through my website. Thank you to Boni Dutch and Shannon Feltus for helping manage that.

Thank you to Erin Talbert and Hannah Lipow, for adminning the really wonderful Ologies [Facebook group](#). Thank you to interns Haeri Kim and Caleb Patton of the *You're Never Too Old* podcast. Thank you to assistant editor Jarrett Sleeper of Mindjam Media. He also hosts the podcast *My Good Bad Brain* and a combat sports podcast called *Fight Stuff*. And thank you to Steven Ray Morris of *The Purrrcast* and *See Jurassic Right* for never being a frog stabber and editing this all together. Also, thanks to Nick Thorburn of the band Islands who wrote and performed the theme music.

And if you listen to the end of the episode. I always tell you a secret. This week I want to tell you about Herbert. Herbert is my tiny tooth. I have this one tooth that I had a veneer on because it's just tiny, and so I was just trying to get my teeth moved around, I've been doing Invisalign for like 4 or 5 months, to get Herbert back into place. They had to take the veneer off to fix it and I did not know how small he was. It's been a while since I've seen him. So now, I just have this one little tooth. I'm in between the veneers, and I got it taken off and I asked some close friends, "Look at this!" And they're like, "I wouldn't even have noticed it, Alie, you're tripping, I wouldn't have even seen it."

And then I went to see my friend Dailyn – by the way, happy birthday, Dailyn. It's her birthday today! And one of the first things she said, "What happened to your tooth??" And I was like, "Is it noticeable?" She's like, "Yes." And I said, "Other friends were like... they wouldn't have even seen it." And she's like, "They're lying to you." So I'm gonna get it fixed.

2020 Alie: Just a quick update on your stepbrother, Herbert. For months on shoots I had this tiny tooth, and I used this plastic material I got in a, like, \$30 kit. It's called TempTooth, and it becomes malleable in hot water, and then every time, *every time* before a business meeting, or a shoot, I would have to mold a temp tooth around Herbert, and then just affix this fake tooth with denture glue. And I did this for, maybe five months until I finally went back to the dentist and was like, "Can you just put the bonding back on?" Anyway, I'm still doing Invisalign to get my teeth a little straighter because with covid I have not seen my orthodontist in 9 months. So, that's how Herbert's doing. I was supposed to be done a year-and-a-half ago with Invisalign, but hey, chin up, masks on.

Stay safe out there. Do not lick anything. Berbye.

Transcribed by Jennie He who has ordered and consumed over 5lbs of Dubble Bubble Bubble gum in January 2019 (today is June 1, 2019) even though she's 25 years old. Also has no middle name.

Final touches by Kaydee Coast the ambivert Gemini accountant.

Some links you might enjoy:

This week's donation went to: www.Islandsseas.org

500QueerScientists.com

[500 Queer Scientists Newsletter](#)

[New species discovered!](#)

[Buthid etymology](#)

[10 Fierce Baby Names for Your Little Scorpio](#)

[Neuropeptides](#)

[\\$6000 worth of blacklight](#)

[Congratulations, ma'am. It's a ...scorpion!](#)

[SCORP BBs wriggling' inside a belly!](#)

[Oops I shook my tail off and can't poo](#)

[Scorpion via live mail delivery](#)

[Scorpion farms: not a get rich quick scheme](#)

[Scorpion venom: pricey af](#)

[Glowing fossils!](#)

[Up to your necks in a volcano full of scorpions](#)

[Temp tooth: what I used to conceal Herbert from the world](#)

[Another Temp Tooth tutorial](#)

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