

Lepidopterology Encore with Phil Torres

Ologies Podcast

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Oh heeeyyy, it's ol' DadWard VonPodcast on the ol' mic. Hello from my closet, per usual. This week, the release schedule's a little wonky because I rushed to put up an episode on Sunday with Dr. Michael F. Wells, who has gathered well over 5,000 scientists willing to help with CoViD-19 testing, and I wanted to get that episode ASAP. So, I put it up on Sunday. There's a link to his Google form if you're an ologist who wants to help out, and his contact information in case you are somehow connected to a government agency that can, hopefully, use that database to ramp up testing in the US. There are also tons of self-help suggestions in that episode; ways to pitch in and help others. That's in the All (Washed) Hands on Deck episode. If you're looking for a fresh one, just go backwards one.

So rather than double you up on two full, new episodes this week, I thought I would have an encore presentation of a super Spring, and fluttery, goofy, happy episode, that is also swear-free, in case you need to listen with a younger... or an older set, I don't know. Although, we do discuss some aspects of bugs making other bugs (if you know what I mean). I love this episode. It's going to make you stop and look at the blossoms on your morning walks and appreciate all the beautiful, disgusting creatures around you.

Thank you to all the Patrons at Patreon.com/Ologies for making the show possible and making donations possible each week even when I don't run ads. It was so fun to livestream with you a few days ago. That was very whacky, just to hang out in my living room. So, if you're not on Patreon.com/Ologies, you are missing out on some very candid livestreams. Also, thank you to everyone wearing Ologies merch from OlogiesMerch.com. Thanks to everyone who rates, and subscribes, and reviews. That costs you zero dollars and you're keeping the show up in the science charts for other people to discover.

Also, I have been feeling, myself, just a little extra stressed. I was really sad yesterday, and your reviews, honestly, brightened my day so much. You have no idea. Maybe you do have an idea, because I pick a fresh one each week, like this one, like a creep, and I read it to you. Thank you, aFlatow, who wrote:

I'm currently working third shift disinfecting public transit buses. The job is incredibly monotonous and would be unbearable if not for this podcast. Thanks to the pandemic, and my new work assignment, I finally have time to catch up on my backlog of Ologies. I guess everything really does happen for a reason.

aFlatow, thank you, thank you, thank you so much for everything that you are doing right now to make this better. I hope you hear this, I hope you're listening, I hope you know how appreciated you are by me and everyone else listening. Thank you for cleaning the transit buses! We need you so much!

On to the episode. This one first aired about two years ago, and I've included some updates and surprises along the way. You ready for the rest of the intro? Here we go.

Lepidopterology. What a word. So many syllables you gotta remember, and you gotta not mess up. But it's the study of butterflies and moths of the order Lepidoptera, which comes from the Greek words for scale and wing. Very sexy.

This ologist I've known for almost 5 years, I think, which is crazy. As a bug nerd, I saw some of his insect photos on Instagram and he's such a really, really, good photographer. So, I forced him to be my internet friend and then my in-real-life friend. Then we introduced each other to our other science friends, and now we're all on a WhatsApp thread called *Scorpions on Our Faces*. We're the ones who field everyone's bug questions. My only aim in life is to deliver insect IDs faster than him, and it only works sometimes, and that's just because he's on a plane, or he's shooting one of his several TV shows he works on, and I'm able to get in before him and I look like a hero. You may have seen him on Animal Planet, Al Jazeera America's show *TechKnow*, he's been on the Discovery Channel and others, he's working on a new show. He also has YouTube series called, aptly, *Jungle Diaries*.

We sat down in LA while he was on the West Coast and I lobbed one million butterfly questions at his face and we talked about the differences between moths and butterflies, the most butterflies he's ever seen in one place, and what children's toys are in his field kit, and why he sniffs butterflies, and the truly disgusting behaviors and preferences of the world's most fawned-over and respected insects. They are disgusting. We talk about sex and mating. So slow down, perch on a flower, and open your ears for some delightful facts and harrowing jungle tales from one of my favorite entomologists, a guy I call Philly T Exoskele-Torres, Lepidopterologist Phil Torres.

Alie Ward: Duh, because butterflies are the best. It appears to be recording. This is your microphone.

Phil Torres: Oooh, I feel like it's Karaoke Night.

Alie: I know, *[laughs]* it really feels like it.

Phil: This is great!

Alie: You just hold it like you're doing a standup bit.

Phil: Okay. So you point it at your face?

Alie: *[high pitched voice]* You point it at your face! *[normal voice]* Philly T Exoskele-Torres, thank you for being here.

Phil: Happy to be here!

Alie: Okay, so you are, by all accounts, a lepidopterologist.

Phil: Let's... let's go with that. Yes. Background's in entomology and I focus a lot of my work on butterflies because they're kind of the best.

Alie: Why are they the best? I'm getting right into it.

Phil: I mean, a lot of it has to do with... going way back for me. When I was a kid, I was out there bringing home bones, and snakes, and bugs, and anything I could find from the local state park and then I started taking these, like, butterfly classes as a kid when I was seven years old. And this guy, Dr Andy Warren, who's now the collections manager at the University of Florida - he's an amazing butterfly researcher - he taught these classes. He was in high

school at the time, I was seven years old, and I was learning about how to collect them, how to mount them, how to identify them, how to store the right data, and it was a blast. And we were out there... I remember when I was eight, me and this kid next to me were *running* after this thing, the Gulf fritillary.

Aside: The Gulf fritillary, by the way, is this cute little orangey, umber, and dark brown butterfly, and the underside of its wings have these crazy, gorgeous, metallic, silvery patches. From the top, it looks like the pallet for a Thanksgiving tablescape, but on the underside it has markings like a Lady Gaga Superbowl costume from the future. Anyway, Gulf fritillary.

Phil: He caught it, I missed it, but it was the first state record ever recorded in Colorado. And I'm like, "Okay, if we can do that at this age, imagine what we can do when I'm, like, a real human and an adult."

Alie: [*laughs*] 'Cause eight-year-olds are not real.

Phil: They're not. Let's be honest here.

Alie: What happened when he caught it? Were you like, "Oh, congratulations. Ouch."

Phil: I mean, I think it was just... it was all excitement. There was probably some high fives, you know, I don't know what the cool word was back then, but...

Alie: It's probably rad, bitchin'

Phil: Probably rad, I dunno, I was eight.

Alie: Yeah, okay, probably not.

Phil: That's a big word.

Alie: Bitchin' is a big word. Dr. Andy Warren, are you guys still... are you pals?

Phil: Totally. We're totally pal still and it's great.

Aside: You too can digitally befriend Andy Warren, the lepidopterologist who inspired Phil. He's @AndyBugGuy on Twitter. So you can have at it; Andy will probably be confused about the sudden spike in his timeline, but it is a lovely buffet of butterfly and moth photos. Totally worth it. Gently stalk him.

Phil: But yeah, actually I talked to him about getting on Twitter and now he's just, like, killing the game. If you have any butterfly questions, he just... he knows it, he knows everything. So he's like the Grandmaster and I'm his understudy.

Alie: I know that you answer a lot of questions when it comes to butterflies.

Phil: I do. I can't help it.

Alie: I mean, is it harder for you to answer a question of, like, "What is this caterpillar?" versus "What is this butterfly?"

Phil: It is. I mean, you tend to spend more time working on - at least for me - working on the adult, and memorizing the different species, and knowing where they're found, and all that kind of thing. And the caterpillars can be a little trickier. Some are more obvious than others. You know that if it looks like bird poop then it's probably a Swallowtail caterpillar.

Alie: Is that true?

Phil: That is true. Yeah. A lot of the younger instars, they will mimic bird poop so well!

Alie: Oh that's so smart.

Phil: On a citrus tree especially. So if you are, like, smelling a nice orange and you see some bird poop crawling around, you'd be like, "Wait a second, that might be a Swallowtail butterfly."

Alie: What's worse than roving bird poop? They're like, [*high-pitched voice*] "Surprise! I'm a chubby caterpillar!"

Aside: Side note. If you are like, "What is this instar business?" don't worry. As much as I have been a bug lover for years, I just learned this word recently. I didn't know it. It just means the different stages, like in this case, caterpillars. They just keep molting into a larger size until they're ready to pupate. Imagine kind of like a Russian nesting doll situation but squishy and at the very last stage, they turn into a purse, and then out of the purse pops a kite, or a drone, and you're like, "What kind of crazy witchcraft magic is this?" Speaking of progressions:

Alie: So let's talk about your path. At what point did you decide you were gonna study entomology and butterflies?

Phil: I was 11 years old and I had to write a paper in middle school saying, "what do you want to do when you grow up?" And I was like, I wanna study entomology at Cornell! Because that's where Andy went to study as well, and it's just the best undergrad program that I'd found. It was amazing and I was just like, "This is what I want to do," because he would tell these stories of, you know, he just came back from South Africa and discovered species, a month in Brazil, and all these places around the world. So I was like, "Okay, there is a job out there where you get to chase after things with a butterfly net, make real discoveries, and explore the world." And that just sounds like a blast. Not to mention, you get to have fun doing it, you make bait traps that smell terrible, and it's just stuff that kids love. And I was like, "I just want to stick with this for forever."

Alie: How many countries do you think you've been to in a quest to look at butterflies, and bugs, and snakes, and bones?

Phil: I don't know. Maybe like 15 or so.

Aside: Phil has traveled through most of Latin America, Mongolia, he's done work in Europe. The dude has some frequent flier miles.

Phil: You get around and that's really what drew me to science in general, is just this idea that... I mean, it's been a really nice career. I think I did my first expedition when I was 19 years old, and worked with a grad student, and we spent three-and-a-half weeks in Venezuela and found 35 new species.

Alie: When you were... You were not 20 yet. You could not rent a car. You were six years from renting a car and you discovered how many new species?

Phil: Thirty-five on this trip. I mean it was... He was, like, really the guy who could look at it. We were studying aquatic beetles at the time.

Alie: As you do.

Phil: It was so cool and a lot of them were... This was in Venezuela, a lot of these beetles, this one genus, *Oocyclus*, lives on this side of waterfalls and that's where it specializes. So imagine

being 19, and being like, “Okay I guess we're going to have to travel throughout this beautiful country looking for waterfalls to discover things.” And I had so many moments when I was young that I was like, “Yes, this was the right choice” because the experiences I got, not just with nature and discovery, but also the humans you meet in these places were amazing.

Aside: Phil had an experience growing up that always stuck with him. And I'm gonna say right up top, it involved travel and butterflies, which you're gonna find is a recurring theme in Phil's life and thus this episode. By the time it's over, I'm just gonna warn you, you're gonna be cramming a butterfly net in a steamer trunk and flipping your boss off on your way out the door. Like, “Byeeyeee. Byeeyeee I'm off. [*slurred speech*] Going to the jungle.” This episode will inspire you to wreck your life. It's gonna be great. Anyway...

Phil: Okay, so my dad's family is from Nicaragua. And when I was 13... I can't remember if I was 13 or 15 at the time, we did two trips as a kid. I reached out to the lead entomologist in Nicaragua saying, “Hey, I'm coming down. I kind of know what I'm doing. Can I get a permit to collect butterflies and I'll send you photos and, kind of, we can ID them together?” And he was like, “Sure.” And I was like, “Sweet, let's go find some butterflies!” So, we were there visiting family, but then I was like, “Okay, we have to go to this really remote rainforest in one area down by the border of Costa Rica.” Then we went up into this volcano called Mombacho for one point too, and a caught this one butterfly. They're called Glasswing butterflies and they're beautiful because they're kind of transparent and just really interesting.

Aside: Just a note to say that a Glasswing is super weird to look at. It's just as it sounds. Most of the wings are totally see-through. Like it's wearing an invisibility cloak, you can see right through its body. It looks like it exists, but it doesn't. Whenever I see photos of them, and I was just looking at a bunch of them, I always get these weird kind of goosebumps and a squicky feeling in my tummers. Like a vertigo, like, “How are you a mostly transparent animal??” Anyway, so Phil found a really cool one.

Phil: A butterfly you usually find at higher elevation or shadier areas in the tropics. And went home, mounted this butterfly, put the location data, all that kind of thing. Then a few months later, my uncle who lives down there, sent us a newspaper article saying, “Hey, a new species of butterfly has been collected on this volcano Mombacho, and there's only three specimens that have ever been found.” And then I looked at my collection, I was like, “Oh my gosh, I have the fourth one!” [*DJ air horn!*] I was, like, a teenager and I was just on this family trip! So it was another one of those moments where I'm like, “If I just did this right now, because there's so few people out there appreciating these things, imagine what else I can do if I make a career out of this!” And it's called *Napeogenes Tolosa Mombachoenses*.

Alie: That's quite a mouthful.

Phil: That Mombacho part, that's the subspecies found on that Volcan Mombacho.

Alie: What does the whole name mean? Do you know?

Phil: I don't know. *Napeogenes Tolosa Mombachoenses*. Tolosa's, my guess...I don't know.

Alie: I'm gonna have to look this up.

Phil: Yeah, let's look it up. We can dig into this. [*Alie laughs*] We'll get the truth!

Aside: I want you to know that your old dad tried real hard to find the meaning of this scientific name and I just plumb struck out, kiddos. It was named in 1851 by an entomologist and I just have no idea what it means, fam. I have no idea. You know what? Let's back up. Let's just back up, let's get to some easier questions first, okay?

Alie: So let's define a butterfly.

Phil: Okay.

Alie: So I know what a butterfly looks like, but what's the difference between a butterfly and a moth? What's the difference between a butterfly and another winged insect? What makes it a lepidopterology?

Phil: So lepidoptera translates as "scaly wing." That's one of the number one things. You look at those wings and they're covered in little tiny scales and that's how they get their color. That color can be really brilliant and colorful or it can be drab and brown, and it kind of depends on the thing. So butterflies get a lot of the glory because we see them more often because they're diurnal.

Aside: Wait, what's that word again? [*instructional robot-like pronunciation of diurnal*] FYI, I avoid this word a lot because I'm afraid of saying it wrong and also it sounds like a pee toilet, but it just means not nocturnal. So butterflies: awake during the day. Which is more than I can say for myself sometimes.

Phil: And they're just prettier. But really butterflies are a type of day-flying moth.

Alie: That's so weird!

Phil: So when we look at the family tree, there's like: moth, moth, moth, butterfly, moth, moth, moth. They're kind of considered, you know, amongst most people as, like, butterflies on the left and moths on the right. But really, it's this branch of moths that evolved into this superfamily, Papilionoidea, that has really done well during the day, [*robotic pronunciation of diurnal*] and that's why it has all these bright colors because those colors help it camouflage, or identify a mate, or to show that it's poisonous. If it has bright orange, and yellow, and black colors, or to mimic something that is poisonous. They're great. So to tell the difference between moth and butterfly, color is one thing. Also look at the way they rest. A moth generally has its wings folded down when it's resting, and a butterfly generally has its wings folded up, tucked behind it, when it's resting.

Alie: All right, so it's like a stealth fighter versus a sailboat?

Phil: Yes, that is great. I'm going to use that.

Alie: You are welcome. Please cite me in all of your papers.

Phil: [*laughs*] You got it.

Alie: So butterflies are up, moths are down.

Phil: Typically. Yeah, typically. There are some that break the rules. The rule that basically is never broken is looking at the antenna. So a butterfly, imagine you have these two long stalks at the top, or two long, things sticking out, and then at the very end it gets a little

thick, a little club. If it's got a club at the end, we're talking about a butterfly here. If it's straight or feathery, we're talking about a moth.

Alie: Okay. And do they have wildly different eyesight or wildly different olfactory senses?

Phil: Eyesight for sure. Butterflies... anything that's flying by day. There are moths that fly by day as well. They're going to be very visual, so they're looking for brightly colored flowers that are telling them, "Hey, we've got some nectar for you." They're looking for conspecifics, others of the same species, to figure out if they want a mate or chase them out of their territory. They're looking for predators flying around. They have pretty decent vision to look for anything swooping at them, and you learn that when you're trying to catch them with a butterfly net. They're very tricky sometimes.

Alie: Is that good exercise, to have a butterfly net?

Phil: It is. It is very good exercise. Yes. It's the real Jungle Gym. [*Alie laughs*] When you're out there in the rain forest and you're swinging these things, it's tricky. Some species are way easier to catch, and they're kind of low flying and just flopping around, and then others are just... they're like jet fighters. They're really tough, really agile, and they're really tricky, which is why sometimes bait traps do the trick.

Alie: Oooh, because I've seen a video of you in your YouTube series *The Jungle Diaries*, where you have the world's longest butterfly net.

Phil: Oh yeah.

Alie: How long is it and how heavy is that? Because you've got to get up in the canopy, right?

Phil: Yes. I was working with my friend Dr. Susan Finkbeiner.

Aside: Phil and Dr. Finkbeiner went to Cornell together and she's now one of the top butterfly researchers ever in the world. She's super tough, she works deep in the jungle and she uses - this is nuts - the longest butterfly net available, possibly on the open market, to catch butterflies in the rainforest canopy. It extends 35 feet. It's a 35-foot-long net. I looked all over for it on the internet. I couldn't even find one to see how much they cost. I think she had to build it herself. Anyway, Phil was like, "I am a buff dude. I can do that also." Note: this was not his verbatim thoughts, I just editorialized them. Anyway he was like, "I got this. You teach me how to use it and I'm gonna look just like you."

Phil: It didn't pan out that way. We have to hike up this crazy stream and... I mean it was an amazing place to work. Like, that's her office every day; pretty great. But then you open up the butterfly net and I couldn't even... I could barely hold the thing.

Alie: It looks so heavy! It's like a clown car. You just keep extending and extending.

Phil: Extending it, my arm got tired. I was like, "Is there a button we can press that this thing happens?" And so, yeah, holding it you have to, kind of, stabilize it with your foot. Then swinging it, and swinging accurately, was a whole other level. But it was a blast and every time I do something like that I'm like, "This is such a fun job!" Studying butterflies, you just get to do these crazy things like swing 35-foot nets in the middle of the jungle.

Alie: But what about the bait traps? If you're like, "My arm is too tired. I'm going to put out a pile of dung and see what happens." Is that what happens? Because you mentioned they were smelly.

Phil: They are smelly. Bait traps, you get creative. Sometimes you will use a banana bait trap, and this is pretty typical throughout the tropics. You get bananas, you add some water, maybe some sugar, maybe some beer. And then you close it up and you let it ferment for a few days. You open it up and if it smells nice and ripe and like you don't want to be anywhere near it, then you got some good bait! Then you set it in a little cup and in this kind of like cylinder net thing. It'll be floating below the cylinder net thing. The butterfly feeds on the bait and then flies up, and when they fly up, they get caught in that net. So, that's the most PG-13 version of a butterfly bait. But then you get a little interesting and we will use rotten fish. We will ferment tuna cans, and that was horrible. We will add human urine to it.

Alie: Hell yeah.

Phil: That doesn't make it any better. And then you can also use... yeah, poop.

Alie: Anything in particular?

Phil: Generally, carnivore poops. If you're vegan, I'm sorry, but your poop probably won't cut it. If you are a carnivore, you've got some good sodium and maybe even some nitrogen they might be going for in there. I always joke that... I mean, seeing a jaguar in the wild is an amazing thing, and knowing that they're around, finding images of them on camera traps is great, but what I'm after is jaguar poop. [*Alie laughs*] Because when you find jaguar poop, you will see some of the rarest butterflies that generally are only found way up in the canopy, but they will come down to the ground to feed on that steamy pile of goods. And that's just it; there's all these rare resources out there, and if you make a bait that smells like a rare resource, like pee, or rotten fish, or rotten fruit, then the butterflies will come.

Alie: I love that the most PG-13 version of this is something that has to do with beer. Like, it gets so gross from there that the most innocent thing is putting out beer for butterflies.

Phil: It is, and you're fermenting this fruit, right? Which is how you make alcohol in the first place. So it becomes slightly alcoholic and you actually, kind of, see that these butterflies get a little drunk.

Alie: Is that true?

Phil: It is very true.

Alie: How can you tell?

Phil: They're just like getting in bar fights and stuff.

Alie: [*laughing*] Tattoos.

Aside: Now, you can discern which butterflies become inebriated on fermenting fruit if you look super closely, because on some specimens you can see a really small tattoo of a human on the lower back of the butterfly. So the love is very mutual, they love us too. P.S., if you'd like a rabbit hole to go down, type in "drunk butterflies" on YouTube and you'll find some gems, like this one from AnaGirlEmpath: [*clip of a young woman talking about a 'drunk' Monarch butterfly in a dish of nectar, "His tongue's all curled again, so he's not eating. He's just, kind of, chillin'."*]

We may both be suckers for getting shmammered on hooch, but a butterfly brain is a little different. They have a lump of ganglia in the head to control the eyes, and antennae, and the coiled birthday party horn of a proboscis. [*sound of party horn blowing*] But it also extends

down their body! Their brain goes all the way down their body to help their back end make decisions, which honestly would be very helpful in humans, especially drunk ones.

Phil: But yes, they can get a little drunk like us.

Alie: Whaaaaat? Okay, well this brings me to a question. If they can drink and eat, how many moths, how many butterflies, actually eat as adults? Because don't a lot of them just chub it up when their babes, and then they're done? They're like, "I'm an adult, all I want to do is mate."

Phil: Totally, yes. Caterpillars are just big feeding tubes, and they just eat and eat and eat, and they just try to grow into a thing that will then turn into a chrysalis, or a cocoon, and then turn into an adult.

Aside: So, some species feed as adults and live a little longer so they can have a better chance at finding a mate, or maybe a few mates. (Hey!) Other species don't live as long and thus they don't even bother growing mouths, which is like, "Hello, *American Horror Story: Butterfly Season*."

Phil: They don't have mouth parts because they ate a bunch as a chubby caterpillar and now they're like, "I just gotta mate." So with them it is a pheromone. Now, butterflies will have pheromones too but with moths it can be way stronger. If you take a female silk moth, a big, let's say, Luna moth and you stick it in a mesh bag, she will release this pheromone out into the world, and if you wait all night, that thing will have like a dozen males that have tracked it down. [*multiple voices simultaneously saying "Heeeyyy!"*]

And the way they do it is the males have these big feathery antennae that are super, super sensitive. They can detect a single molecule from like two miles away and they'll be like, "There is a female around here, let's find her." They do kind of a zig-zag pattern to triangulate and to figure out where she is. When they find her they know that they got something to do and they try to mate.

Alie: How pissed were they that she was in a mesh bag?

Phil: They were so pissed!

Alie: They're like, "I came this whole way," and she's like, [*snobby girl voice*] "Sorry, I'm in a bag tonight. Maybe tomorrow." Now, how is it different for butterflies? How do they find each other? Just by peeping each other on a flower? Like, [*laid back sexy voice*] "Hey, I saw you on the flower back there. You looked pretty good."

Phil: Yeah, it'll be a visual thing usually because they have colors that we can see and also UV colors as well. Then from a close distance it will oftentimes be a mix of behavior and smell. So, certain species, males will defend a territory and wait for a female to come by. Other times they'll be cruising around looking for a females. [*clip of Cruise by Florida Georgia Line: "Baby you a song. You make me want to roll my windows down and cruise."*] So that kind of makes a difference. But then up close, butterflies too have a pheromone. The best thing about butterfly mating is that their pheromones smell really, really good.

Alie: [*laughs*] Do they really?

Phil: Super good.

Alie: Is this just a personal fetish from a lepidopterologist or would you say...?

Phil: It's a little bit, but... When I was in Peru a couple of months ago, we found this one butterfly and... Butterflies sleep underneath leaves in the tropics, so if you're walking around at night and you shine lights underneath leaves, you'll see a little butterfly tucked in. And so you can catch them in a way that they're totally not harmed, open up their wings and give it a sniff. If it's a male in certain groups, I passed this around, 10 out of 10 people were like, "This smells *exactly* like brownie batter."

Alie: Why brownie batter?!

Phil: Not even cooked brownies. We're talking the batter! [*Alie laughs*] This is so different. I think it's just, it's a mix of incidental that it smells like that. Also this group is known to feed on plants like banana and certain plants that may have some chemicals in them that are volatile and smell nice. So, when the caterpillar eats it, it gets into the adult, and these chemicals have taken a long journey, and they have components in them that are kind of like fruit-like or food-like and it's delicious. There's some that smell like that. There's some that smell exactly like maple syrup, some that smell like cake, some that smell like barbecue potato chips.

Alie: That's so specific.

Phil: So if you guys ever catch a butterfly, please, please smell it and let me know. The Black Swallowtails that you get around here, actually the Tiger Swallowtails as well, the males in the U.S. smell like Froot Loops, like, *exactly* like Froot Loops.

Alie: How did you discover this?! Is this a thing that lepidopterologists know about?

Phil: They know and they kind of pass it on. I think I probably sniff more than other lepidopterologists. I just like using my nose. I think it's... When you work a lot with animals or when you work a lot in the jungle, you start to use your senses a lot more, and not in like a "be one with the earth" way. It's just, like, you do because you notice... if you want to find monkeys in the jungle, you don't crane your neck looking up, you use your ears and you'll hear a little crash and you know, okay, that's a big crash, that's a capuchin. If it's like a running crash then that might be a spider monkey or something. You start to use your ears different and then also your nose because those resources, like fermented fruit, if you are near a fruiting tree and you smell fermented fruit, you'd be like, "Oh, there could be good butterflies over here."

Dead animals too can attract certain things, or maybe you find a really cool dead animal that just died of natural causes. I found... My first sloth was a sloth with a big bite out of it from like an ocelot or something, but I was like, "How cool is this?" We used a machete and cut off its head and then preserved its head in a way that we got the skull, and then we were able to take that around the local schools in Ecuador and show them a sloth skull and teach them about it. Slot teeth do not mess around! They may be slow, but they got sharp teeth for cutting through.

Alie: Seriously?

Phil: Yeah.

Aside: I just want to interject to tell you that sloth skulls, I just looked it up, they look kind of like a softball wearing dentures, plus plastic Halloween vampire teeth and they are cute as hell.

Alie: What's the grossest thing that's happened to you in the jungle? You just talked about beheading a dead, rotting sloth, which I can't imagine, the whack with the machete...

Phil: Yeah, I've done it with a dead puma too. It's pretty gross, but you start to get a little... It's sad to see the dead things for sure, but you kind of realize that we can take this death and make something out of it. I think skulls and bones are great educational tools and so you just do what you gotta do.

Alie: Have you ever been really, really scared in the field?

Phil: Yeah, for sure. I definitely do get scared sometimes and I think that's okay. One thing that helps is basically just to focus on my work. If I'm out there at night, sometimes I'll hike alone, which you probably shouldn't do. I just really focus on, okay, what is my target that I'm looking for, if it's a spider or sleeping butterfly or anything like that. The main thing, we call it the 'jungle scares.' That is our term that we created where if you're out there, especially at night in the jungle, even if you're with a group during a survey, sometimes you just get this creepy feeling like you could turn and your headlamp would look out and there'll be a jaguar just like glaring back with glowing eyes. And that would be really scary. So we call that the 'jungle scares' where, like, your mind kind of gets away from you.

Aside: Okay, but Phil's greatest fear in the jungle just shocked the socks off me. This is not what I was expecting. Wait 'til you hear this. I just click-baited you in my own podcast but seriously, [*cheesy ad voice*] you won't believe what this entomologist fears most in the rainforest! Ooooh! Click, click, click.

Phil: My biggest fear in the jungle is trees.

Alie: What??? Why??

Phil: Trees, because they weigh so much., and tree falls are a very natural part of the cycle of the rainforest. About 2-3% of the rainforest is in the tree fall zone at any moment. And every single day when you're in the jungle, you will hear at some point, a big [*makes crashing noise*]. And sometimes you feel the earth shake because a tree, that could weigh a few thousand pounds just fell. And not only did it fall, but there's vines everywhere, so it took a bunch of trees next to it down. And you can have this huge area cleared out that if you are anywhere near, there's not a whole lot you can do.

There was one time in Peru that I was out hiking, I was about a mile from base camp and I hear this crazy loud storm come in. I mean, it sounded like a train was coming. I'd never heard anything like that. Then the wind started, and that is your biggest danger when it comes to trees, it's rain and wind, because that's what will take them down. And I just started hearing trees come down, branches started falling, so I turned and sprinted back. I've never sprinted a full mile. Probably did like a four-minute, 55-second mile. And there was literally, I mean we're talking 600, 400-pound branches falling to my left and right. A giant tree started falling in the trail in front of me, and I had to kind of stop, and then I ran underneath it and it was like a crazy Indiana Jones moment.

Alie: Indiana Jones stuff!

Phil: I was like, "Where's my hat that I dropped? I gotta grab it." [*Alie laughs*] Yeah, I got back and I just... You don't mess around with that kind of thing. So there's a lot of times that I've had to cancel hikes if rain is too high or wind is too high because you just don't want to risk it.

And I've had friends that have left their bags somewhere and they come back, you know, an hour later and that bag is smashed by a giant branch that fell from the sky. So, it can just happen.

Alie: I never knew. I never considered this. I thought maybe you could fall into a pit of alligators, but I never considered trees.

Phil: Yeah. You know the animals, at least in the New World tropics, central South America, generally you're pretty okay with most of the things that are down there. There are some other topics where you have other animals you need to be concerned about, but usually where I work you're pretty good. Just don't get hit by a tree.

Alie: Oh! I have a question about gifts. I know that... let's say that you really like pigs or dragons, or yachting or something, you get a lot of gifts with that. Do you get a lot of butterfly and moth gifts?

Phil: I do! I do and I'm okay with it because I remember somebody got me, like, a little kiddie... you know, it was one of those bug chamber things, like a little fold out thing that is aimed at - judging by the font - probably aimed at seven, eight-year-olds. And I was like, "This thing's dope!" And I carried it around in my backpack in the field for like two years, and I used that all the time when I found something cool and I wanted to stick it in there. I'd be like, "This thing's collapsible! How great is this? They need to make this for adults too!"

Aside: I looked this up and they're like 5 bucks on the internet or in a toy store, and they look like tiny mesh collapsible laundry hampers that zip down flat. So you can keep a bug catcher in your purse or pocket at all times like a six-year-old who might just need to hang out with a cricket or a firefly for a little bit. It's chill.

Phil: Also my favorite thing about gifts and butterflies are the gifts that butterflies give each other.

Alie: Such as, for example?

Phil: It's called a nuptial gift.

Alie: [*getting excited*] Ooooh God!

Phil: Let's say you love a female butterfly and you're like, "What do I do to impress her?" Sometimes that tactic will be finding a source of sodium, whether that be in mud, or piss, or dead animal, or Jaguar poop. You get that sodium in you, and then you make a sperm packet. This thing is called a spermatophore, and you inject the whole thing into there. So you're giving her sperm and salt.

Alie: Wait a second. So you're giving her like a gift basket. That has... [*high pitched voice*] your jiz... And then also just like a salt chunk?

Phil: [*laughing*] A salt chunk.

Alie: Are you serious?

Phil: Yes. It's because salt is generally pretty rare out there. Plants don't have a lot of salt because it's poisonous to them. So the males kind of say, "Hey, you're going to need this to make some nice eggs and for our babies to be happy together." So they give her some salt. But my favorite nuptial gift is poison.

Alie: What??

Phil: Yes.

Alie: That sucks! Although I guess when you buy someone a drink at a bar, you're technically giving them poison.

Phil: That's right.

Alie: Yeah, like "Here's the poison, let's have a babaaay."

Phil: So there's this group, the Glasswing butterflies, and they are naturally chemically defended by what they eat as a caterpillar. They have a certain type of... I think it's a cardenolide toxin, in them that makes them toxic to most things like birds. But spiders can still eat them, and some other predators can still eat them. So they need to get another toxin as an adult. But only the males do it. There's certain flowers out there that you will very rarely find. So when you do find them, you will find a swarm of like, 30 males of a bunch of different species, all drinking up the nectar of these rare flowers to become poisonous themselves. And they hold onto that poison until they mate. Then when they're poisonous, that means that they're defended from things that would try to eat them. And scientists have done tests and found that spiders will reject eating them if they have drunk from these flowers.

Alie: Do they take a chomp and they're like, "Oh hell no!"?

Phil: Yeah. The spiders somehow detect it and other predators somehow detect it or they've learned. They hold onto it until they mate because the female doesn't go for those flowers. She's busy just being a female flying around. So when he mates, he gives her sperm, but he also gives her that poison. I think he gives about 50 percent of what he has to the female. Then he says, "Here's the gift of poison. P.S. Now you're protected for life." It sounds kind of crazy to give that, but it doesn't even stop there, because then the eggs that she lays have a thin layer of this poison on them too, and it protects them from things like parasitoids that would inject eggs into those eggs. So it's a pretty cool thing that you can watch these butterflies swarm around this flower, knowing they're after a single chemical here that is going to go into a female when they mate, and then into an egg when she lays eggs.

Alie: That's so romantic!

Phil: It is! But I do not recommend giving the gift of poison. [*Alie laughs*] Public disclaimer right now.

Alie: Alcohol and perfume, both poisonous!

Phil: That is true.

Alie: You've told me before, and I would like you to expound upon this, that butterflies are disgusting.

Phil: They are *horribly* disgusting.

Alie: In what way? Because they're so *beayuteeful*.

Phil: They are beautiful, but they're disgusting, you guys. You find this out when you spend enough time with them. I find it hilarious. Every time I see them do something even grosser, I'm just like, "Wow, you do not stop." [*Alie laughs*] So, were on the topic of mating. Let's talk about mating. They do things like, they have sperm plugs. [*grunting noises*] When they mate

with the female, they plug her up and say, "No more males inside you!" It's kinda gross. They also have some hooks sometimes, that will hook out the sperm from the previous male and stick their own sperm in there.

Alie: They'll clean you out like a pipe cleaner? *[laughs]*

Phil: *[laughing]* They will clean you out like a pipe cleaner. It is messy. Yeah. Insect genitalia can be pretty crazy. They feed on dead animals. I've seen some of the rarest butterflies feeding on dead animals that smell *horrible*.

Alie: Those pictures don't make sense to me, because butterflies, it's a thing that's on a Mother's Day card, but it's also on a rotting carcass.

Phil: Yeah. We need to make some new Mother's Day cards. Like, "Love you mom! Here's a dead animal, but look at the beautiful butterfly in that little corner! It's there!"

Alie: And maggots.

Phil: Yes. So, they feed on dead animals. They love poop. All sorts of poop. Especially if you eat some meat in there. They will get drunk. Another thing I've seen... a lot of it is to get rare resources, so when it comes to sodium... one time I had a butterfly that landed on my finger and I was like, "Oh, this is really nice!" Then I was looking at what it was doing, and it was drinking the sweat off my finger.

Alie: You have sweaty fingers?

Phil: Sweaty, sweaty fingers. When you're out there, trust me, your fingers get sweaty. I don't want to...yeah, it's gross. But after a while my sweat dried, but the butterfly still wanted to get that salt that was on my finger. So what did it do? It would pee on my finger and then turn around and drink up that pee. *[Alie laughs in disgust]* Because basically that pee, that liquid, would absorb the little salt crystals and make it into a salty solution, and then it would turn around and drink it up. So, I would just watch it basically pee, turn around, drink, pee, turn around, drink, on my finger. And I was like, "You disgusting creature! You're lucky you're beautiful!"

Alie: That's like if a Mountain Dew dried and you're like, "I know one way to rehydrate it!" So gross!

Phil: *[laughs]* Yes. Super gross.

Alie: Do you like that about butterflies, that they have such a beautiful public image but are secretly super nasty?

Phil: Yeah! I mean they're so much more interesting than people give them credit for. In the entomology world, people like to give each other a little bit of crap depending on what you study. They'll be like, "Oh, you studied micromoths, you must be weird." But butterflies seem like the easiest, most approachable insect to most people, so I think some entomologists will just kinda dog on people who study butterflies because they're like, "Oh, of course you study them because they're so pretty. I study these things that are horrible looking."

Alie: Yeah, like weird botflies and many-toothed Sabre maggots.

Phil: Exactly. I love those Sabre maggots.

Aside: So ok, Sabre maggots are not real. But botflies are very real and will lay a baby in your skin, which hatches out like a wormy surprise jumping out of a birthday cake. And entomologists, they brag about getting botflied. Phil has expressed to me before his chagrin and dismay at having never had one of these moist, miniature, alien-esque beings burst from his flesh. One day, Phil. One day you'll get one.

Quick update: Phil finally got his first botfly! It was just about a year ago. It was ga-gnarly! It was just a weeping, chewing, squirming, baby maggot in his back. [*retching*] He made videos about it on his *Jungle Diaries* YouTube channel. You can go back and find them. Also, as long as you're following him, he does Ace nature content on his TikTok these days, including some breath-taking slow-mo he just posted today that he rigged up with an iPhone and a hummingbird feeder. It's going to make your whole day. And every day feels like a month lately, so it's going to make your whole month.

Phil: So we came up with an expression when I was working in Ecuador. We said, "Only tough guys catch butterflies." because they're just very complicated. They do gross things. They have really interesting behaviors. They're a really good model to study, and you have to be really tough to get out there and study these things.

Aside: Uh, yeah. You can fall into a volcano chasing an invisible butterfly, and then the jungle is a tangle of dangers, and beauty, and mystery.

Alie: Not to mention there is the ever-present mystery of transformation that... I feel like that is one thing that just boggles everyone about butterflies. That they are capable of such an extreme makeover. Such a rebranding! What is happening when you have a chubby caterpillar, you have a tube of guts, and then it "peaces out," is like, "Catch ya later, gone fishing" and then it comes out as a different creature. I've heard that they have the same memories and the same aversions?

Phil: I think there have been some studies that have showed that yes, some of those memories and aversions can last into an adult. Some people think that they entirely turn to goo inside and then just reform. They don't entirely. There are still some parts that remain, these things called imaginal disks that have been with them for a long time. And actually, inside some late instar caterpillars, meaning they're very mature caterpillars about to pupate, you will actually have little bits of butterfly in them.

So they're already starting to change before they get in there, and then they get in there and a lot of them goes down, but the imaginal disks will turn into things like their eyes, or their wings, and that kind of thing. So, it is a lot of work and it is really amazing, but there's some people out there, our friend Aaron Pomerantz is an example of somebody who has figured out a way to cut a little window into a pupa.

Alie: What???

Phil: And then you can actually watch what happens on the inside.

Alie: That's crazy! How the hell does he do that?

Phil: Just a very tiny knife and a lot patience.

Alie: Some Saran wrap?

Phil: Yes, and so you can actually see what's going on inside. So scientists have a pretty cool idea. They've done MRIs or crazy scans on them to watch this transformation over time. There

are a lot of things in nature that just blow your mind, and that is something that is happening every day around the world. A lot of kids grow caterpillars into adult butterflies, and that stage is truly impressive and really wild.

Alie: Now, the DNA is the same, right? Is the DNA expression changing? Like how does... I just have no idea how it works.

Phil: Yeah. So there will be genes that get expressed differently. It is fascinating how some of the genes will turn on at different times of their life or turn off at different times of their life. And it's all stored in that same nucleus. I mean, their DNA has all the information to do all of these things throughout its life

Alie: And now can you tell me the difference between a cocoon in a chrysalis? Because I know that those things get used a lot, wrongly, and does it piss you off?

Phil: It doesn't piss me off because I mess it up sometimes too, but just don't do it, okay? If you're listening at home, [*sarcastically*] it's going to start to piss me off now because you've heard me explain it. So, a chrysalis is what a butterfly creates, and it's just a single little wrapping on the outside and they're right on the inside there so you can actually see their abdomen still. You can kind of see the wings a little bit in there and you can... if you poke it, it'll wriggle a little bit. That is a chrysalis.

A cocoon has a pupa inside. That pupa is basically equivalent to the chrysalis where it is everything self-contained right there. But the cocoon is this silky thing wrapped around the pupa. That's what a lot of moths will do, is they make a cocoon and they make a little silk or they'll use their hairs on their body and they make a little protective thing, and then inside that protective thing they will pupate. They will spend the winter as a cocoon and then hatch in the spring. So that layer of protection that the cocoon creates allows them to survive, and you know, withstand the elements and that kind of thing.

Alie: And a lot of times when they changed from one instar to when they upgrade their instar and they get a little chubbier, don't they eat their skin? I seem to remember that when I was volunteering at the butterfly pavilion.

Phil: Yep, they will. Especially when they hatch, they'll eat their egg.

Aside: Remember when I was talking about those instars, those Russian nesting dolls? So caterpillars will molt into the bigger size. Kind of like they're unzipping their skin like a sleeping bag, and then unlike a sleeping bag, they'll eat it after. Just nom-nom-nom it up, because it's made out of them! And they need to make more of themselves! So they just use that raw material. I was so enthused to learn this fact in a museum volunteer seminar about butterflies. But quite frankly I was more amused to look up at the presenter's PowerPoint and see that on their computer desktop, they'd labeled the butterfly keynote folder, "Butt Stuff." [*ba-dum-TSH!*] I think of that often and it makes my day.

Also, thank you to Patrons and sponsors of the show for making it possible to donate to a cause of the ologist's choosing each week. This week a donation is going to go to the Xerces Society, that's Xerces.org. You're going to hear more about them later in the show. You're going to be like, "Wow. Xerces.org. I like you a lot." So we donated to them. Also, I just texted Phil to see if he has a CoVid-19-related charity he wants to donate to and he chose Meals on Wheels, which is providing food, and home checks, and gift baskets, and even just notes to

seniors during this not-easy time. They are at MealsonWheelsAmerica.org. Great choice, Phil.

Those donations were made possible by sponsors of the show who you may hear about now.

[Ad Break]

Alright, so let's answer some friggin questions! Thanks Patrons, for [singsong] sending these in! You ready? Why am I singing? I am so excited!

Alie: Are you ready for a rapid-fire round?

Phil: Oh, goodness. Hit me.

Alie: I got so many questions. Over 40, but I'm going to try and blaze through. You don't have to do rapid fire, but we got a lot. So just...

Phil: Challenge accepted.

Alie: You ready?

Phil: Let's go. It's butterfly time.

Alie: Brian Edge wants to know: Why are they not called flutterbyes?

Phil: You know, let's start a public campaign and change this. Let's do it.

Alie: Alright, flutterbyes should just be what they're called.

Phil: Yeah. So, I think the name butterfly comes from... There's a few theories, but supposedly this came from, like, Europe or England or something where one of the common butterflies around there is a Sulfur, which is kind of yellowy and it looks like butter-flying, but that might just be people these days being like, "This makes sense. Let's say that that's the case," but yeah, that is why.

Alie: Okay I'm gonna look into that because that's really cute.

Phil: It is very cute. Look at that butter flying! Let's call it butterfly.

Alie: Damn cute.

Aside: Quick fact check on this. It's split! Some folks think butterfly came from *butterfleoge*, meaning to beat fly, as the wings beat. But honestly, I prefer the alternate etymology, which is that they're named after floating pats of fat. Also the German word for butterfly translates to 'thief of dairy protein' or 'botterlicker.' Or, people also think it could be because they excrete a yellowish substance that looks like melted butter. The Dutch for butterfly translates to 'butter crapper.' Between milk-licker and butter-pooper you now have so many friendly, low-key insults in your arsenal. No arse pun intended there.

Alie: Clark Rake wants to know: Growing up it seemed like there was an abundance of butterflies through the summers, Monarchs especially. These days I'm lucky to spot even one through the summers. Is this just a drop? Is it my region, Ontario, or is there a real population decline?

Phil: There is a real population decline, and when it comes to conservation in the US, I always think that the minimum standard we should have is that future generations of kids get to see butterflies flying around their backyard. That should happen. That was something that

in my backyard was happening all the time and I loved it. And if we've messed up our ecosystem so much that we don't have butterflies for our future generations to see, we've made a big mistake. And we're certainly on the way there and that's a good observation that people are actually seeing less.

A lot of that has to do with things like Monarchs, their migration. Along the way there aren't as many flowers for them to drink from. There aren't as many milkweed plants for them to lay eggs on. It has to do a lot with our agriculture. We've done a lot of habitat destruction when it comes to developments. The best thing you can do, everybody can do this if you have a yard, or a patio, or anything, is to plant native plants. There's a great website, Xerces Society, they will have great listings to show what you should plant there. And it makes a big difference because if you're putting out any plant, any flower, and you see butterflies come there and drink from it or lay eggs on there, that means that that was previously missing from the ecosystem. We need more, and more, and more to help boost those populations and help them sustain what we've done to our area.

Alie: So make sure that you plant something native, and you can check on the website and be like, "a ha!"

Phil: For sure. Yes. Something for the adults, some really nice cone flowers are great. Butterflies love drinking those for the nectar and then something for the caterpillars too. There's a lot in the carrot family that will be really good for some caterpillars. There's a lot of options out there.

Alie: Okay. Oh, killer! Also, it's just like, "Party at My Patio. Butterflies invited. I got what you like to drink. Please do come over."

Aside: So once again, that's The Xerces Society for Invertebrate Conservation, and they're at Xerces.org. This site is great! I just poked all around it. You can click on your part of the country and a whole list of region-specific pollinator plants come up. So you don't have to worry, like, "What if I planted the wrong thing??" It will tell you what to plant. The name Xerces is in honor of the first North American butterfly to go extinct (whomp-whomp) because of human activity.

The non-profit was started by a Dr. Robert Michael Pyle, who was a butterfly biologist and author. He still is. He's very much alive. I looked up a photo of him and found one where he has these bright blue eyes that peer out from around a halo of white, wiry hair, all framed by this snowy bush of a beard. Over his shoulders, in this one photo, he's wearing a cloak of pea-green moss from a nearby fallen tree. I just wanna kick back and drink rotten nectar with this dude. I wanna be his friend! Phil, [*in slowed speech*] hook it up!

Alie: Sarah Wright wants to know: Are there any moths and butterflies that will actually eat you or is my fear of them completely irrational?

Phil: Um, I'm sorry to tell you, but your fear is rational.

Alie: [*laughing*] No!

Phil: So there is a real thing called a vampire moth.

Alie: This is such a lie.

Phil: This is absolutely real. I think the genus is called Calyptra, and they have a piercing mouth part, and a lot of times they'll find them like cattle or something out there. But I think they have landed on humans and, like, pierced them and then drank their blood.

Alie: This does not feel like a real story, Phil Torres! Please tell me if this is a lie.

Phil: This is totally real.

Aside: WHAT?? WHAT?? WHAT?? This cannot be real!

Phil: And what I love about it is the way that they think it evolved is from previously feeding on fruit. If you feed on fruit, you need to be able to pierce that skin of the fruit, right? So they've evolved this proboscis that's kind of pointy at the end.

Alie: Oh my god!

Phil: And then imagine this scenario where one of these butterflies that was feeding on fruit landed on some mammal, and maybe it was drinking its salt or something like that and then accidentally pierced through the skin, and then they got a mouth full of blood, and then that one was like, "Wow, I have super powers and can lay a million eggs or mate with a million females!" They had higher reproductive success and then that gene and that behavior just evolved into them. So it all came from piercing fruit.

In my science-fiction future of the world, in like a million years that's going to be more commonplace because there are butterflies, especially in the Charaxinae subfamily, that will feed on fruit all the time. And they have very sharp proboscises. They can pierce right through a fruit to drink it. They basically have the right scenario set to evolve into drinking human blood! [*Alie makes gagging noise and laughs*]

I would just love to go into the future in a time machine and you come out and be like, "Where are all the humans?" Then all of the sudden you're just surrounded by butterflies that are beautiful and landing on you and piercing your skin and drinking your blood dry. You'd be like, "The future sucks!"

Aside: So naturally, I looked up the vampire moth and despite its hella-death metal habits, it looks very beige, very unassuming, very normcore. So is that the most goth moth?? I'm feeling like, no. I think that the Clymene moth might take it. Hear me out: it's this lily-white moth with a black, velvety, upside down cross on its wings, and it looks very much like it would fly into a Hot Topic and try to eat a wool cape. But then, in a quest to find the gothest moth, I have to land, perhaps, on the legendary lepidoptera from *Silence of the Lambs*.

[*clip from Silence of the Lambs: "Agent Starling, meet Mr. Acherontia Styx. Better known to his friends as the Death Head moth"*]

So, Death Head moth, it's got a skull on its face, it's named after a river in Hell and it tricks bees and eats their honey! This is the clear winner of the Gothest Moth Pageant! Thank you for taking this journey with me.

Alie: No wait, really quick diversion. Speaking of movies, do you have a favorite butterfly movie? How do you feel about the butterfly effect? Are there any movies that get butterflies right or wrong?

Phil: There's a lot to get them wrong. *A Bug's Life* is still one of my favorite movies ever. It's pretty great. They make some mistakes, but I like it. When I was in college we had an

entomology club that we started. [clip from *Revenge of the Nerds*, chanting: "Nerds! Nerds! Nerds!"] We would get together and we would watch really bad movies with insect themes. We would watch *Arachnophobia* and be like, "Oh, that butterfly isn't found on that continent!" and make all these snarky remarks. And so most people get it wrong, but *The Butterfly Effect*, the movie, that is 100% accurate. [Alie laughs] Every butterfly flap that happens, that changes the entire world.

It's not true. It's not.

Alie: Well, even you got me with the vampire butterflies for a minute there, so...

Julie wants to know: How long do butterflies live and what does a day in the life of a butterfly look like?

Phil: Ooh, that's a good question. Most butterflies will live maybe around two weeks, you could say. Their life, if they're male, it'll be, you know, getting some good resources. Lots of times it'll be defending a territory. Some will just, kind of, hang out in a patch of flowers or hang out on the side of a tree and kind of defend that waiting for a female to come by. For females, same thing, she's gonna be drinking nectar, but then floating around a little bit easier. You can actually usually tell the difference between a male and female butterfly in flight, just by watching the speed. The males kind of fly around like they got somewhere to go and they're a little bit more rapid and jittery and like, "Hey are you a male? Get out of here!" and that kind of thing.

Alie: So wait, they have like a horny swagger? [laughs]

Phil: Basically. It's like they sprayed too much Axe on in the morning and they're like, "I got this!"

Alie: Five cups of espresso, "Who wants to do it?? Who wants to do it??"

Phil: Then the females kinda just float around. They're these beautiful little things that are just a little bit floppier up in the air, a little bit more like a cartoon butterfly you would see. Generally, they're just kind of saying, "Okay, is there a male that's gonna approach me?" Or let's say I'm ready to lay eggs, they're smelling the air with their antennae to figure out where is the host plant that I need, that specific type of plant to lay an egg. So they're just kinda cruising, sniffing the air, and enjoying the day.

Alie: And for two weeks! They've got a life span – two weeks!

Phil: Generally, two weeks. Then you have some exceptions, especially migratory species, like the Monarchs, the ones that overwinter in Mexico. They live for months and they can travel super far and it's pretty cool.

Alie: You just went there and you posted a video and there were millions of Monarchs.

Aside: Look for the video called *The Butterfly Migration* on Phil's YouTube channel, *The Jungle Diaries*. So, did Phil lose his mind? Spoiler alert!

Phil: I lost my mind. I think it's about 10 million Monarchs per acre, something like that, and it was insane!

Alie: That's crazy. Ten million Monarchs per acre??

Phil: There were so many butterflies around that it was loud. You would hear this like, [makes whooshing noise]. You know, a single butterfly flies by you and flaps its wings, you won't

hear that. But if you put 10 million around you, all of the sudden all those micro noises add up into filling the entire forest with this whispering sound.

[clip from The Butterfly Migration of Phil in the butterfly forest, listening to loud white noise of butterflies: "You can hear it, but that's no wind. That is the sound of millions of butterflies, flying around me right now. It's probably my favorite sound ever.]

It was just one of the most magical things and it really solidifies our need for conservation in the US, and our need to put more native plants out there. Because growing up, when I first learned about these Monarchs migrating down to this forest in Mexico, we were always taught like, "Oh, the Mexicans better protect this forest because if they don't then the butterflies won't have any place to overwinter and it's going to be their fault." And they've done a pretty good job, actually, of protecting the forests. It's not perfect, but they've incorporated it into their local tourism so it's providing good income and more motivation not to cut down the forest.

But the reason why butterfly populations have been dropping now, the Monarchs, is because of what we've done here in the US. We've decimated their migration routes. We have used certain herbicides that have killed out all the milkweed in certain areas so they don't have anywhere to lay their eggs. It was very interesting, when you're down there and you look around at these butterflies and say, "You could have flown here from Canada. You could have flown here from Montana. You could have flown here from South Carolina." Each one has a different story behind it. You can imagine how many times it could have died, or needed a flower, had all these things happen to it, and then they end up right there in this forest and it's really something.

Alie: Is that all... those are during the winter months or right before spring?

Phil: Yep, winter months. Basically November to February is the peak, I would say.

Alie: So get your tickets for the Mexican Butterfly Forest now?

Phil: Yeah, I'm actually going to be leading trips out there next year. So if you guys want to come, just follow me and I'll be posting about it.

Aside: Phil and another friend of ours, Dr. Jason Goldman, lead trips through *Atlas Obscura*. Follow Phil on social media, go to his website in the show notes or check *Atlas Obscura*. It may not be booking yet, but keep checking back.

Alie: Heather Crowther wants to know: I know touching butterfly wings can really hurt them, but why? What's happening? Is it the oils on our hands reacting with something? What's happening when you touch a butterfly without consent?

Phil: Not a whole lot.

Alie: What?? Okay.

Phil: So a lot of people out there will, if they see an image of me holding a butterfly by its wings or something, they'll be like, "Oh, you're killing it!" That's not the case. Now, there are very specific ways to hold a butterfly, that I'm good at, where you minimize the amount of damage. Generally, if you're touching it wrong, you're rubbing all the scales off of it or you might tear its wing a little bit because their wings are pretty sensitive. So, you definitely don't want to damage the wing. I do not recommend anybody touching a butterfly but you

probably won't kill it unless you, like, really get into there. So yeah, they're tougher than they look.

Alie: I didn't know that. I always felt like it was like, if... you... touch... a butterfly, it will find a corner and be like, "See you later." Killed it. Not True.

Phil: Not true!

Alie: Jason Shirley wants to know: What's the largest butterfly ever recorded?

Phil: The Queen Alexandra's Birdwing, which is found down in Papua, New Guinea and certain areas there. And I want to say the females have, like an 11-inch wingspan, something like that.

Alie: What???

Phil: It's huge! And the first entomologists who went down there to collect this thing, they didn't have giant butterfly nets because they fly way up high. The only way they could collect them is with a shotgun.

Alie: [*gasp*] No!!

Phil: They would take a shotgun, aim it up, and then [*bang!*] shoot this thing out of the sky. And they'd be like, "Whoa, this is a butterfly!" Some of the oldest specimens I'm sure, in the London museum and that kind of thing, have shotgun holes in them.

Alie: Oh my God! A Queen...

Phil: Queen Alexandra's Birdwing

Alie: Oh my God! What a mouthful.

Phil: Which is a very endangered species and it's one of the few that collecting it has made it endangered. Generally, there's so many butterflies to go around that habitat destruction is the big thing and collecting it is not really a big deal. But some of those, they are protected species, a lot of the Birdwings, because they're so big and really beautiful. The females look different than the males, really gorgeous, incredible species. Sometimes people will collect them just for art or just to own them rather than collect them for data or for science to be done.

Alie: So their caterpillars, are they the size of hotdogs?

Phil: Uh, yeah. Probably bratwurst. I'm sure they are huuuge. There are some big caterpillars out there.

Alie: That brings me to a personal question about our own collection. Is it bad that I have a butterfly collection and dead butterflies that I have purchased?

Phil: It's not. It depends... You want to make sure it's the right species. There are some that are protected, some that are endangered in the wild. You definitely don't want to have those for that. I think if you're doing it right and you're spreading appreciation, that is okay. A lot of these are actually bred in facilities and they're not collected in the wild, because wild butterflies get pretty beat up pretty quick. You can actually tell the age a butterfly, depending on how beat up it is, generally. Only a couple days in they'll have some clips on their wings or they'll have some dusty spots, and that's not going to be nice to display in a home.

So people will breed them and that provides a good income for people and motivates them to protect the forest and protect the native plants in some corner of the world. So I think it's a cool product that can come out of these places and can be done in an ethical, and sustainable, and conservation-minded way.

Alie: Okay. Lexie Fetter says: I've heard that butterfly bushes are now considered invasive and are bad for butterflies. Why is this? P.S. I live in Michigan.

Phil: She's talking about Buddleia, which is a Butterfly Bush. That was the one maybe, in the '90s, early 2000s, everybody was like, "Plant this plant, because it's a big bush. It has these really big flowers on it that are just really pretty colored." I planted a lot when I was a kid. That's a tricky one because they are not native. There are native options that you can go for that do a similar effect. Generally, when you plant non-native things, you're slightly sterilizing your environment because yes, it may attract things that will feed on the nectar, but there are no caterpillars that are going to feed on the leaves.

And if there's no caterpillars on the leaves then there's no birds feeding on those caterpillars, or spiders crawling on that. So it basically takes away this opportunity for life. It's a tricky thing. It's a personal decision. If you have the time and just google "What's the best native thing to plant here instead?" that would clearly be the winner.

Alie: John Worster and Casey Handmer want to know; essentially, how do some butterflies fly so long? Are they just on the wind currents or are they really that bad ass?

Phil: It's a little bit of wind current. A little bit of bad ass. Every butterfly, their thorax will be a little bit different. The thorax is where they keep all their big muscles for flight and for walking around. Some butterflies, you grab their thorax and you're like, "That thing is buff! They work out!" You'll really feel the strength of these flight muscles. Some insects like beetles, the big ones, when they fly and you feel their thorax, it's actually warm from the friction from all that exothermic stuff going on. Their muscles do some work. So there's some butterflies that are pretty buff and so they're able to fly a long time, and then they do take advantage of the currents. I think Monarch butterflies have been recorded at 11,000 feet.

Alie: Oh my God!

Phil: They just kind of go where the wind goes and they take advantage of that. There have been times where if there's a big hurricane in the Caribbean and Florida somewhere, people will be like, "Wow, I just found a butterfly that is native to Guatemala that is flying around my backyard right now and it didn't belong here." So they can go really far sometimes and storms will push them that way.

Alie: Oh my God! Maybe they had some plant nectar and then they're like, [*in nasal voice*] "Let me go fly a couple thousand miles. Byeeee!" That's so bad ass.

Phil: Yeah. It's pretty cool how they're able to pull all this off. Evolution is crazy because predators put so much pressure on things and freak accidents put so much pressure on things to be a really efficient machine as an organism. So butterflies, they may look pretty, but they're efficient, and they're good flyers, and they've got a lot of interesting things about them.

Alie: Have you taken anything away existentially or philosophically from butterflies? Like about change or about not being ashamed to smell poo? I don't know, anything?

Phil: I think... the metamorphosis analogy or metaphor, that's not my thing, but for me it's all about keeping that curiosity and joy that I had as a seven-year old catching butterflies, and being not ashamed at all to have that same excitement as a full-grown adult. And sure, in high school and a little bit in college it wasn't the cool thing to do to show off your butterfly collection, but I was just like, "it doesn't matter." I love this stuff and nature is so cool and there's so much to learn.

We know probably the most about the Monarch butterfly and the Cabbage White, but we still have so many questions about those two species and imagine all the other 18,000 that are out there. I just think if anything, I've just learned, just keep that joy alive and that curiosity alive because nature really has some magnificent things. Even if they happen to be really pretty. I don't care! They're awesome!

Alie: What's the crappiest thing about your job? What's the hardest, or most disappointing, or most arduous?

Phil: It's a mix because I used to be more like an official scientist and now I'm more a science communicator. The travel is amazing, but there was a point where after living two years in the jungle where I was like, "I should probably be around other humans again." So, finding that balance, and I've seen some field biologists who go a little bit too far... because it's kind of addicting. You have this adrenaline rush, this idea that you can make a discovery and it's really exciting out there, but you need to have a real life too, you need to have relationships, and that is a successful life to me. It has to be meaningful both in work and discovery but also in relationships with friends, and loved ones, and family, and all that. Balancing that took a little bit of work and still sometimes I'm traveling quite a bit, that can be challenging. I'm sure you know what I'm talking about.

Alie: Word.

Phil: What other is tough about my job? Then also just freelance life thing, that's the only other thing. There's not a lot of jobs in science. I saw a lot of people going for the same thing of going to be a professor or a research scientist and I was like, "Okay, well I'm going to take a little left turn here and still have my mind stimulated. Still get the same opportunities to travel for science, but work more on the communication side and storytelling side," because I would do these expeditions when I was young and we would do the craziest things.

We got held at gunpoint twice in Venezuela. I got lost in a forest full of quicksand in Mongolia. I would sing under the stars with these Mongolians drinking fermented horse milk and that's how we communicated because they didn't speak English, I didn't speak Mongolian. We would just sing each other songs.

There's a side of science that people aren't hearing, and maybe if they're heard those stories more they would care more about what we're studying here. Because sure, some of the insects out there aren't innately appealing to the average person, but when you tell a story around it, then it really starts to shine and people start to attach appreciation to them.

Alie: I love that I asked you what the scariest thing in the jungle was and you neglected to tell me that you've been held up at gunpoint twice. *[laughing]*

Phil: Oh yeah. Humans are also very scary in the jungle too. Generally, as long as you communicate and don't go in there as "American Savior." Conservation is about working with the people. It's not about working just with the animal, it's all about working with the people, so building good relationships and using what they've figured out over a long time.

Alie: Were you able to negotiate your way out of that?

Phil: Yeah, we were. One time it was the government of Venezuela. That was under Chavez. They weren't very friendly. They stopped our bus and took the three of us off. There were two or three trucks full of dudes with machine guns, and they put us against the bus, and patted us down. I think it was kind of just a bluff because they track your every move there. Everything you do you have to put in your passport information and they weren't very fond of Americans back then. I mean, that would be a good cover for a spy because there have been lepidoptera-studying researcher spies in the past. The founder of the scouts would work in North Africa... I think this was during World War I, and he would draw maps of enemy locations on butterfly wings and then send it back to the collections.

Alie: Noooo way!

Phil: Heck yeah.

Aside: Robert Baden-Powell did indeed found the Boy Scouts and was indeed all up in some espionage, as detailed in his book: *My Adventures of a Spy*. Just a straight up spy. He wrote, "Carrying this book and a butterfly net in my hand, I was above all suspicion to anyone who met me on the lonely mountain side." Thanks for the advice, my dude! I will go do that! What, no?

Phil: I don't recommend people doing it now because then that'll ruin scientists' access to these places that we want to go and study. So don't mess with science. Let's just, yeah, let that be in the past. Then the other guys, they were just kind of really drunk and that was challenging, but we figured it out.

Alie: Oh my god! What's the best thing about what you do? What do you love the most about butterflies? About your work?

Phil: One part that I love is just being able to go to places and have access to things that there's no other job that gives you that opportunity. You go to some really weird places. You really get to go behind the scenes in areas and that's irreplaceable. I mean, I've pretty much never had an office job my entire life and that's great. And I love that. Then the other part is what it does to your brain. You get this brain tingle, I like to call it, as a scientist and many people can relate to this where there's something out there that you're trying to figure out. In some of these things that I've studied and published papers on, it's like a puzzle out there that you're like, "Okay, I see this part over here, this part over there, this part down there. How do they relate? How does this thing make sense?"

I would lose sleep over it sometimes, but your brain has this feeling that you just can't... there's nothing out there like it. It's like the best crossword puzzle ever, where you're like, "I nailed it!" [Alie laughs] That is a really exciting part of my job because it's super, super fulfilling, because you're not just doing it for yourself. I'm sure some people may be more kind of ego driven. One thing I was noticing, people who call themselves explorers oftentimes would go to just be like, "I've done it!" Plant a flag and say they've done it. Now many are doing it for conservation reasons, which is great, but I was like, what if you could

explore *and* contribute knowledge to the world? The things you find as a scientist and studying butterflies, like some of these papers I've published, nobody knew this before. That's a really cool feeling to be like, "Guess what world, I'll drop some knowledge on you," that now for the rest of the history of humanity, they're going to know this thing that they didn't know before. That's exciting.

Alie: I mean, and to start helping discover species at 19. That's got to be a little bit addictive too probably, right?

Phil: For sure. And I have huge respect for the people out there who dedicate their entire career to that. People kind of forget that we still need a catalog of what life is out there. We have so much work to do. Insects alone, there's probably at least another million, if not 9 million species out there to be discovered. Millions left to be done! They're everywhere, and so we need people to do those jobs, and even though it sounds cool when it comes to getting funding for that kind of work, you don't always get the biggest budget.

Alie: And now you're getting married this year.

Phil: I am.

Alie: Are you going to have butterflies be represented at all during your wedding?

Phil: Definitely. We're going to, instead of flower girls, we're having butterfly girls.

Alie: Really???

Phil: So little butterfly wings everywhere. And then for our place settings we're going to do some cool stuff with, like, giving out native seeds and that kind of thing just to get people oriented.

Alie: Oh my god, that's so cool!!

Phil: Yeah. There's so many ways you can incorporate this stuff into your life. We just kinda want to show people that this is what's important to us.

Alie: Oh, that makes me so happy! I was wondering. I was like, "I wonder if Phil's wedding is going to involve bugs at all."

Phil: Yeah. I kinda want to get some shoes with bugs on 'em.

Alie: I know. I think you should. I think you deserve it.

Phil: Yeah, we'll see.

Alie: Some butterfly slippers?

Phil: Yeah. Why not?

Aside: I did look up some flyyyyy shoes for Phil and found some cool Gucci bug loafers that cost a grand. And then also some suede butterfly loafers on eBay for like, a hundred bucks. So, if anyone has a Gucci hookup for these loafers, holler at Phil online. Wouldn't that be great? C'mon! C'mon, someone, right??

Another update: His wonderful fiancé, and now wife, Silja, got him the Gucci bug loafers! As a wedding gift! And the ceremony was gorgeous. I danced so much at the reception, I should be mortified, but for some reason I'm not. It was just a great party. It was such a good wedding! They're both so wonderful! And I'm very glad that they're here on planet Earth with us (and married!).

Alie: *[laughing]* Thank you so much for doing this!

Phil: Totally! This was a blast!

So please do continue to ask smart people awkward, sometimes not-smart questions, because that's the only way any of us learn and they secretly love it. To see some of Phil's gorgeous photography - and it's really amazing - check out his Instagram [@Phil Torres](#), his Twitter is also [@Phil Torres](#), and he's at [The Jungle Diaries](#) on YouTube, or his website is [Phil-Torres.com](#). I'll put links to those at [AlieWard.com/Ologies](#) and in the show notes.

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For merch, you can go to [OlogiesMerch.com](#) and tag your photos online with #ologiesmerch and I'll repost them on Merch Mondays! Thank you, Shannon Feltus and Bonnie Dutch, very, very cool Portland sisters, for helping manage all the merch. You can join the discussion on the [Facebook Ologies Podcast group](#). Thank you Hannah Lipow and Erin Talbert, my good friends, for adminning that. And thanks as always to the very, very wonderful Steven Ray Morris for editing this all together and being just the coolest dude. Just the coolest dude! Also, side note, Happy Birthday Sara Boscoe! We've known each other since we were 12. Happy Birthday!

If you stick around until the very end of the show you know I tell a secret and this week's is *[whispery voice]* freeessh. It's fresh off the griddle! Two hours ago, I was leaving my friend Catherine's house and she has a bowl of peanut butter ginger chews. Have you had them?? Oh! They're so good. They're right next to her door and I grabbed two, and I ate the first one as I was leaving her house. I was like, "Oh it's so good!" And then I unwrapped the second one before I even got to my car and I dropped it on the sidewalk... very public sidewalk. And I just picked it up and dusted it off and I ate it anyway because I was alone and soooooo what? And I'm still alive! Okay berbye!

Transcribed with glee and love by Wendy Fick, who would really love to sniff a butterfly or two (for science... or just for fun) and wouldn't be ashamed to admit it to total stranger. Greetings and happy reading from Iowa City, IA, a UNESCO City of Literature!

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