

Chiropterology Part 2 with Dr. Merlin Tuttle

Ologies Podcast

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Oh hey. It's still your friend's baby who looks like a turtle, Alie Ward, back with a Part 2 episode of *Ologies*. Hey, did you listen to Part 1 of Chiropterology about bats? No?? Then what are you doing here?! Would you walk into a movie 85 minutes in with only half a bucket of popcorn? No, so go listen to Part 1. You're going to hear all about cave tales, and bat flimflam debunkery, and what is a bat? And how are they similar to primates? And what makes them able to sleep upside down? And why should we protect them? And can you build a huge habitat that they'll come and live in? And who makes good bat houses? And how can you train one? And some real tight spots a Chiropterologist can get in.

But real quick, thank you to all the folks at [Patreon.com/Ologies](https://www.patreon.com/Ologies) who make it possible and who submit wonderful, fun questions every week. And also, to anyone who rates, and subscribes, and keeps *Ologies* up in the charts among the science giants, thank you so much for that. And for telling friends about the show, and of course for leaving a review for me to creepily read and choose one each week to thank. Such as for example, Nicole3496 said:

I've been listening to Ologies at work and it never gets old. I wish I had more time in the day to listen to every episode. I love the uniqueness of each episode. It will keep you extremely interested in wanting to learn more. P.S. Merlin is my new celebrity crush thanks to the bats episode.

Well, thank you Nicole on behalf of myself and America's favorite bat expert. So this week, Part 2. Now, after a quick potty break for both of us, we concluded Part 1 of this massive three-hour bat extravaganza. Took a little break. Merlin just went into his office and grabbed an iPad containing an archive of bat calls he'd recorded using an ultrasonic microphone and he lent a play-by-play like Vin Scully of the bat world, and then we dove back into your Patreon questions.

So hang out, open your ears to hear bat conversations about echolocation, and how to put up a bat house, and more info on white-nose syndrome, and bat coitus, and habitats, and his favorite species, and what he does in his leisure time. So settle in for the wildlife wizardry of human treasure and America's favorite Chiropterologist, Dr. Merlin Tuttle.

Alie Ward: I mean, it's not every day you get to sit down with *the* Merlin Tuttle.

Dr. Merlin Tuttle: This is just a very slowed down recording... yes right there. That's a call of a free-tailed bat [*sound of bat call playing intermittently through discussion*]. And that one he's just coming up on some obstacle. No actually, he's chasing an insect. That's his feeding buzz, he's locked in. Here that? [*rapid echoey chirps*] That's where he caught the insect. Now he's going back to what he was doing.

Aside: Okay, so that ultrasonic recorder is called, The Echo Meter Touch, and it's made by Wildlife Acoustics. They're not sponsors, they just make cool gadgets for scientists and friends to animals. And this thing can plug into an iPhone or an iPad. They're between like 200 to 350 bucks depending on how pro of a model you get and hey, holidays are coming up. How about everyone gives each other bat houses? And maybe chips in for tiny ultrasonic microphones and some of Merlin Tuttle's books? Just, wing in the New Year.

Also, what if you just want to see some bats? Now, first-time question-asker, and part-time chiropterologist in Alaska, Dave Hejna, asked about bat research instruments. And I hope that he gets one of these things; maybe he already has one. Also, patrons including Iris McPherson, Lisa Butterscotch, and Jamie Kishimoto all asked about the best way to spot one. And Natalie Bradt asked: Where can I go to give bats a tender little hug? Providing they want it.

Alie: If you want to go bat spotting, if you want to see a bat, what's the best way to do that?

Merlin: If I want to see a bat, I'm probably going to do one of several things. First of all, I'm going to learn a lesson learned right here in front of my house. One night, I wanted to test this out when I'd first obtained it, and I went downtown and went all over places where I thought there would be bats feeding, and I couldn't pick up hardly a bat. They left town and went out to the agricultural areas to feed.

Alie: *[laughing]* Oh wow!

Merlin: When I came home, Paula wanted me to try and see if there were any in the yard and I said, "No, no, there wouldn't be any out here." And it turns out that in our neighborhood, as in most neighborhoods, most of the streetlights are yellow now and don't attract insects. But the one in front of our place is white, and I got such good recordings standing in front of our house that the manufacturer asked to use them for promoting the product. *[recording of ultrasonic bat sounds]*

Aside: Merlin says that these are social calls like *[clip of various people saying greetings: "Hi." "Hello." "Hey."]*.

Alie: So, they do chitchat a lot.

Merlin: *[laughs]* These are just telling him what's right in front of him. But much more detail.

Alie: And that's a type of sonar?

Merlin: Yeah. With a bat detector, you'd be amazed how many times I can go out, and even with a spotlight, can't spot a bat. But I can hear at least one or two right close, and I'm like, "Where the hell are they?" The first place I'd go looking for a bat if I didn't have a bat detector, would be a white streetlight or any outdoor, powerful, white light because they attract insects the bats like to eat, as opposed to yellow lights that just exposes them to more owl predation and don't attract insects.

Aside: So, go crash an insect party but do not invite any owls.

Merlin: The other thing I'd do, if there was a river or a lake anywhere and there were boat docks, and there are landing lights, white lights on the docks, I would look around those because it's a lot easier to spot bats out over clear open water, flying low over the water, than it is up high. Around streetlights, if you can find a white streetlight still – and that's hard these days – sometimes you need to shield your eyes from the absolute center of the light, so it doesn't blind you. But then look around and you'll see bats.

I used to take people up to the state capital in the springtime and we'd sit there with the bat detector and listen. And there wouldn't be anything for a while and then we'd hear several bats coming into the zone. And we'd look up and you'd actually see the wings dropping from the moths that they were eating.

Alie: Aww man! Now the wings just drop like Snickers wrappers, right? They don't want those; they just want what's inside. I didn't realize that about moths until I was helping renovate

a kitchen up in Montana and found out that animals don't eat the wings. They just eat the squishy part. It's like candy wrappers everywhere.

Aside: So, in this case, it was a mice infestation on our family's little, teeny, tiny prairie house and the mice just, hmm, hah, they yum-yum it up with the moths. But yes, they leave the wings around like slobs. Nobody wants them!

Merlin: So, there are other ways to see bats too. Watch a cave entrance where they come out at night. I have often been in a foreign country and just look up and see a woodpecker hole in a tree and wait and watch and see a bat come out. [*clip from The Office: "Look who's here!"*]

If you're in the tropics, then most places you go, anywhere in the tropics, you'll have various kinds of bananas growing, banana plants. Bananas are bat pollinated. We didn't even get into this whole part of how important bats are at pollinating, economically important and ecologically important for plants.

Aside: Yes. Patrons such as Sophie Cousineau and Laura Kinney who asked: Aside from bats chowing down on insects, some bats are important pollinators, right? Gwen Bode simply demanded: What can you tell me about bats as pollinators? I want to know everything. Gwen Bode, here we go.

Merlin: So, if you're staying in a resort hotel in the tropics – in fact, I've done this down along the Gulf of California coast in Mexico – a lot of the resorts will have cardón, and organ pipe, and saguaro cactus growing right up outside your door or in the parking lot, and there will be lights around. And in the right season bats come and pollinate. They're mostly bat pollinated and bat seed-dispersed. I've sat in the back of a hotel room in Mexico and watched bats four feet away come in and pollinating flowers.

A lot of places will have bananas – bananas flower over very long periods during the year – and you see a banana that has one of its stalks that hang down that eventually develop bananas on them.

Aside: PS. Merlin was like, "What is the word for a stalk of bananas, like a stem of them?" And I was like, "Got me dude, but I'll look it up." So I did, and let me tell you, there were some search returns that are more than you bargained for when you type in 'banana' plus 'anatomy.' Now at first glance it seemed like the word we were looking for was just 'stem' or 'stalk of bananas'. But then I saw that when it's a bunch of flowers, it's called an inflorescence, which sounds like a new Calvin Klein perfume.

Also, is now a good time to remind you that a banana is a berry? Or are we still reeling from that pumpkin fact in the Cucurbitology episode? We are. Anyway, bats love an inflorescence, or a big stalk of flowers, to motorboat.

Merlin: After the sun goes down, or starting a little bit before, you'll see one of these purple bracts will start opening. When it gets open, then the bats come and pollinate them. Now, there aren't any New World bats that originally depended on bananas for pollination, because bananas didn't come from the New World, they came from the Old-World tropics. But all commercial bananas that we eat today, come from bat-dependent ancestors. [*"This is bananas!"*]

So anywhere in the world, just about, if you go out and you see banana plants growing in a yard, watch those carefully at dusk, or a little bit after dusk, and you're very likely to see small nectar-feeding bats coming and visiting them.

Aside: So, bats are important pollinators for another plant. And *agave* a clue of what that affects. Tequila. It's agave. The plant's agave. Oh, but if it grows a big stalk of flowers in the middle, that's an inflorescence, by Calvin.

Merlin: I mean, even in Austin, I've laughed at myself before. I'm curious. I've never gone out to a big fully flowering agave plant in Austin and watched it for a couple hours at night. There might be nectar bats here that we don't know about yet.

Alie: Now, are you a night person? Or are you a morning person?

Merlin: I don't think I'm naturally a night person, but I've certainly had to adapt.

Alie: What happens when you're out doing nocturnal field work? Do you just have a thermos of Folgers? What do you take with you?

Merlin: I have been accused of trying to kill people from starvation and dehydration. [*Alie laughs*] I used to go on trips into caves; my most arduous cave trip took 23 hours. And in one day we probably climbed 600 or 700 feet of vertical ropes. [*Alie stunned, whispers: "Oh my gosh."*]

And on things like that, you've got to carry all these heavy ropes, your climbing gear, your research gear. You don't want to carry anything else you don't have to. So, I tend to go really light on food and water, [*Alie almost cry laughing "Oh no!"*] and I have myself been so desperate at the end of one of those long stays underground that one night I actually got down and drank water out of a puddle that had bat droppings in it.

Alie: Oh no! You lived to tell the tale. Did you get sick?

Merlin: No.

Alie: [*groaning*] Ohhh!

Aside: Do I need to remind you to never do this? Okay good. So, bring water or emergency water purification tablets or filters. Listen: you spend literally 50 years in the field and some shit's going to go down. But he survived. Just don't you do it. Please.

Alie: So, have you learned a lesson? Did you never let that happen again?

Merlin: No, I don't think anyone who knows me would say I fully learned the lesson. [*laughs*]

Alie: [*laughing*] Oh no. Oh, that's like some Indiana Jones stuff right there.

Merlin: One more thing on bat watching. Another way to see bats, if you're in a... if you go to a Caribbean island to a resort, or you're on one of these cruise ships in the subtropics of Latin America, you can often see fishing bats with up to almost 3-foot wingspans catching minnows under dock lights.

Alie: Catching minnows? Fisher bats!

Merlin: They have big hind feet and laterally compressed toes so that they slide through the water with minimum friction. They have very sharp claws and they just dip down and snag the minnow out of the water.

Alie: That sounds like a pterodactyl or something.

Aside: Okay, side note, I looked this up and it's impressive as hell. To use sonar to scoop up a fish? With your feet? While also your hands are wings? But I did think it was funny that fisher bats were featured on one *Nat Geo* documentary called, [*deep ominous voice*]

World's Deadliest. I mean, they catch fish. So, was the documentary made for fish? Anyway, sounds like another fearmonger smear campaign. Bunch of bull guano, if you catch my drift.

Alie: On the topic of guano, some people asked how you felt about the term batshit crazy?

Merlin: I don't have any particular response to it. First of all, I firmly believe that if you're too much in love with a kind of animal, you can't really effectively conserve it. If you're too much in love with it, you're probably going to go out into combat with everybody that doesn't do what you think they should do.

When I first started trying to save bats, virtually everyone I met hated them and they would often tell me about how they kill large numbers of them. [*Alie sad whimper: "No."*] And I had to learn, you can't win battles without allies.

Aside: That's a good point.

Merlin: And you can't get allies by fighting with everybody who disagrees with you if the majority disagree with you.

Aside: Welcome to Merlin's School of Conflict Resolution Wizardry. Let's role play, shall we?

Merlin: And so, I would simply ask, "Well I'm curious, why did you do that?" "Well, one tried to attack me." "Oh really? I'm very interested in attacks. In all my life studying bats, I've never been attacked or seen anybody that was. So, I'm really curious, could you tell me how this attack occurred?" And we usually end up finding out that it was imagined and certainly unproven. Or they say, "Someone told me," and I just ask, "Has this person ever been wrong about anything?"

Alie: [*jokingly*] And they're like, "Well they're my drunk uncle and they're wrong about everything."

Merlin: You just keep asking questions until finally, "What would you think of bats if you understood that just one of that species can catch 1,000 mosquitos in an hour?" [*"Well I'll be danged"*] Or can catch enough potato beetles or cucumber beetles in a summer to protect your garden from all kinds of havoc?

I've had people that thought they had a terrible problem with bats in their attic and I'd come and actually tell them how to get the bats to leave. But when I'd finish telling them about what bats did and what they're like, they'd say, "No, no we don't want to get rid of them now, we're going to keep them."

Alie: Yeah, what do you do if you have bats in the attic? Is it okay to just leave them up there?

Merlin: I certainly wouldn't advocate allowing bats or any wild animal to come into human living quarters, inside. But there's absolutely nothing to worry about from a bat that wants to live behind your window shutter or lives in the attic. But bat droppings, too much of anything in the wrong place isn't good. One guy put up a bat house over his front door because he wanted to look and see the bats every day. Well, after there got to be hundreds of them in his bat house and started dropping a half inch of guano, he was calling to know how he could move them. [*laughs*]

Alie: [*laughing*] Maybe just consider that before you hang it up, perhaps?

Aside: So, where do you put a bat box? A lot of you wanted tips. A lot of you such as, Josie Gombas, Molly Henning, Trisha, Lauren Dean [phonetic], Lauren Blanchard, Mae Merrill, Robin Kuehn, Eva, Jen Henry, Addie Markham, Debra Diller, Em Wing, Sarah Greer, Robert Pulcini, Carolyn Armitage, Liz Powell, Gretchen Hereford, Fernando, Derrick Allen, Ellie Abbot, Anna Thompson, Jennifer Alvarez, Julie Noble, Heidi Stooshnoff, Tristan Kwiecinski, Brandy, Madeline Runion, Charlotte Fjelkegård, Sarah Crocker, Amy Salley, Colleeneebie, and Kevin List asked: What's the deal with bat houses? Why do they need to be on a standalone pole above a certain height?

Or Janet Sebastian-Coleman, who asked: How do I befriend the bats? How do I get them to come hang out in my yard? Or Jessica Shunk who asked: How can I attract the bats to a bat house after we evicted them from our eaves? Or will they forever tell tales of our lack of hospitality? She sounds guilty as hell.

Okay, so I looked it up on MerlinTuttle.org. He has a whole guide about bat boxes, clickable right there on his home page. Read it and figure out how big of a bat box would be good for the species in your area and even what color to paint it depending on your region. So, darker bat houses tend to retain heat and are better for colder climates and ones mounted on a building retain more heat than the bats dig. And temperate and warmer climates might be better served with a bat box on a pole.

Also, in general, bats aren't crazy about ones mounted on trees because predators can scramble right up the tree. Or birds of prey can hang out on a branch and snack on their babies like popcorn shrimp.

Also, apparently there's not much evidence that adding bat guano will attract bats faster, so don't deal with that shit. And, if you have an empty bat house that just isn't getting a lot of action, it might be because needs seven hours of direct daily sun; so it might need to be moved.

Anyway, go to MerlinTuttle.org, figure it out, and then just breathe easy. He writes, "If you know you have a good bat house mounted in a good location, be patient. The bats will likely arrive eventually."

Merlin: As long as the bats are on the outside of the house and you're on the inside, I think that's perfectly fine. The old pest control operators who are trying to make a lot of money scaring people would tell you they bred like rabbits, that once they get their scent established you'll never get rid of them, and all that kind of thing. But: not true.

Aside: Okay remember, bat breeding goes a little slow and many of them only have one pup at a time. Unlike a soft, squirming pile of rabbit babies. So, flimflam debunked.

Also, it didn't strike me until later that I totally forgot to ask Merlin about bat gennies. What's happening in a chiropterology crotch? So, Casiana Brook wanted to know: Do bats have penises? How do they procreate? Well, I looked it up and they do have sexual intercourse with their penises and vaginas. They are mammals. Also, bat dicks sometimes have keratinized spines on them that may serve like a barbecue brush just to get out other bat's sperm. Since, as we mentioned briefly last week, bat's love an orgy.

Now Sam F said: I have recently read articles about fruit bats performing fellatio and cunnilingus. Can you tell me more? Juliebear put it more plainly: Truth or flimflam, bats engage in oral sex. Derrick Allen, friend to bats, chimed in on the Patreon questions and

said: I have seen this happen when I was a zoo volunteer. Both fellatio and cunnilingus have been observed. So yup, bats will get down and they will go down. That is a fact.

Now, Tay Solis left the Patreon plea: Pleeeeee talk about homosexuality in bats! We deserve gay bat talk!! Tay, I looked it up and sure as heck yeah, bats are gay. Bats will bone when everyone's awake. They'll also bone each other while one is taking a snooze; which is reprehensible in human mammals. Researchers tasked with quantifying bat sex say up to 35% of the sleepy sex is just man-on-man bat action.

What about lady bats? Can we talk about the bat boobs? Sure can. Their bat boobs are sometimes located in their armpits so that their one to two babies can just latch on, bite a nip, and go zooming through the sky.

Now, side note, if you Google 'bat nipples' the first 10,000 or so returns are about George Clooney's beleaguered, benippled bat suit. Which *Batman* director Joel Schumacher later explained that he had told the lead costumer of the film, "Let's make it anatomical." And then he gave photos of those Greek statues, the costumer did the nipples, and he says, "When I looked at them, I thought, 'That's cool.'"

You know what would have been cooler? Armpit nipples. And maybe a same-sex romantic subplot. Let's spice up these franchises people! Now, this next question, asked by not-Clooney George, was echoed by Breann Wharton, an Austinite.

Alie: Let's see, George Farrar wants to know: How did different types of bats evolve to have such varying food sources? Like fruit bats having fruit, vampire bats and blood? I was thinking it's like birds having different beak types, but fruit and blood are not the same in any way. So, hmmm.

Merlin: Well there are a lot of these things that we can't know absolutely, we can only speculate based on what we see today. But one that's particularly interested me, if you go to my website photo gallery, you'll see pictures of bats pollinating cacti. And some of them are pallid bats pollinating cardón cactus, the world's largest cactus. It gets up to 50-60 feet tall. And this is a bat that predominately was thought for most of my career to eat only insects, scorpions, and centipedes.

Then one night, I'm out trying to catch a nectar-feeding bat to put in my studio, and I watch a bat come in and, obviously, stick its head in the flower. Comes out with its head covered in pollen, gets caught in my net, and it turns out to be a pallid bat, not the nectar bat we felt sure should have been there pollinating the plant. And later it's been well documented that pallid bats are major flower pollinators.

Probably how this all started, was pallid bats love to eat things like sphinx moths that come to those same flowers. So, a pallid bat coming to a cardón cactus may be just as likely to grab a sphinx moth as it is to grab a drink. [*clip from Downton Abbey: "Can I give you a nightcap?"*]

Alie: So, they're kinda like omnivorous a bit.

Merlin: Sure. There are bats that are quite omnivorous.

Aside: Now what about fuzzy blood guzzlers? Are they low-key monster creeps? Or are they just like your friends on the keto diet? But very hairy with wing hands.

Merlin: You can imagine that even vampires... it's a little harder to figure out, but they may have been attracted... When you have these giant animals jabbing each other with tusks and

things, there were probably some bare open wounds, and they probably attracted insects. And bats may have come to catch those insects and then found that the blood tasted good. And before anybody wrinkles up because bats eat blood, let me point out that it's only been relatively recent years that it hasn't been popular with humans. [*both laugh*]

Alie: Yeah. I mean, we're in Texas right now and there's a lot of people eating steak today, I'm sure, that are eating blood.

Merlin: Well, blood sausage is still probably pretty popular in some parts of the world.

Alie: Oh, for sure.

Aside: Now, of course vampire bats were on the brains of many of you including Caleb Patton, Jody Rieck, NoFunNicole, Radleigh, Meg Mihaly, Dain Goding, Hayden Sloan, and first-time question-asker Kyra Dye.

Alie: Do you think that the vampire bats are maybe where vampires got the lore of being associated with vampires, Transylvania types?

Merlin: What's interesting is that the whole vampire legend occurred before anybody knew of a vampire bat. There are independent vampire legends in many parts of the world; from Europe to the Pacific Islands. There was this whole idea of vampires and drinking blood long before they found a bat that did it. [*"Seriously?"*] And the earliest vampire stories were people that were vampires.

And in fact, people did, even in Europe, do really despicable things not even 200 years ago. There were major generals and people who, after battle, would impale enemies by sticking a sword handle up through their body and leaving them alive dangling on it. People who would fill a tub with human blood and bathe in it. There are all kinds of crazy things, horrible things, done by people involving blood. But when we finally discovered a bat that ate blood, like we still many of us do, all of a sudden we found it a despicable, terrible, nasty thing.

Aside: You know what's not despicable? Sharing a meal. Now, since it's hard to sneak up on bird butts and mammal nipples to slice and lap up the blood, sometimes vampire bats will get hungry if they don't feed for a day or two. So, their friends will know that and will just barf up blood for them to share. Is there anything more goth and selfless than that? It's just like offering your neighbor a hot dog, except you have eaten it first.

Alie: Not to mention, the vampire finch. No one's out there worrying about finches.

Merlin: Go to my website, go to the photo gallery, and look under vampires and you'll find that species of vampires is one of the cutest animals around. The bat is cute.

Aside: Merlin got up to get this beautiful, little, full-color pamphlet smaller than a deck of cards, slim as a credit card. He hands them out to strangers to spread the bat facts, like how invaluable bats are as pollinators, that they can live up to 40 years, that they save farmers up to \$23 billion a year in pest control, that a bat can catch up to a thousand insects an hour, that 1.5 million live in Austin, that they form long-term friendships (that may involve blood vomit). So many great facts on this pamphlet, except for the blood vomit part, but the front of the pamphlet has this squished-face bat. It looks like a very hairy, tiny French bulldog.

Merlin: That's a cute vampire.

Alie: [*excited*] Ohhhhhhhhh! Oh, it's sooooo cuuutee! Look at its little nose! Oh, it's so cute! That's a vampire bat?

Merlin: Yeah.

Alie: I'd let him take a nibble.

Aside: Okay, now on to the sweet, difficult question of picking a favorite species. A thing wondered about by Patrons Crystal Mendoza, Ruby Oestreich, Iris McPherson, Kathleen Sachs, and Jake, who asked: What's the best bat? And why is it the Flying Fox? Ut-ut! Not so fast, Jake!

Alie: So many people asked if you have a favorite species of bat. Is that so hard to ask?

Merlin: It's virtually impossible for me to pick a favorite. It would tend to be the ones I've worked with most recently. I used to think my favorites were the larger carnivores. Then I found out that these tiny little bats smaller than a nickel are so intelligent they can start training me. It's hard not to fall in love with them.

Aside: Merlin says that an unfortunate part of conservation means preserving some individual specimens to keep in collections for future ecologists. And he says it's in the name of learning as much as possible about each species to keep millions of them safe. Now, one thing that's a real threat to bats that we don't talk about often is wind turbines.

A few of you, Samantha Mitts and Derrick Allen, asked about how dangerous harnessing wind energy is and Merlin has an article on his website about all of this. But the long and short of it is that, sadly, wind power kills tons of bats from collisions and from a drop in air pressure that affects their oxygen levels and their lungs and can kill them instantly.

Now, hundreds and hundreds of thousands of bats die in just in the U.S. each year and the estimates are likely way lower than the reality since so many scavengers will just gobble up the dead bats before they are found and counted.

So, what can stop all of these bats dying? Things that can stop it involve, raising the wind speed threshold for when the turbine starts rotating. So, waiting until it gets a little bit windier to have them start going around. That could save 77% of some species killed with only a one percent decline in energy output.

Or, perhaps adding an annoying ultrasonic deterrent, kind of a loud noise that they just hate. Like when bars play the *Semisonic* hit "Closing Time" at intolerable volumes at 1:55 AM. [*clip of Semisonic's "Closing Time"*]

Now, Merlin says that until the wind folks and the bat folks figure it out, we can each try individually just to use less electricity. Just turn out the lights. For the bats.

Merlin: The goal is to save as much of healthy nature on this planet as we can and it's not to quibble about every little thing that goes wrong.

Alie: Yeah, the bigger picture for sure.

Aside: Okay. Let's return to the topic of cuteness.

Alie: A listener named Georgia wants to know: Is it true they drink by licking water off their bellies?

Merlin: Flying foxes do drink by kinda belly-flopping into river water and when they come up there's a bunch of water clinging to their fur and they drink that.

Alie: Oh! That's just like dunking your hair in the sink and sucking on it as you go about your day. *[laughing]*

Aside: Tons of you had the foresight to submit questions about bat eyes. Such as Gracie and....

Alie: Gretchen and a few others asked if there's any truth to the saying 'Blind as a bat', and does bat vision vary from species to species? What's the range of eyesight for bats?

Merlin: It varies from species to species, but I don't know of any bat that doesn't probably see fairly well. There are bats that have very small eyes and we wonder how well they see, but most bats that have been tested certainly see fine.

Alie: Oh! I didn't know that.

Merlin: In fact, some even see color. What's cool though is that using sound alone, bats can see everything we see except perhaps in some cases color. But they can also see things we can't see because, by looking at this table you do not know if that's foam rubber painted over or if it's hard wood. The bat would know.

Alie: And how is that echolocation working? Is it similar to whales? Some listeners wanted to know.

Aside: Patrons Helena, Dave Woodruff and curiousDNA, y'all wanted to hear about echolocation and sonar.

Merlin: Yeah, it's been estimated by Don Griffin, the guy that discovered bat echolocation. He estimated that it was on a watt-per-watt, ounce-per-ounce basis, billions of times more efficient than anything ever developed by humans.

Alie: Oh my gosh! Have you heard that there are a few people who are not sighted, who are blind, who use echolocation themselves to avoid obstacles? Have you heard about that?

Merlin: Well, bats have been a model... they've been used as models for developing aids for the blind to navigate. In fact, the military is using bat models now to try to develop artificial bats that fly into enemy territory to spy on the enemy.

Alie: Like little tiny baby drones? Just little ones?

Aside: Now, a few people wanted to know about citizen and community science programs like Elizabeth Ilean, Claire Simpson, and Janine Williams, who asked a bit too humbly: What is the best thing us plebs can do to support bat conservation? Also, I had to look up plebs because I was like, "Is it plebs or plebs?" Apparently, it's plebs.

Now, one thing this podcast episode is doing is tossing some money towards MerlinTuttle.org. Every week we donate to a foundation of the ologist's choosing and this one was very easy. Merlin Tuttle has been working for 50 years to help in bat conservation and MerlinTuttle.org is an amazing resource. So a donation for last week's episode and this week's episode will go to MerlinTuttle.org and there are sponsors who make those donations possible. So, you may be hearing a few words about them.

[Ad Break]

Okay. Back to your questions about community science programs.

Alie: Janine Williams and some others wanted to know: What's the best thing that community citizen scientists can do to support bat conservation?

Merlin: The first thing you do is help your neighbors and friends get over unfounded fears of bats. [*clip from Dune: "Fear is the mind killer."*] The single most prevalent reason that I have seen worldwide for destroying large numbers of bats is fear. I've got pictures of piles of bat bones in a cave in Mexico where the owner had sealed it shut with hundreds of thousands inside. I have been at places where millions were burned in caves by just putting old car tires in the entrance and dousing it kerosene and lighting it on fire.

I was told by colleagues that there's this beautiful bat cave in this place, I should go there if I went to Kenya. I went there and it had all been bulldozed over and the owner said, "Well you know, I built a house just a quarter mile away and everybody told me that if I didn't get rid of those bats, they would move from the cave into my house." Those bats would never have cared a bit about his house they would have stayed right in the cave.

Just in the last couple years, it's even been on National Public Radio, that bats are arguably among the most dangerous animals on our planet. In an NPR story that's probably still there and can be looked up, they report – this is almost a direct quote – "When bats are flying overhead, beware that poop that falls on your shoulder may be Ebola."

And not long after that aired, I was down at the Congress Avenue Bridge, a gal saw me and realized that I probably knew something about bats, and she was very concerned there with her husband and said, "Can you tell me, am I safe? Can a bat poop on me here?" And I knew she'd been listening to NPR. And these wild stories linking bats to every kind of conceivable dangerous thing, it gets back in my opinion... Well, it starts with the fact that rabies treatment is so lucrative. I mean, just look at the difference between treating a dog and a human. Talk about lucrative.

Aside: So, Merlin has a blog post about it, and he says he usually loves NPR, but was deeply, deeply disappointed by this. And of course, once again, do you have a job or pastime that involves encounters or permanent handling of wildlife? Not a 'bat' idea, [*ba-dum-TSH!*] to get a rabies vaccine.

We did cover rabies stats, which are much lower than public perception in Part 1, but these patrons asked about rabies and rabies vaccines. Paul D Simmons, Margaret Ebacher-Rini, Emily Martinez, D. B. Narveson, Brandy, Mandy Binder, Mads Clement, Caitlin O'Connell, Erik Pohanka, Sarah Greer, Dawn Ewald, Allison Waring, Chris Brewer, and Lauren Eggert-Crow. And I will repeat the disclaimer from Part 1, Dr. Merlin Tuttle reminds us he and other bat researchers, like vets, they have received pre-exposure vaccinations against rabies that protects against defensive bites from animals that they might handle who are unfamiliar.

Now, unprotected people bitten by any animal should seek advice regarding a possible need to be vaccinated or have the animal tested for rabies. But Kathryn Stacey asked: Can the bats get the vaccine? Is there a bait laced with rabies vaccine for bats, like what's used for other wildlife, such as foxes and raccoons? What's going on with that?

Alie: Someone asked about giving bat vaccines like they might do with other wildlife? Like, if vaccinating bats for rabies is even a thing that's worth looking into?

Merlin: I was part of a panel discussion and actually have a paper – I believe in press now – in which that is discussed. I happen to be one of... There are several authors. I am one that says I don't think it is worth it.

Aside: Okay this next, sunny, or perhaps not so sunny question, was asked by Leanna Shuster, Azam [ph.], and Amelia Heins.

Alie: On that topic, a lot of listeners had the question: If you see a bat during the day, is that a bad sign?

Merlin: Not necessarily, it depends on where the bat is. If the bat's hanging in a normal position where that species lives... I have plenty of times walked under a tree and I know what kind of leaves that bats that live under leaves like to hang on, and I'll look up and, "Oh there's a bat," and that bat's perfectly normal that's not a problem.

If the bat is out on the ground or out where a bird could easily catch it in the daytime, then that bat is almost certainly sick. Now, that doesn't mean he's rabid. 95% of such bats aren't rabid, but 5% are. Most of the statistics you hear about rabies and bats, they're taken from... The health department only gets suspect bats submitted. If the bat's not acting abnormally it doesn't get submitted. So, this is like deciding what proportion of Americans have cancer by checking cancer clinics. [*"See how that works?"*]

Aside: Now, the next question was asked by a lot of you, and I mean approximately one million. So, I will say your names with my mouth very fast. This is a white-hot topic. It was right under our noses. Now, even though Merlin's a fungi, [*Alie uses the 'fun guy' pronunciation*] I had to ask him this tiny bummer. White-nose syndrome.

Asked about by Ruby Oestreich, first-time question-asker Jess Spencer, Emily Jean, Alicia Geilen, Margaret Matera, Bronwen Trim-MacDonald, B&K Boyce-Quentin, Mckenna Larson, Jennifer Downey, Liv Shaffer, Samantha Vold, Pandora II, Hanna M Childers, Acacia Sprog [ph.], Lauren Harter, Sarah Lucchesi, Cassy Flint, Lea Wilbur, Anna Thompson, JCW, Adam Weaver, tangygnat, Mandy Binder, Caitlin Fitz Gerald, Ronda Grizzle, and Madalyn Rogers who says: Where is white-nose syndrome the worst? And what's species does it affect the most? And how bad is it? What can we do? What's going on with white-nose?

Alie: And now, when it comes to white-nose, what can be done to help them?

Merlin: The most important thing that could be done now, to help bats that have populations that have crashed because of white-nose syndrome is to help protect and restore more roosting habitat, more habitat in general, but particularly roosting habitat.

Alie: And now, roosting habitat, that's the overnight, sleepy time?

Merlin: Mostly where they hibernate.

Alie: Oh! Well that was the next question. Do they eat in the winter? Do they hibernate?

Merlin: The bats that have been hardest hit by white-nose syndrome are bats that hibernate in caves all winter. There's very little food in a temperate zone from... You might get away with staying active in the winter here, but you go a little bit north of here and throughout most of the United States and Canada, there are no insects available to eat at night.

So, you have to either migrate south for the winter or hibernate in a cave. And the biggest losses of all time have occurred when their hibernating caves were destroyed and are disturbed. And here's the problem, years ago I naïvely would say to cavers, "What's the problem with saving less than one percent of caves for bats? It leaves all the rest for you." Well it's not quite that way.

We humans want the same caves that the bats want. So, we're competing for the 1% that have gigantic entrances, huge passages, multiple complexity. Those are the first ones that

we humans want. [*clip from Willy Wonka and the Chocolate Factory: "I want it now!"*] And so, many, huge numbers of our US bats were lost before anybody even reported that they were present.

Alie: Is there anything that can be done to medicate them at all?

Merlin: To medicate?

Alie: Yeah, can you give them anti-fungal?

Merlin: No.

Alie: [*dejected*] No, okay.

Merlin: I'm absolutely adamant about that. I believe that more harm is being done than help in trying to find a cure for white-nose syndrome.

Alie: It's more just trying to recover the populations?

Merlin: Since this began, there have been cures found. I remember a rehabber that just mixed a dilute vinegar and water mixture and could cure white-nose syndrome. But when they banded all those bats for releasing them back into the wild, they got infected again and died. So, curing because you find something that will kill the fungus is not a cure that will keep you from getting re-infected.

Even if you found something that would prevent reinfection, imagine trying to treat all of the bats or the locations. There must be billions of locations infected with that fungus now. Just Mammoth Cave alone that used to house many millions of bats has more than 400 miles of passages. Imagine treating all of those with something that's going to kill this fungus.

And then, understand that this fungus is only one of thousands of kinds of fungi and if you found something that would kill it you might cause a horrible problem, chain reaction, destroying whole ecosystems that we don't even know much about.

Alie: Yeah. Is the best course of action to let it run its course and make sure that they have enough places to roost and just repopulate?

Merlin: If you go to my website again and look under Resources under white-nose syndrome, I did a thorough investigation a few months ago of what has happened, where it has passed over the last decade. And we're seeing clear signs of recovery. Genetically resistant bats are apparently recovering.

Aside: Okay! Okay, that's promising! That's the good news and so it's wonderful that we have Merlin going to *bat* for these critters. Wow, I hate myself.

Merlin: I did find evidence that – it's very interesting – there are colonies that have fully recovered, that dropped by at least 80% when it passed, that are now fully recovered. The ones I'm thinking about, many of them have been banded by researchers, and when they look for them, they never find them in hibernation. This means that those survivors are doing so well, they haven't had to put up with humans trying to save them.

Let me point out that before white-nose syndrome was a problem, I founded the first two endangered species recovery teams for bats in America. And we were adamant that nobody would go in and disturb bats during hibernation more than once every two years; even to census for the government to tell how they were doing. And in retrospect now, I think we should have made that every 3-5 years.

I have, again on my website, published resources about the cost of hibernation disturbance. When you go into a cave and force a bat to wake up out of hibernation in the wintertime, he burns up on average 30-60 days' worth of stored fat reserves.

This fungus is killing bats because... If you've ever had chiggers or poison ivy, you don't sleep well at night; you wake up scratching. Well that's what's happening to the bats. They're waking up out of hibernation and it's very costly. And that's why they're coming out before spring. They're desperate, they're starving and that's why they're dying. Well, imagine once white-nose syndrome came along, there were some places where researchers were going in there a half a dozen times or more a winter. And sometimes spending hours.

Alie: Oh wow. And they're even more tired.

Merlin: That would have been enough to knock the population of that cave out without any fungal problems.

Aside: So, let those snoozy, little floopy-faced, fuzz puppets sleep, people! Get out of their beautiful vulva noses. Let them catch some z's.

Merlin: Evolution's going to play its course.

Alie: Yeah, that makes sense.

Merlin: I don't know of any evidence yet that any species is going to go extinct because of this. All the ones I know of where it has passed by far enough ago to have an idea, seem to be hanging on. I won't call it thriving, but hanging on and showing signs now of recovery.

Alie: So if you're worried about the bats don't lose all your sleep over just white-nose.

Merlin: White-nose is only affecting, right now, less than a dozen species out of 40-some species in the US. They don't all have to hibernate in caves. Some species are actually probably benefitting because they don't have to compete with ones that are dying from white-nose syndrome.

And I'm not going to say that's beneficial overall. The good side may be that we have suddenly become much more aware of bats and how harmful it could be to lose them. And more people have learned about bats and care because of white-nose syndrome. But I do believe all the colonies that have been best monitored that I know of are starting to recover.

Aside: [*crowd applauding*] [*low voice*] That's good.

Merlin: And I'm very optimistic. One thing that I'm very concerned about is working with sport cavers who often discover old roosting sites in caves that nobody else knows about. During this time, government agencies have blanket told the cavers oftentimes, they just couldn't go caving. And I've actually made enemies out of former allies. We need those cavers out there telling us where those places are that we need to protect. And often they're very happy to do it for us if we just cooperate with them instead of just saying you can't go caving anymore.

Alie: Yeah, is to try and get them invested in it as well?

Aside: Merlin Tuttle. National Treasure. Skilled diplomat. Now, on MerlinTuttle.org you can find a 15-minute video titled, *The Power of Winning Friends and Not Battles: Merlin Tuttle's Conservation Philosophy*. I love him. Have I mentioned he's an American Hero?

Okay, so it's dark and mysterious in caves, and how do cavers tell if there have been past bat parties?

Merlin: They stain the limestone and you can tell by the contours and the stain on the limestone. You can actually estimate roughly how many bats lived there in the past. There are plenty of those places where bats could be restored. Even millions. And I personally have seen at least multi-millions restored where there were none. Not multi-millions in one cave, but in one Tennessee cave, it was down to 65 Gray bats and now it's up to a quarter million. There are many encouraging instances where we can see that we are reestablishing hundreds of thousands of bats.

It's not all about millions dying. There are things that we can do to restore habitat. We can put up bat houses in our back yards and we should be very concerned about caves that can be restored. Years ago, when everybody was scared to death of rabies, commercial cave owners – and they don't like calling themselves commercial cave owners – they used to not want any bats in their caves because people were so frightened and freaked out by them.

But we have a cave right here in North Austin now; it's a commercialized tour cave. It's got quite a few hibernating bats in it that have learned to ignore people because it's very well protected and nobody ever harms them. People walk right by within two meters of those bats and the bats don't even pay any attention. The bats are very good at adapting to us, if we'll only adapt to get along with them.

Despite all this stuff about how bats are supposed to be such dangerous disease carriers, let me point out that they have one of the world's finest track records. I don't know of any animal that has a finer track record than bats of living in close association with people without causing human sickness.

Alie: Right. And it's so cool to think that they might be all around us and we just don't get the chance to necessarily see them. And Ryen&Jazmin want to know: What material is closest to that of bat wings? Like, how can you make a bat suit?

Merlin: I have seen comparisons in terms of strength where – I think this is actually a medical doctor that wrote this – the average bat wing was 19 times sturdier than a surgeon's glove.

Alie: Oh my gosh. I can see it.

Merlin: That's the best statistic I can come up with on wings.

Aside: Pretty solid stats. So, I looked into it and their skin that stretches like a living drum between those gorgeous, freakishly long, fashion model fingers; that's called a patagium or patagia for the plural. And it's two thin layers of skin with elastin between it. Also, listener NoFunNicole says she got slapped in the face once by one and it felt leathery. And I don't know why she calls herself NoFunNicole because that's a top-notch story. Boy howdy, she's fun. So, moving on to things that are not excellent.

Alie: What is something about bats or about your job that you really don't like? What sucks about being a chiropterologist?

Merlin: That I don't like?

Alie: Yeah. What's the worst part about your job? The thing that you're like, "Uhh! This!"

Merlin: The worst part is just, I have founded more than one conservation organization and spent most of my life devoted to that. And the worst part for me is day-to-day wanting to be sure

that I find the financial resources to keep those good people that follow me and want to help financially healthy and their families okay. It isn't easy, even now, to raise money for bats.

People and organizations will line up and compete with each other to protect cute things like pandas. And the crazy thing is there's nothing un-cute about bats. It's just the belief. Here's another one of our crazies about humans. You know we perceive anything, the bigger the eyes the more beautiful? You don't want a very big nose. You don't want to be very heavy set.

Aside: Okay. Quick aside. For more dirt on incredibly screwed up beauty standards, listen to the two-part Kalology episode with psychologist, Dr. Renee Engeln. We did not discuss pandas in it. But it is otherwise very juicy and life changing.

Merlin: Okay. What animal by those tokens should we dislike the most?

Alie: [*laughing*] A panda?

Merlin: Elephants.

Alie: Elephants? Okay. I was going to say, the pandas.

Merlin: Everybody loves elephants! And you want to know another interesting statistic? More humans are killed annually in the United States by elephants than by bats.

Aside: By the by, I looked up 'most deadly animals to humans' and the top two are mosquitos and... humans. Bats are like, "Don't look at me man. I'm eating the mosquitos that are killing you. And I've never been caught up in a life insurance scandal, that's on y'all."

Merlin: That just shows how rare it is for anyone to be killed by a bat.

Alie: I think what you will do for bats is what people did for whales in the '70s and elephants. I think that your work alone may bring bats into human consciousness, where they're not just an October decal or decoration.

Merlin: Well, that's one of my primary purposes in being a photographer. Until I learned to take pictures of bats as they really are, you could almost never see a picture of a bat that wasn't snarling in self-defense. You take a little bat whose head is no bigger than my thumb, provoke him, he thinks you're about to eat him. You take a picture and blow it up to page size, it looks like a sabretooth tiger on the attack. Who in the world wouldn't be afraid of this critter?

Alie: And what kind of speeds do you have to use? What kind of camera, what kind of speeds and lenses do you have to use to get these gorgeous pictures?

Merlin: You don't have to take everything that fast, but now I take almost all my pictures – at least if they're flash pictures – they're taken at 1/40,000 of a second.

Alie: Wow. They're gorgeous.

Merlin: Well, the pictures have been a major, major part of the public turn around when it comes to bats. Seeing is believing, hearing is not quite there.

Alie: And now, the best part of your job. Your favorite thing about bats, your favorite thing about your job?

Merlin: Anybody that associates with me would tell you loud and clear that I am a bat photography addict. I love getting great pictures that nobody else has thought of getting. I will sit out seemingly endlessly waiting for something to happen and usually it's for the purpose of promoting conservation.

Everybody knows I'll spend 10 times more time trying to get a good shot of a bat catching an insect that cost billions of dollars in crop losses, as an insect that is just pretty or ugly or something. But people ask me what I do in my leisure time. I study bats and photograph bats for vacation time. I've had a lifelong vacation.

Alie: That is the best!

Merlin: One of my favorite things is developing, perfecting my ability to change attitudes for the better for the environment. That, over time, takes a lot of skill. You learn to ask questions rather than debating people who have done things you disagree with.

Alie: I think you would have been a great politician, but I'm glad that you helped the bats instead.

Merlin: *[laughing]* Probably more productive. *[continues laughing]* I didn't really say that.

Alie: This has been, just, years in the making and quite possibly my favorite conversation I've ever had. Thank you so much for letting me come to your place, your roost here.

Merlin: Well you're very welcome. And just know that we didn't even cover a tenth of what should have been talked about, about bats. So, if you get a big encore, come on back, you'll be welcome.

Alie: Heck yeah!

Merlin: You did a great job.

Alie: Aww, thank you Dr. Tuttle. That's amazing.

So, there you have it. Shamelessly ask the sharpest minds the doper questions because that is how they learned. And people who love things want to share those things. Now, of course follow Merlin Tuttle on all social platforms. He and his social media right hand, Teresa Nichta, are both amazing. He is on Twitter [@MerlinsBats](#), Instagram [@MerlinTuttlePhoto](#), on Facebook at [Merlin Tuttle Bat Conservation](#), and of course [MerlinTuttle.org](#) has all those links. That website is an incredible resource for photos of bats, and articles, and blog posts from Merlin, and future trips in the field with him. So, check that out.

The worst thing about his work, and he has drank out of cave puddles, is making sure it's all funded. So, of course, a second donation went to his organization for this episode. To support you can go to [MerlinTuttle.org](#). Now, links for this episode are up at [AlieWard.com/Ologies/Chiropterology](#) and there are links in the show notes.

There are also shirts, and hats, and totes and *Ologies* merch available at [AlieWard.com](#). Thank you, Shannon Feltus and Boni Dutch for managing that, and also check out their comedy podcast *You Are That*. I spilled my guts on their October 28th Halloween episode, so get all up in that. Thank you to admins of the [Ologies Podcast Facebook group](#), Erin Talbert and Hannah Lipow. Thank you to all the *Ologies* Transcribers, helmed by Emily White. Transcripts and bleeped episodes are at [AlieWard.com/Ologies-Extras](#). There's a link in the show notes.

Happy Birthday to Gizmologist Simone Giertz, just one of my favorite people, thanks for existing. Thank you, assistant editor Jarrett Sleeper of the mental health podcast *My Good Bad Brain*, and the mustachioed bat – which I believe is a species of bat—Steven Ray Morris of, *The Purrrcast* cat pod, and the dino pod, *See Jurassic Right*, who edits all these pieces together each week.

And if you listen all the way to the end, you know I tell you a secret each week. And this week, the secret is that I'm recording these asides from the hotel room in Austin. I'm here shooting for CBS and I'm pretty sad because I don't think I'm going to get to see Merlin again while I'm here. But hopefully I'll be back in Austin soon. Austin, you're a great town. What's up with that? Why are you so good? It's pretty, people are nice, food is good, it's got a bunch of antique malls.

Also, one more secret I had phở today and it was very onion heavy and I feel like my hands still smell like onions. And I can't figure that out because I didn't eat the soup with my hands, and I've washed my hands several times. So, I'm just alone smelling like onions in a Hampton Inn in Texas, googling bat dicks. This is the life I chose, and I love it.

Okay, next week, I'm not going to tell you what the episode is but I'm very stoked about it.

Okay, Berbye.

Transcribed by Brian Davis, Outer Space-Loving Office Drone

Edits by Kaydee Coast who reminds you; don't lick toads, check your crevices, milk your thumbs, and never apologize for asking questions. Kthxbi.

Some links which may be of use:

[Merlin's CV](#)

[Merlin on David Letterman](#)

[Egyptian fruit bat vocalizations](#)

[Bat chattering](#)

[A wooly bat trains Merlin](#)

[Merlin in a tight squeeze](#)

[Bats eating corn earworm pests](#)

[Bickering bats](#)

[Thailand trip](#)

[Gasahol](#)

["Bat B N B" houses](#)

[Ways you can die that aren't rabies](#)

[Echolocation around leaves](#)

[A Glorious Wiki List of Bats](#)

[Weird bat noses](#)

[Hammer-headed fruit bat](#)

[The bats of Mammoth Cave National Parks](#)

[13 Awesome Bat Facts](#)

[Bracken Cave bats](#)

[WHO's rabies info](#)

[The cost of rabies treatment](#)

[Bats spy on each other](#)

[The Chiroptorium](#)

[Upside down bat hanging](#)

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