

Video Transcript: Arthropod Adaptations – Inside the Insect Zoo

- Maggy Benson: [00:00:30] What's your experience with insects? Do you enjoy butterflies? Have you been stung by a bee or bitten by a mosquito? Regardless of whether you like these animals or feel squeamish about them, they are part of the most abundant and diverse group on earth, arthropods. But how did this group of animals become masters of survival? Today our guest, Dan Babbitt, has hissing cockroaches, giant spiders, and other fascinating [00:01:00] bugs for us to explore their secrets.
- Maggy Benson: Hi, thanks for joining us. I'm Maggy Benson, host of Live From Q?rius, Smithsonian Science How. We have a really fun show today where we're gonna look at insect adaptations and see special features on these insects that have made them masters of survival.
- Maggy Benson: Before we get started and get to our guest, I want to ask you a question. You can respond using the window that appears to the right of your video screen. So, [00:01:30] how can so many different kinds of insects be masters of survival? By getting along with each other, by occupying different niches, by not competing with each other, or by sharing food. You can take a moment to think about this and put your answer in the window to the right.
- Maggy Benson: All right, while you're thinking about that, we're gonna go to our special guest, Dan [00:02:00] Babbitt, who's manager of the insect zoo and butterfly pavilion here at the Smithsonian's National Museum of Natural History. Thanks for joining us today, Dan.
- Dan Babbitt: Yeah, happy to be here.
- Maggy Benson: We're getting a lot of responses back and the majority think that by occupying different niches, insects are able to be masters of survival. What do you think about that?
- Dan Babbitt: Yeah, we have a smart group out there. That's totally true. Insects are great at adapting into different niches, or areas within the ecosystem. So they're utilizing different resources and [00:02:30] different spaces within that ecosystem.
- Maggy Benson: Interesting. So if they're sharing resources and spaces, that's kind of like when I was growing up and my sister and I had to share a room. We had to share our space, our clothes, maybe even sometimes our meals. Is that something that's kind of similar?
- Dan Babbitt: Yeah. If you divide up your room and one sister is living in one and your sister is living in one side and you're living in the other side and you're maybe sharing your food, like you would eat the peas and she would eat the mashed potatoes, and that's how you could both survive, of course.

Maggy Benson: So that could be [00:03:00] called something like a niche.

Dan Babbitt: Yeah.

Maggy Benson: Wonderful. So these insects are surviving because they live in so many different niches.

Dan Babbitt: Exactly.

Maggy Benson: Can you show us an example here today? We have a lot of amazing insects it looks like. Can you show us one that has its own special niche?

Dan Babbitt: Sure. Let's take a look at this guy first. One of our-

Maggy Benson: Wow. Is that real?

Dan Babbitt: It is. It looks like he's made out of plastic or a wind-up toy, but this is a real big bug.

Maggy Benson: He's beautiful. What is it?

Dan Babbitt: This is an Atlas [00:03:30] beetle from Southeast Asia, and you can see ... there we go. You can see he's an insect because he has six legs, three on this side and three on this side. That's one of the major characteristics of insects.

Maggy Benson: What else makes an insect an insect?

Dan Babbitt: Insects, you're gonna find they have jointed legs and they have an exoskeleton, so they have a skeleton not on the inside like the vertebrates do but on the outside.

Maggy Benson: What kind of family is this part of? I know as a human I'm a mammal.

Dan Babbitt: This is a group of animals, the [00:04:00] arthropods. Insects are part of that group, but also you'll find centipedes, millipedes, you'll have crustaceans, and arachnids.

Maggy Benson: So what you're saying are like spiders and crabs, they're arthropods, but they're not necessarily insects.

Dan Babbitt: No. They're not ... Not all ... All insects are arthropods, but not all arthropods are insects. What they share, as you'll see here, I can even bring out a different arthropod here, once he's on the table. There we go. So we have an [00:04:30] example of the crustaceans here. This is a Halloween crab from Central America. They both have that hard exoskeleton on the outside and they both have jointed legs and they're both symmetrical on either side of their body, so they look the same on one side as they do on the other, but if we count legs, we'll

see that this has 10 and this has six, so that's one of the differences between the groups.

Maggy Benson: I guess a rule of thumb when trying to decide what arthropod you have, you count the legs.

Dan Babbitt: It's a good place to start.

Maggy Benson: Cool. [00:05:00] So let's learn about the niche of this Atlas beetle.

Dan Babbitt: All right, so this is the adult of the beetle and he lives on fruit and sap, so likes things that are sweet. So he's gonna be up in the tree. If there's flowing sap in the tree, he might find a good spot and be able to feed on that. One thing that is really neat with this species is that their young form, their larval form, is gonna be eating something in a different part of that forest ecosystem. So this is [00:05:30] a different species, but this is a larva of another scarab beetle, *Megalosoma*, which is from South America.

Maggy Benson: Wow, it's huge.

Dan Babbitt: Yeah, he's quite massive. This is what this guy looked like when he was little. These are living in rotten logs on the forest floor, where the adult is eating sap and fruit in the canopy, or in the trees.

Maggy Benson: So really different life stages aren't actually competing or living in the same habitats at all.

Dan Babbitt: Right, so with a lot of insects, especially [00:06:00] once they go through complete metamorphosis, where they have an egg, larva, pupa, and adult stage, they aren't competing with their young.

Maggy Benson: So you said that these beetles are from the forest, but what kind of forest?

Dan Babbitt: Yeah, this is from a tropical forest in Southeast Asia and this one is from the rainforest, tropical rainforest, of South America.

Maggy Benson: If these are tropical species, why do we have them here at our insect zoo at the Smithsonian?

Dan Babbitt: That's an excellent question. The Smithsonian [00:06:30] is a bit bug crazy. We have about 35 million specimens in our research collection, so behind the scenes in the museum that we have active research going on and that we share with other researchers around the world. So we want to show a bit of what's going on behind the scenes to our public and a great way to do that is with our live insect collection.

Maggy Benson: That's incredible, 35 million.

Dan Babbitt: Yeah.

Maggy Benson: Wow, that's huge. So I can imagine that caring for them is a big task. How do you care for all of these?

Dan Babbitt: [00:07:00] It is a big task. It's hard to have a tropical environment in ... well, even though DC feels tropical sometimes, today it doesn't, it's quite cold, so it's hard to have a tropical environment inside of a building. We have about 70 different species of arthropods that we have in the exhibit plus the butterfly pavilion, which is a whole other ecosystem we have to recreate. So we have to make sure ... we have to know about the natural history of all of our arthropods and know what they need from temperature, humidity, and food, and we can recreate that for them.

Maggy Benson: So you mentioned the butterfly pavilion in the insect [00:07:30] zoo, a big component of this is allowing our visitors to be able to see these insects, is that right?

Dan Babbitt: It is. We want to get people firsthand experience from insects they might encounter in their own backyard but also from around the world.

Maggy Benson: What does that do? Does it give a better appreciation or just a better knowledge of what's out there?

Dan Babbitt: It does. Insects can get a bad rap. Some people ... there's a lot of things about insects just being gross and scary, so learning more about it and the important role they have in our environment we think is vital, so [00:08:00] it gets them better connected to their natural world.

Maggy Benson: Cool. We already have a student question. Are you ready to take it?

Dan Babbitt: Yeah, definitely.

Maggy Benson: This one comes from Traeger Middle School.

Dan Babbitt: Okay.

Maggy Benson: Thanks for joining us again, Traeger. They want to know what's the most common color of insects?

Dan Babbitt: That's a great question. You're gonna be finding insects that are blending into the environment, so there's gonna be a lot of green insects that are trying ... green and brown that are blending in to the natural environment, but you're also going to find insects that are ranging in color from red to even blue.

Maggy Benson: [00:08:30] Cool. So these are all adaptations, right?

Dan Babbitt: Right. Depending on the environment they live and what has been most successful.

Maggy Benson: Dan from Alberta has a question. Dan wants to know is it hard to keep insects alive?

Dan Babbitt: It can be a challenge, Dan, but that's our job here. You have to know a lot about them. Your work with colleagues or colleagues around the country and we do studies here and we keep charts and we record all the information that we take by when we [00:09:00] care for the animals so we know what works and what doesn't work so we can pass that information on.

Maggy Benson: I feel like you've given us a really great overview of what happens in the insect zoo and how you care for all these animals with different adaptations.

Dan Babbitt: Yeah.

Maggy Benson: Let's start looking at an adaptation. I hear that you have some cockroaches.

Dan Babbitt: I do. Here, let's get them.

Maggy Benson: Let's take a look at those.

Dan Babbitt: Let me put this guy back in his case here.

Maggy Benson: He has powerful legs.

Dan Babbitt: He does. He has very strong legs, because what he's doing, he can hang on to a branch and battle other males [00:09:30] so he needs really strong legs to be able to do that. All right.

Maggy Benson: Wow, these are big roaches.

Dan Babbitt: Here, I'm gonna let you hold one, Maggy. Put one down here. So these are famous in the insect zoo, ones a lot of our visitors might have seen in movies or when they're visiting other insect zoos in their area. These are the Madagascar hissing cockroaches.

Maggy Benson: How do they get that name?

Dan Babbitt: [00:10:00] Because they can hiss.

Maggy Benson: Really?

Dan Babbitt: Unlike most other insects that make noise, they'll make noise by rubbing parts of their body together, it's called stridulation so the ... like a cricket will rub its wings together to sing. These guys don't do that. They push air out of these

holes in their abdomen and that can make a hissing noise and that's the same hole they use to breathe, so insects breathe not from their mouth but from holes in their abdomen.

Maggy Benson: So it might be like the same sound that might come out from a human pushing air through their nose, it's [00:10:30] just theirs is going through their abdomen.

Dan Babbitt: Right, it's more similar to what vertebrates do than what insects and other arthropods do. They can make three distinct noises, the males can. The males make a noise when they're defensive, so if you grab them and they feel like they're being threatened they'll make a noise. They'll make a noise when they're trying to mate, so to attract females, and they'll make a different noise when they're battling other males.

Maggy Benson: So they must be happy right now because they're very quiet.

Dan Babbitt: They are very quiet.

Maggy Benson: That's a good sign.

Dan Babbitt: We treat our roaches well.

Maggy Benson: [00:11:00] They're happy. Cool. Why don't you show us something else?

Dan Babbitt: Sure.

Maggy Benson: I hope those aren't the kinds of roaches that people have in their houses either.

Dan Babbitt: They are not. Most roaches and most insects don't do well in houses. It's too dry and there's not enough food or water. Some have adapted very well to living in houses, but most insects don't. Most roaches you're gonna find on forest floors or woodland floors. [00:11:30] All right.

Maggy Benson: Wow, that's beautiful. That's a big spider.

Dan Babbitt: It is a big spider.

Maggy Benson: What is this?

Dan Babbitt: Big spiders can make some people nervous but this is a very nice spider. This is a-

Maggy Benson: It has a beautiful pink hue to it.

Dan Babbitt: She is. It's a Chilean Rose Hair tarantula. Tarantulas are some of the larger spiders, and they can get even bigger than this. Up in the insect zoo we have a bird-eating tarantula that could be the size of a dinner plate, but she is ... this is

about an average size for [00:12:00] most tarantulas. You can see with the spider, we're talking about legs, so she has eight legs. One, two, three, four, five, six, seven, eight, and then her two main body parts there.

- Maggy Benson: I think a lot of people have a lot of fears around spiders and maybe even especially tarantulas because they're so large. We actually have a question for our students where we want to ask you how does a tarantula defend itself? Does it run away, rear up to look bigger, flick irritating hairs, or does it bite? Take [00:12:30] a moment to think about it and put your answer in the window to the right of the video.
- Maggy Benson: Okay, Dan, so while the students are thinking about their answers, can you give us some hints?
- Dan Babbitt: Some hints for that? So I'm holding this tarantula, and this tarantula is not biting me.
- Maggy Benson: I know, it looks very nice. It is spinning a little bit of a web.
- Dan Babbitt: [00:13:00] It is. You can see coming out here, they have spinnerets on the back of the spider and she's spinning a web that you can see coming out right now. They don't use that to catch their prey, but they'll line their burrow, this is a ground dwelling tarantula, so she'll line her burrow with this webbing.
- Maggy Benson: So we have a lot of split answers. We have run away, flick irritating hair, rearing up, but nobody's answering bites. What do you say?
- Dan Babbitt: Oh that's good. That means we're getting our message out about spiders. These guys, they ... biting is one of the last resorts. [00:13:30] If they're feeling threatened, what they're gonna do is run away. They just want to get out of the bad situation, away from a predator or dangerous place. The next step, if that's not working, tarantulas from the Americas might flick hairs. They have specialized hairs on their abdomen that they'll flick off that can be irritating, so they can get in the eyes of a predator and it can hurt. It will give them time to get away.
- Maggy Benson: Now is that the normal hair that we have on our head?
- Dan Babbitt: No. It's the same makeup as the rest of their body so it's a [inaudible 00:13:59] material [00:14:00] and it's specialized so it causes that irritation.
- Maggy Benson: Like an exoskeleton.
- Dan Babbitt: It is, it's part of their exoskeleton, exactly right. If that's not working, what they will do is they'll rear up on their back legs and look as big as possible and show their fangs and that might be enough to scare a predator away. Sometimes it's enough to scare us away if we're working with the tarantulas. If all else fails and

something is grabbing it and squeezing and hurting it, it might bite to try to get that thing to let go and let them get away.

Maggy Benson: Cool. I feel really [00:14:30] comfortable now with the tarantulas and other spiders that biting is their last resort.

Dan Babbitt: It is. It's very hard to get bitten by a spider. They get a bad rap.

Maggy Benson: I see another spider here.

Dan Babbitt: Oh right.

Maggy Benson: What's that?

Dan Babbitt: This is our Pink Toe tarantula. This is another type of tarantula but this tarantula lives on the ground. It lives in a burrow and it will hunt by waiting for bugs to walk across above it and they'll run out and grab it. These guys can even wait a year between meals. [00:15:00] They can sit and wait a long time.

Maggy Benson: Wow.

Dan Babbitt: This is a Pink Toe tarantula up here.

Maggy Benson: It actually has pink toes.

Dan Babbitt: It does have pink toes. She ... here, I can get her to move down a little bit. I'm leaving her in the case, not because she's dangerous, but she's really quick. She's adapted to live in the trees. Where most tarantulas live on the ground, she's a really good climber and if you take her out, she'll want to climb up and be up on my head and jump off and run away, so we'll leave her in the case. They can [00:15:30] climb up high and they can fall, they can even drop from high heights of a tree and float down. Where this tarantula, if I were to drop it, it might get seriously injured if I dropped it just from a few feet off the ground, where this one can fall from the height of a tree and even land in water in a flooded forest and swim back to a tree and climb back up again. It has amazing adaptations to live in the trees which is different from most tarantulas.

Maggy Benson: It's really interesting to see that we have two arachnids, two tarantulas, but they're still very different.

Dan Babbitt: Exactly, yeah.

Maggy Benson: Cool. What else do you have [00:16:00] to show us for defense?

Dan Babbitt: All right. Did you want to hold?

Maggy Benson: Everybody's happy today.

Dan Babbitt: Do you want to hold the tarantula when we take out another one?

Maggy Benson: Yeah, absolutely. Very calm.

Dan Babbitt: This one is one that maybe our guests haven't seen before.

Maggy Benson: Oh, it's fast.

Dan Babbitt: She is. She's running. She's trying to check out this environment.

Maggy Benson: What's the name of this one?

Dan Babbitt: This is called a Vinegaroon, [00:16:30] or a whip scorpion.

Maggy Benson: A whip scorpion. I can see the resemblance to a scorpion. So I see a lot of legs on that. I think we should ask our students if they think this is an insect or not. Maybe if it sits still for a second we can count the number of legs on it. All right, is this an insect? Yes, no, or you don't know. If you look closely, you can count one, two, three, four, [00:17:00] five, six legs that it's walking on, but it also has this piece in the back, these claws up front, these antennae maybe? Dan, maybe you can give us some hints. We're kinda split 60/40 between is it an insect yes or no?

Dan Babbitt: All right.

Maggy Benson: Most people are saying no.

Dan Babbitt: No. I think most people are correct. This is a pretty cool animal. They live in ... it's from the US, but people aren't that familiar with it because it lives [00:17:30] ... it's mostly nocturnal and lives under rocks and logs in the desert Southwest. It is an arachnid. It's a different group of arachnids, a relative of a spider and a scorpion, but it's not a true scorpion. It doesn't have a venom, it can't sting me. But it's a bit of a trick question that we asked, because it has six walking legs just like an insect. There's one, two, three, four, five, six, but you can see it using these antennae-form legs up front to find its way around. These are legs, but they use them like antennae. [00:18:00] Arachnids don't have antennae but they've been really useful for them to have it if they're a nocturnal animal or living in dark spaces. So this group evolved these antennae-form legs to act like antennae.

Maggy Benson: That's so cool. We're kind of learning about different adaptations here even within the arachnid family. Now I think that you have some insects here that have different colors and warning signals. Can you show us some of those?

Dan Babbitt: Sure.

Maggy Benson: I can give you back the Rose Hair too, [00:18:30] although she is very happy.

Dan Babbitt: It's a nice accessory on you.

Maggy Benson: Yeah, I think she's very pleased.

Dan Babbitt: All right.

Maggy Benson: She isn't rearing up.

Dan Babbitt: Since we have the Rose Hair-

Maggy Benson: Or flicking.

Dan Babbitt: Since we have the Rose Hair here, I can show one warning color on her. Flipping her over, we can get a look at her fangs.

Maggy Benson: Oh, they're bright red.

Dan Babbitt: Right, right, yeah, you can see there. Her fangs are right around, she has hairs that are bright red. She wants to get away there. We'll let her get away. Those are ... when she rears up to show her [00:19:00] fangs, she'll have that bright red coloration around her that says, "Don't mess with me. I'm dangerous. You could get hurt if you bite me."

Maggy Benson: Kind of like the ones that we see on the screen right now.

Dan Babbitt: Right, you see that's a wasp or the ladybug, which are showing those bright colorations. You don't think of a ladybug as being dangerous, but if you ate it, it would taste horrible so it's that noxious taste that you're getting from it, or something can sting or if it tastes bad, smells bad, or it can hurt you.

Dan Babbitt: This guy here, [00:19:30] if any of our guests have been down to Florida, you might have seen this. This is a grasshopper, but as you notice one thing it's not doing, it's not hopping.

Maggy Benson: No.

Dan Babbitt: It's staying pretty still.

Maggy Benson: It is.

Dan Babbitt: This grasshopper no longer is a good jumper and it can't fly, but you've noticed that it has these bright colorations. It's a yellow and the red and the black stripes. You think of those black and yellow stripes that you see on a wasp and that means I [00:20:00] could hurt you, it's dangerous. This can't hurt me unless I were to eat it. If I ate it, it could make me really sick and throw up. So it's poisonous to eat and that's its defense. It's broadcasting that by having these bright colors. So it can hang out on plants and not be worried by most predators

and be safe to eat, just because it's showing that it's ... that bright color is showing that it's poisonous.

Maggy Benson: This kind of has the adaptation of color whereas maybe some other grasshoppers fly and hopping [00:20:30] away is their adaptation to be able to get away from predation.

Dan Babbitt: Right. If you ever walk through a field in the summer and these grasshoppers will start flying and buzzing away from you as you're walking, they're trying to get away as fast as possible. These guys don't have to do that. They'll just hang out. You can walk right up to them and grab them because they know that they can make you sick.

Maggy Benson: Do you have any other examples of colors?

Dan Babbitt: You can see the bright colors of this guy's wing too.

Maggy Benson: Oh wow.

Dan Babbitt: He's showing off [00:21:00] that ...

Maggy Benson: It's brilliant red.

Dan Babbitt: Yeah. It flashes that wing. So it will make noise and it will flash that wing when it's in danger and that will make it a better shot at it getting away, him not being preyed upon.

Maggy Benson: So you've shown us a lot of defense adaptations. We've learned about color, we've learned about rearing up, we've learned about flicking hairs, biting, what about feeding? I know that that is an essential part of life.

Dan Babbitt: It is.

Maggy Benson: Are there special adaptations for feeding?

Dan Babbitt: Feeding is very [00:21:30] important. There's a number of adaptations you can have for feeding, and this was a good one to show it because as the book says, this is a very hungry caterpillar. Caterpillars are very good at eating. This caterpillar just about three weeks ago would be about the size of your eyelash or a grain of rice. Three weeks later it's the size of my pinky. They can ... they eat and eat and eat and grow incredibly fast.

Dan Babbitt: This guy has the type of mouth parts that can click through [00:22:00] plants, it has chewing mouth parts. But in a few weeks he's gonna go through metamorphosis and become an adult moth and that moth has a long proboscis that it uses for feeding from flowers. So it will be able to get the nectar deep in the flower where this one doesn't have to worry about that. This one is just

sitting on the plants and being able to chew and chew and chew, where the moth is adapted to have that siphoning mouth part.

Dan Babbitt: You can find [00:22:30] that with different insects with different mouth parts, you can have a piercing sucking, like a mosquito that we shared the picture of earlier, that's gonna be able to poke into you and then suck out blood, or a fly who throws up on its food, it does external digestion.

Maggy Benson: Gross.

Dan Babbitt: And then has a specialized mouth part that's like a sponge. It will sponge up the throw up digested food and take that into its body.

Maggy Benson: Wow. You mentioned that this will turn into a moth that actually has that specialized proboscis, that [00:23:00] mouth part to be able to feed on flowers. That's really important for pollination isn't it? Are arthropods and pollination, do they go hand in hand?

Dan Babbitt: They do. A lot of arthropods are important pollinators. A lot of that is through plants and insects and some other arthropods co-evolving over time. They've evolved mouth parts that fit into the plant and the plant evolves shapes of their flower to fit those mouth parts. A lot of times specific insects are feeding on [00:23:30] specific flowers. So you'll have that moth that is feeding in that flower and it can go dip its proboscis in and then get its head down into that flower and get some pollen on it and it will fly over to the flower, put its head down in there, and they will transfer that pollen from one flower to the other, allowing that species to be able to continue to plant and the mouth gets a good meal.

Maggy Benson: Cool.

Dan Babbitt: Yeah.

Maggy Benson: Monarch butterflies, they're definitely a pollinator and very important for agriculture [00:24:00] in that way, but I've heard that there are some shifts because of changing climate and habitat that they may not be living in the same kind of ways that they used to. How do arthropods and monarchs adapt to climate change and other impacts that are going on right now?

Dan Babbitt: There are some challenges that humans are imposing on our natural world. Monarchs can be affected specifically by some changes in the environment from farming to habitat loss and [00:24:30] possibly to climate change. So if we're having really dry periods, they could be affected by that and not have the resources they need when they're flying on their migratory route.

Maggy Benson: How much of our food actually comes from pollinated plants, fruits and vegetables that require pollination?

Dan Babbitt: It's about a third of our food supply comes from pollinated plants. Things like your berries and your nuts are coming from pollinated plants where a lot of things like bees and other insects are really [00:25:00] important and a lot of them, especially our native pollinators, are in danger.

Maggy Benson: Wow. We have a student question. Are you ready for it?

Dan Babbitt: Yep, sure.

Maggy Benson: Okay. This one comes from Casey from Fresno. They want to know why did you decide to work with insects?

Dan Babbitt: I've always loved natural history and the natural world and I was out in the woods all the time as a kid, and then when I got to college, I knew I wanted to study biology but I didn't know what I wanted to do with it until I took a class freshman year that [00:25:30] was called aquatic ecology and I got to go out into a lake in Michigan and dip a net in that water and pull up super awesome alien creatures, insects, from the bottom of that lake and I was hooked from that time on. I knew I didn't just want to study them, but I wanted to share my love of them with everybody too, so everybody would like insects as much as me.

Maggy Benson: It seems like you've had a great experience with them. We're lucky to have you as our insect zoo manager keeping them all alive and healthy.

Maggy Benson: Leo wants to know how long does it take for an insect to [00:26:00] evolve a new defense mechanism?

Dan Babbitt: Oh, that is a ... it depends on time. It's a lot, a lot of time. That's things that a lot of the scientists here in this museum are studying on looking at how long and what process that insects ... how long it takes for insects to go through evolution. It's challenging, because insects are sometimes hard to find in the fossil record, because they're little and they don't have bones. It's challenging and we sometimes have to look at not the insect, but the effect of the insect, so how it can [00:26:30] be chewing on plants. You might find a fossil of a plant that has chew marks in it, and some of our researchers here at the museum do that and will be able to tell how the insects are evolving over time.

Maggy Benson: Interesting.

Dan Babbitt: Yeah.

Maggy Benson: This one comes from Traeger Middle School, and they'd like to know how many known insects are there in the world?

Dan Babbitt: That's unknown. We have about a million named insects, the ones that have scientific names. It's thought that there's probably about 10 to even 30 million

species of insects in the world today and [00:27:00] alive on the planet at this moment, the number that's used is 19 quintillion.

Maggy Benson: Quintillion. I don't even know ...

Dan Babbitt: It's a lot of zeroes.

Maggy Benson: Yeah. I can't even fathom that. Okay, so this one comes from Shawn Carlson at Thomas Hunter Middle School in Mathews, Virginia. Do praying mantis eat their young?

Dan Babbitt: They can. When praying mantises, when the young emerge, they scatter and the parents usually aren't around so they'll eat anything that is moving and so when you [00:27:30] have a ... oh, here's a praying mantis here. This is a gorgeous mantis.

Maggy Benson: That's beautiful.

Dan Babbitt: It's not purposefully going after their young, but it's ... they're not a ... they don't have maternal care, so if there's something that looks like food to them, they're gonna eat it.

Maggy Benson: Roosevelt Elementary from North Dakota wants to know what's your favorite insect to learn about?

Dan Babbitt: That is a really challenging question, because I get to work with so [00:28:00] many kinds of insects and I get to work in a museum that has a gigantic collection with amazing researchers, so I get to learn new things all the time, so that changes constantly.

Maggy Benson: Do you have anything for our visitors who may have to sign off to tell them about how they might learn more about the insects here that they saw today?

Dan Babbitt: Well, one way to do it is to come to the insect zoo and live butterfly pavilion here at the National Museum of Natural History in Washington, DC. If you're local, come on by. If you're coming on a trip, then you can come visit us and see all the amazing [00:28:30] arthropods we have on exhibit.

Maggy Benson: Wonderful. Thank you, Dan.

Dan Babbitt: You're welcome.

Maggy Benson: If you missed part of this broadcast or you want to watch it again, it will be archived later today on Q?rius.si.edu. Thanks for joining us for the webcast and for our special question and answer session, and thank you, Dan, for being here with us today.

Dan Babbitt: Oh, thanks for having me.

Maggy Benson: See you next time on Smithsonian Science How.

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