Adventures in the Realm of Little Brown Beetles
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Joe McHugh lecture from the Looking for Life: Adventures and Misadventures in Species Exploration Symposium presented as part of the Darwin Distinguished Lecture Series. This symposium series is sponsored by the Arizona State University International Institute for Species Exploration, College of Liberal Arts and Sciences, and the School of Life Sciences.

Transcript

Robert Krulwich: [0:01] First up, from the University of Georgia, the title - Joe McHugh's title - is called "Taxonomic Adventures in the Realm of Little Brown Beetles." The Realm of Little Brown Beetles is not a country that I'm aware of, but it is probably a territory. So, Joe, here you are. Let's hear the story here, and we'll go from there.

Joe McHugh: [0:22] Thank you, Robert, and thank you, Quentin, and the institute for the invitation to come here and talk to you a little bit about some of the adventures that I've had in my search for tiny little brown beetles in most of the neotropics. [0:35] I think it's appropriate for me to make a little connection to the symposium here today and to the lecture later on this afternoon. As a beetle worker, I feel a special connection to Linnaeus. Linnaeus, in addition to describing several new species of beetles, was actually the first person to establish the order Coleoptera, one of the groups that holds up today that he established.

[0:54] And Charles Darwin, of course, we all are familiar with the work he did with finches and his barnacle taxonomy and so forth, but he also was a very avid beetle taxonomist, as well.

[1:03] If you're going to be somebody studying, looking for new species, studying biodiversity, there's no better group probably to work on than the Coleoptera. Insects make up a very large portion of the diversity of life on earth, more than half, as you can see here. But, Coleoptera alone make up a very large part of that insect diversity, and in fact, one out of every five known species of organisms on earth today are beetles. One out of every five.

[1:30] Estimates put the number of beetle species actually alive on earth anywhere from one to three million for conservative estimates, and up to tens of millions actually on earth today. A vast amount of beetle diversity still remains.

[1:45] If you look at beetles, you can't help but appreciate their diversity. Their form is incredibly diverse. Size, color, shape, biology, physiology, behavior, and so forth, are all remarkably diverse.

[1:58] Nobody could ever be a master of all of these different things, so if you're to make any kind of impact, any kind of contribution, you really would need to be an expert on some small little piece of this very diverse group. Of all the beautiful and spectacular options that are out there, these beautiful and interesting forms, this is what I narrowed down on.

[2:17] The LBBs. We in the Coleoptera world refer to these guys as the little brown beetles, or the little brown jobs. These are the things that accumulate in the back of museums in drawers and
drawers of unidentified material. Many of them belong to this one superfamily Cucujoidea, and that's where I've made most of my taxonomic work in the past decade or so.

[2:36] These beetles are also very beautiful in their own way, in their own subtle little way. Each requires a lot more magnification for you to really appreciate their subtle beauty. But this group, Cucujoidea, includes 34 families of beetles and about 9000 known species, and a vast number of undescribed species.

[2:53] Many of them are fungus feeders, or myxomycete feeders, or feed on decaying vegetation of some sort. So this is sort of my schtick here. Creeping and crawling around on the floor of rainforests, usually looking at fungus and looking at rotting logs to collect my critters.

[3:08] So, what I was hoping to do today is to talk to you a little bit about how I got there, and a couple of the adventures and some of the observations that I made doing this kind of work.

[3:17] I was born in Brooklyn. I shed the accent long ago, but I lived there through my grade school years. Brooklyn, for those of you who know it, is not really a biodiversity hotspot. It's never going to be on a World Heritage List. In fact, it's probably famous for its lack of diversity.

[3:32] But, there are a couple of things that happened very early on in my youth, there in Brooklyn, that definitely helped to steer me in my path toward becoming a beetle taxonomist.

[3:41] One was the American Museum of Natural History. It was a bright spot in the middle of New York City that I got a chance to experience during class field trips in first, second, and third grade. I remember being absolutely mesmerized by the museum and thinking, "What a really cool place. Wow, the people who work here must be the luckiest people in the world to do this kind of stuff."

[4:00] I also very distinctly remember walking through Brooklyn and stumbling across a newly emerged, gravid, female cecropia moth when I was in first or second grade. I remember being absolutely shocked at this creature, thinking it had come from outer space or something. In the middle of all the sidewalks and all the garbage cans, there was this absolutely gorgeous creature, fluttering around there on the ground.

[4:25] I remember I finally got enough courage to pick it up and bring it back home. I put it on a bush and watched it for hours until a bird came and ate it.

[4:32] [laughter]

Joe:  [4:35] The next time I was at the American Museum, I was passing through the gift store, and I saw Holland's book on moths, "The Moths of North America." I grabbed my mother, and I begged her, "Mom, you've got to buy this! This is an entire book just about moths." I couldn't believe there were such things as books just about the moths of North America. [4:52] For once, my mom's pat response of, "No, we don't need it. We're not going to get it." She broke down and she bought the book for me. That book still sits in my library at work, and I've used it an awful lot. It's ragged from all the use that I gave it.

[5:06] My family went to the Adirondacks in the summertime for vacation. I was very lucky. I would go native when we got there. I'd disappear into the woods in the morning, and I'd come back late at night. I'd basically just enjoy nature to the extent that I could.
[5:19] That moth book and that cecropia moth had me standing out as a young kid under the streetlights, waiting for the moths to come down. Spiraling, spiraling. I had no equipment. I caught them in my hands. I put them in little envelopes, brought them home, pinned them up, then looked them up in my book.

[5:35] That's sort of where I got started with my bug collecting. I learned a couple of important lessons then, like the night that I accidentally grabbed one of these. This is a dobsonfly. I was a young kid, and I thought it was a moth. It was flying around; I grabbed it in my hands. I ran over to the light to see what it was, and all I saw was that big head and those big mandibles coming out and waving around.

[5:53] I screamed. I threw it in the air, and I ran as fast as I could back home and left all my gear there. I learned eventually that was a dobsonfly, and that it was completely harmless. That was one of my first chances to appreciate the fact that some of the things that are really scary out there about nature aren't really scary at all, or dangerous at all.

[6:11] Some of the things that are really kind of cute and cuddly looking are really quite dangerous or not very nice. So, these are megalopygid caterpillars. They look like little tribbles. You just want to reach out and pet them. If you did, you'd be making a terrible mistake. You'd get a nasty reaction from the urticating hairs that they have.

[6:28] Later on in life, I still was pursuing insect taxonomy, but in a more formal way. I went to Cornell University and had the pleasure of running into this gentleman, Quentin Wheeler, your director of this institute, your dean and vice president.

[6:41] Quentin, at the time, was studying a bunch of slime mold-feeding beetles in the family Leiodidae. He showed you a couple of examples there with the Bush, Cheney, and Rumsfeld patronyms.

[6:52] Quentin hired me to be a technician in his lab, and this was my first experience with looking at little beetles on rotten logs and looking at fungus and slime molds and things, and doing some beetle taxonomy identifications.

[7:04] One day this critter came in. I was unable to identify it. It would not key out in any of the books that I used, and I showed it to Quentin. Quentin was not sure what it was. I showed it to Rick Hoebeke and Jim Liebherr; they weren't sure what it was.

[7:18] I was thinking, "This is a beetle from the United States. This is something that was from Virginia, and three prominent coleopterists can't tell me what family it's in."

[7:26] I thought, "This is really amazing. It's really amazing. Right here, in the United States, there's a beetle here that you can't tell what family it belongs to."

[7:33] I looked more into it and eventually figured out that it was in the family Sphindidae. That sort of attachment to the fact that this is a very poorly known creature, right here in our backyard, led me to go on and get my master's degree studying Sphindidae.

[7:47] It turned out to be a great little master's degree project. Three new genera were described from that and 12 new species, including a few right from the United States, some that are right in my back yard in Georgia and up in New York at the time, were new species described in that work.
[8:01] Lesson number two: You don't have to go to exotic places to find frontiers in taxonomy. You think small and you look at cryptic creatures. They are still right there around you, unless you know enough about a group and you have adequate microscopy facilities, you can find wonderful new taxons right under your nose.

[8:19] Quentin also took me on my first field trip. We went to the Blue Ridge Mountains looking for his leiodids, and we came across this critter, Tachycineta bicolor. It was a new species at that time. We knew it was a new species, but we were looking for leiodids. We caught seven or eight or so of them, and we vowed that we would describe this thing when we got back home, as soon as we had a chance.

[8:37] Four or five years later, we started to draft up the manuscript to describe it, and I happened to be driving down back by the Blue Ridge about that time. I decided I'd swing back over and get a lot more specimens and maybe get some larvae too, to include in the paper.

[8:51] On the way through there, we returned to the same habitat. If we go back for a second here, you can see the habitat was in the high elevations in the fir forests on fungusy logs and branches along the floor of the forest.

[9:04] When I returned just about five years later, this is what it looked like, the very same place. The trees have been killed off by the balsam woolly adelgid and atmospheric pollutants. Now, instead of being that misty, dark, wet, fungusy, forest, it now is an open sunny field full of weeds and butterflies and bees and flies. My wife and I stayed there, Roxanne came with me, and we stayed there for two days looking and we only found two more on that trip.

[9:30] Rule number three I learned right there, that I've learned many times since, is you've got to make hay when the sun is shining. Populations rise and fall, the weather changes, the habitat changes, so make use of any opportunities you get to study and to collect taxonomy, when they are out and around. Again, this is sort of my MO. It's creeping around in usually wet tropical places looking for fungus feeding cuca joy beetles. It's dirty and it's sweaty, and I kind of love that about it. And you get out of the office, you've got the jacket and shirt put away, and you get out there and just crawl around in the mud again and have lots of fun.

[10:04] When I tell my friends about this, I tell my family about it, they always ask me, "What's the scariest thing that's happened to you? You know, with the scary creatures that you run into out there?" So, I just want to click through a couple of the scary things that we see out there and try to put them into perspective a little bit. You go out in the field, you're going to get chewed up. The mosquitoes are going to get you, the various different stinging hymenoptera are going to get you. You'll get blisters, bruises, all kinds of little nicks and dings. It kind of comes with the turf and it's not all that big of a deal. You're usually healed up again a couple of weeks after you get back.

[10:37] Getting lost, that's kind of scary. Now with GPS systems, it's probably a lot less likely that you're going to get lost. I spent a memorable night or two trying to crawl my way back to the station after a night of nocturnal collecting, before GPS and after flashlights had burned out and I was at an unfamiliar place. Those were quite exciting nights.

[10:55] Quicksand. People love this. Quicksand, wow! I've run into quicksand and mostly it's been a source of entertainment. Creeping and crawling around logs, peeling bark, rolling logs and things, you come across kinds of arachnids and other kinds of arthropods that bite and sting.
and pinch. For the most part, I've had no kinds of problems with these things, although they
terrify people, typically.

[11:19] Crawling around in brush and around logs is also a great place to run into all kinds of
venomous snakes. Some of the other places we go we run into crocodiles or into alligators.
Again, they don't want to bother you usually. As long as you don't step on them by accident,
you're usually OK. So, I really don't worry much about these guys when I'm out in the field.

[11:39] Parasites. We get these. These do bother me. Ticks and terrestrial leeches and chiggers
and bott flies and things like that. You get them, you get rid of them. They're more of a high
ick factor and a nuisance, but not any real serious problem.

know they're around, I see their footprints. I know that they've been photographed in the places
that I've been. Never seen any. They don't want to be seen by you and they keep out of sight. So
those are not the kind of things I really worry about, rather [inaudible 12:15] from the
Smithsonian.

[12:16] What I do worry about is being wet all the time. Why is that? The human body wasn't
made to be wet all the time. I'm using Ted here as my model. Sorry Ted, if you hear this. This is
in [inaudible 12:29], Costa Rica. When you're up in the tropics in the rainy season, out in
fungusy type places, it pours all day. It pours when you're out there. The trees are dripping the
whole time you're out there. You never dry out. If you have a field station you can go back to,
you can change your clothes. You can try to dry yourself off. But, in some cases we're out in the
field camping, and you can't go back and dry off. You very quickly don't have anymore dry
clothes to put on. So, you're wet a lot. That leads to problems.

[12:51] Trench foot. Sounds funny, not fun at all, very, very painful. When your feet are wet a
couple of days in a row, it becomes painful even to walk, sometimes. But again, this kind of
thing clears up very quickly once you dry out. And you become a substrate for fungus. Any kind
of fungus you can think of seems to be able to make a home on your body if you're wet and
warm for any length of time.

[13:13] So, it's an interesting little biological story here. You have fungus out there. You've got
the beetles that eat the fungus out there. Then you've got the fungus who eats the biologist who
collects the beetles that eat the fungus. It's the circle of life. It's a beautiful story.

[13:31] These guys, though - often times people don't really think of these guys as something to
be worried about, but I actually do worry about [inaudible 13:39]. They ruined a couple of trips
for me - not trips, but they've ruined a couple of days for me, certainly. Army ants have chewed
me up and made me look like a plucked chicken on a couple of occasions. Fire ants have
certainly made me miserable.

[13:50] These nocturnal vespids that you see here, Apoica, these yellow guys, are nasty. Bullet
ants, and even [inaudible 13:58] yellow jackets and things, can make you miserable if you
stumble into a nest of them or have a swarm pass over you.

[14:04] This is a picture from [inaudible 14:06] and their black lighting done by a river.
Moments after this picture was taken, this poor gentleman right here was stung by one of those
nocturnal vespids. We were two hours away from any hospitals and he started to have an allergic
reaction. He broke out in hives, was sweating. He started to have difficulty breathing. We packed up and we raced back to the station and pumped him up with some Benadryl and sat up with him with an EpiPen wondering if we needed to stick him that night. It was a very scary moment, for a few minutes there that was just from a sting and an unexpected allergic reaction from that wasp.

[14:38] So, those things stung us up pretty much every night we were out there. That poor fellow had not been along with us before and he suffered from it.

[14:45] This is a little place in Bolivia where some friends and I set up a tent and we were doing some field work in the jungle around there. For three nights in a row, army ants poured out of the forest and poured across the forest floor and tore us up. Much to the delight and entertainment probably of the people who were living around the square here. The first night it was a surprise. They kind of ambushed us completely by surprise. The second night we got a little bit of a head start running on them, and we got tore up a little bit. The third night, we were waiting for them. Then we got out of there.

[15:18] I had a trip to Jamaica with Quinton. Quinton took me there shortly after I graduated from my undergraduate studies. People talk about their first trip to the tropics, biologists, and they usually talk about that first experience in the tropics being this mystical, magical experience, life changing type of event. Mine was not that way. My very first one was not exactly that way and that was in Jamaica.

[15:39] Quinton and flew into Montego Bay and then hopped over to down on Kingston. We stayed up here some place in a field station that was advertised in a reputable journal. We had hopes of going to the Blue Mountains to do some field work. It turns out that the field station was just a hotel. The field station manager was a professor at a university there who was busy with his job. The field station vehicle was his personal car, which was with him when he was at work. We were able to go off in the field and actually see these mountains only a few times.

[16:13] It was a disappointment from the get-go. The grand finale - I could give you a half hour talk on this trip to Jamaica, honestly. Later on, if you want to go have a beer afterwards, I'll tell you some more about it. But, the last 24 hours of this trip involved us waking up and realizing that a guide we were forced to hire to go along with us on one of the trips had actually robbed our traveler's checks. While we were off in the woods collecting, he was going through our bags. So, we had to get to an American Express Traveler's office the morning we were leaving for our flight. We had to go and wake up our host, banging on the bars of his house and rouse him to get us to the American Express office.

[16:50] We got there, eventually, and then we eventually got to the airport only to realize that our tickets had also been stolen. But, they had been stolen by somebody who worked for the airline the day we arrived. Because our tickets were separated at that point in two different places. The same ticket was stolen out of both of our booklets. It was the return trip from Kingston back to Montego Bay. So, our plane was sitting out there, people are boarding. We're trying to explain that we are standing here. The people who are on the plane have the stolen tickets. He is not Quinton Wheeler, and he is not Joe McHugh, we are.

[17:25] But, the plane was allowed to board. They were allowed to take off and we were left in Kingston to try to catch a later flight. We eventually got a later flight. We flew to Montego Bay, got there having not eaten all day and we were both famished. A mere half mile down the road or
so was a Kentucky Fried Chicken. We thought, great. We're going to run down there, we'll get a quick bite to eat then come back home.'

[17:45] As we walked out the hotel, the guy at the front desk said, "You need to hire a guard to go down to the Kentucky Fried Chicken. We looked at him and it was right down the road there. We thought, the last guard we hired didn't work out very well, so we're just going to go. We walked quickly down to the Kentucky Fried Chicken. It was not a pleasant walk. We were not received very well. On the return trip, we were jumped by armed muggers. A car pulled up alongside of us, a bunch of guys jumped out and we ended up running for our lives back to the hotel, grasping our Kentucky Fried Chicken. I was so terrified from that event, I actually couldn't eat that night anyway. It wasn't until the next day I was actually able to eat something.

[18:22] We were kind of happy to see that in our rearview mirror and go on to the next leg of our trip, which was Tambopata Peru. Things were completely different there. In Tambopata Peru, all of our connections were at that well. Facilities were very, very nice, and we had fantastic luck. This was the experience that people talk about.

[18:39] I walked out into the forest, and there were things flying in there I'd only read about and lots of things I'd never read about. The diversity was incredible. The scenery was beautiful. It was just an absolutely wonderful experience.

[18:49] It was the first place where I had one of those "Aha!" moments. We were cruising along the river at one point, and I saw a cleared area that looked like a perfect place to find slime molds. So, we stopped the boat and hopped out, and within a couple of minutes found slime molds and found this beetle here, which I knew immediately was a new species and a part of the new genus I was describing.

[19:09] As a young kid really just getting started, it was a wonderful moment. The first new species that I actually knew the minute I saw it that is was something special. That one I named after my poor wife, who had to put up with a lot of these different adventures over the years.

[19:21] Tambopata was also where I fell in love with a new love, and that was the erotylid beetles, down in the dark corners of the jungle in these little crevices, crawling around on fungi, were these absolutely beautiful little gems, spectacularly beautiful beetles, also with very poorly established taxonomy, and so these ultimately became the subject of my PhD dissertation. It's a group that I still work on today.

[19:45] So, Lesson Four: local arrangements can make all the difference. A well-advertised facility can't necessarily be trusted. Call your friends; ask them whether they've been there. Get good recommendations.

[19:56] Travel is always exciting when you go out and do fieldwork, whether you're on the Highway of Death in Bolivia or just in the back country roads. You will have delays. There will be roads that are washed out. You'll have flat tires. You'll have trucks stuck in the mud. You'll have protests and strikes and things. Got to be mellow, be flexible, be willing to change your plans whenever you need to.

[20:17] One case this came up, where it was a very important change of plans and a very kind of lucky break, happened when I was in northern Peru with Jose Santisteban and Pablo Goloboff. We planned to do a little bit of collecting in northern Peru, and we were going from the coast up
into the mountains. Then we were going to come down through the montane rainforest and do collecting along the way.

[20:38] Jose was a Peruvian, and he had been there about five years earlier, and said it was fantastic habitat, wonderful place, great place for us to make our trip. So, we started up through the mountains, weaving our way up through the mountains, higher and higher. We got to a pipeline that was along the road, an oil pipeline that came from the Amazonian side over to the coast.

[20:58] There're a lot of dead trees along the pipeline with a lot of fungus growing on them, and I stopped there to look for my beetles on the fungi. It looked like a perfect spot for them. I was crouched down in the bushes, doing my thing. I had my bag, and I was busy picking away at some logs around the pipeline, and I heard a twig break behind me.

[21:15] I jumped up, and when you're out in the woods, you always look around when you hear things moving around and jumping. I turned around, and I saw a young kid, a teenager, standing there with an army uniform on and a gun pointed at me.

[21:27] He was shaking. He was scared to death. I was holding a vial, and I was holding a pair of forceps, and, I think, a beetle. I slowly turned and showed it to him, and I told him that I was a biologist from the United States. I was here collecting beetles.

[21:40] He asked me a lot of questions before the gun finally went back down again. He told me his job was to guard that pipeline. Here I was, a guy sitting there with khaki clothes on and some equipment, crouched down under the pipeline.

[21:52] That was exactly what they trained him to look for. It was a very scary moment with my broken Spanish and him looking at me down that pistol before we became friends and chatted.

[21:59] What was interesting out of this was that he asked where our next stop would be. I told him we were going to Tarapoto, and we were going to go to Tingo Maria after that. He got a big smile on his face, and he said, "Gringo, you're crazy."

[22:11] He said, "I don't even go there. They know that I'm a soldier. That whole area is run by the Sendero Luminoso right now. The Maoist rebels own that part of the country."

[22:22] He said, "You are an obvious gringo. There's no way you could even drive through there without them seeing you. They'll catch you up there. You can't go there."

[22:29] So, I went back, and I talked to Peppy and Pablo. Peppy had no idea that things had changed since he was last up there. The day before we were about to leave for that part of the country, we turned around and we made a different path. It was very, very fortunate that that young guy was out there doing his patrol and ran into me that day.

Lesson Five: [22:46] Your carefully scheduled travel plans will change. Returning from Tambopata, I've another story back on the tail end of that. Quentin and I were coming back from Tambopata. We had to fly through Cuzco. I arrived in Cuzco with an extra bit of luggage. I had a case of dysentery starting right about the same time a bad storm came in.

[23:06] Cuzco sits in a little bit of a bowl with high mountains around it. Hard to fly into, hard to fly out of. When bad weather comes in, all planes are canceled, and you're kind of stuck there.
After four days, I felt like this. I think my skin was this color. I was so sick, I was standing there, holding on to the counter just to keep from falling over. I was shaking. I was sweating. I was running to the restroom every 15 minutes, and all the other tourists who were trapped there were just looking at me. They took pity on me. They were bringing me pharmaceuticals from around the world.

Joe:  I was taking anything and everything. Finally, on that fourth day, Quentin had had enough. He was very worried about me. He actually forced his way into a manager's office and demanded... One plane was getting out that day, and usually that one plane was filled with people who had connections. He got us onto that plane and, fortunately, some of those medications finally kicked in, because the plane had no facilities. It was an hour-long flight, and I still had a little shred of dignity left that I wanted to preserve.

We got out just in time, but this is one of the scary things about traveling. It's one of the things I actually fear more than any of the animals, is us getting a disease, sort of being back some place, getting injured, or getting sick.

In Las Alturas, I had an open compound fracture of my ankle. Nothing to do with doing fieldwork, nothing to do with being out there in the wilderness. I fractured it starting the generator for the station one night.

I came home late at night. The station was dark; everyone was sitting around. I was the only person who could start that old beast. It had a great big steel handle you had to wind up; then you had to pop a clutch on it and it would start up.

This one night, it flipped the handle off, spun around, and it cracked me on the ankle and fractured my ankle. It was two weeks before I was planning to go back home. I had a whole bunch of rearing cages set up that I had taken weeks to get going.

I just thought it was a really bad cut and bruise, so I kept it clean and I kept it covered. But, by about the end of the next week, I realized that my ankle was growing larger and larger, that it was more serious than that.

When I got home, I was given a long lecture by the doctors at the medical center for being very, very stupid, for not coming back immediately. Injuries like that are a serious concern. Easy to get infected, easy to have serious problems from any kinds of cuts and injuries.

There are a lot of scary things out there. The scary things that are out there are not the scary things that people usually think of, though. What brings me out there is the thrill of the adventure, the excitement. Part of that is why I go out there. It's fun to kind of not know what you're going to see next, see these beautiful places, see these beautiful creatures, have a change to experience nature up close and personal.

I want to just close with a couple of final notes. One is that my path to becoming a taxonomist had a lot of luck, a lot of fortune, involved. People who I met, mentors along the way, who were really helpful and supportive to me. Little events that kind of got me pushed in one direction or another. It's just kind of interesting, the different little steps that put me where I am today.
I want to bring you all the way back to New York City, to the American Museum, again. Back when I was a kid visiting there, I remember being mesmerized by the museum. But, when I was a graduate student at Cornell, I had a chance to go back there for a week or two to do some work in the museum.

One night I was working late. I was working in the scanning electron microscopy facility, I think, and I got out late. The museum was closed. The elevator that I usually rode was closed for service, so I had to come down a different elevator than usual.

I had to walk through the museum after hours. I remember walking through the dimly lit museum, and I stopped in front of this diorama. I remember I stood there, and I got cold chills because this diorama was etched in my memory. I remembered it from when I was a second grade, third grade kid standing there at the museum and looking at these old copies, thinking what strange beasts they were, what beautiful and odd creatures they were.

It was a really special moment for me. I try to think what that little boy would have thought knowing someday he'd actually be back there at the museum as a scientist, one of the people who he thought would be really cool to be someday, actually being there and doing that kind of work.

Interesting taxonomy and biodiversity develops early. As a parent, I think of this often when I see kids with their Xboxes and their iPods and all their indoor electronic entertainment. I think, "I spent my days out there in the country. I spent my days wandering around the woods up in the Adirondacks," and that's where my love and appreciation for insects and their diversity really grew.

I worry a little bit where the next generation of our taxonomists are going to come from. I can't imagine it's going to be those kids who are growing up on electronics indoors. But, I hope that I'm wrong.

But anyway, I'll end there. I will rest this journey.

[applause]

Announcer:  This lecture is part of the Arizona State University Darwinfest, and is sponsored by the Institute for Species Exploration, the College of Liberal Arts and Sciences, the School of Life Sciences, and is a production of Grassroots Studio.