Ask-a-Biologist Vol 051 (Guests: Vicki Funk and Richard Pyle)

New Species Hunters

From high on top of the Tepui mountains in South America and into the depths of the Pacific Ocean, Vicki Funk and Richard Pyle search the globe looking for new plants and animals. Dr. Biology has a chance to learn some interesting things about exploring for new species - like what is the Smithsonian Diet and how to lighten the mood when surrounded by hundreds of sharks.

Transcript

Dr. Biology: This is Ask A Biologist, a program about the living world, and I'm Dr. Biology. My two guests might not seem to be linked, at least not at first. Vicki Funk is a senior research botanist and a curator at the Smithsonian Institution. Yes, the same Smithsonian you might have heard about in Washington, DC. And as a botanist, she's very interested in plants.

My other guest is Richard Pyle, who's part of the Hawaii Biological Survey. He spends a lot of time in the ocean - and from what I've learned, in some very deep parts of the ocean - studying fish and how some of them pretend to be other things.

So, what links these two scientists? You might be asking that question. They're both looking for new species and in some very exotic places. They're also very busy building computer systems that will help scientists know what they've found.

I want to welcome you both. Vicki, thanks for coming.

Vicki Funk: Thank you for asking me.

Dr. Biology: And welcome, Richard.

Richard Pyle: Thank you, very much.

Dr. Biology: Now, with Ask A Biologist, I have to admit and apologize that we've been very animal-centric. So I was really excited that I got to have Vicki on the show. What kind of plants do you study?

Vicki: I study a family called a Compositae, which is interesting because the name describes the group. The flower is actually a composite of many flowers sitting in the same place. So you have a composite, inflorescence, and the family is called a Compositae.

Dr. Biology: A Compositae, OK. And for just the average person, what would be the name of the plant?

Vicki: I can give you several very interesting plants that belong to this: the sunflower, lettuce and thistles.

Dr. Biology: And thistles.

Vicki: And dandelions.

Dr. Biology: Oh, and dandelions? Well, the dandelions, I hate to have in my yard.

Vicki: [laughs]

Dr. Biology: And the sunflowers, these would be the same kind of sunflowers like my wife likes to plant in the backyard?

Vicki: Exactly. If you look at it, and if you watch the birds on it, you will see that each of those sunflower seeds is a separate flower. And you'll watch the finches hanging on the edge of the sunflower head, leaning over and picking the seeds out one at a time.

Dr. Biology: OK. Well, so you have been studying these composites. And my question is, why? What got you turned on?

Vicki: I think what turns everybody on in biology is they find some question that they can't answer. I had a question about how so many sunflowers came to be. There are 25,000 species of sunflowers. I wanted to find out why there were so many. And that led me into looking at the field of study called taxonomy, where we name things and we look at how they're related to one another.

Dr. Biology: Twenty-five thousand, wow. There are a lot of cities that don't even have that many people in them.

Vicki: That's right.

Dr. Biology: OK, 25,000. They're not all in my backyard.

Vicki: No. They're everywhere except Antarctica...

Dr. Biology: Everywhere except Antarctica.

Vicki: ... today. And they used to be in Antarctica.

Dr. Biology: So you're going to tell me you do some traveling?

Vicki: A lot.

Dr. Biology: A lot of traveling.

Vicki: A lot.

Dr. Biology: Well, this is part of the theme of the show. Because being a scientist, especially a biologist, could be the greatest career for travel and exploration anyone could have. So, name a couple places you've been that are pretty exotic.

Vicki: Tibet.

Dr. Biology: Tibet.

Vicki: I would say the next most exotic place would be the tops of some of the mountains in South America, because some of the plants I work on actually grow in the melt water that comes off glaciers. So, you have to climb all the way up to the glacier in order to collect them, just the opposite of what Richard does.

Dr. Biology: Right. Actually, you're a perfect guest. [laughs] It turns out that you're going off to these exotic places, but you're traveling all over the globe. And Richard, you really aren't traveling that far, but you are traveling really deep.

Richard: Well, it's interesting. I actually do cover a lot of horizontal ground, except I shouldn't say "ground" because it's ocean. The Pacific Ocean is the largest body of water on earth; it covers a big chunk of it. So, traveling from one side of the Pacific to the other is a much farther distance than traveling, say, from the United States to Europe. It's a very big area, and I have been all over, including the Indian Ocean. However, what's really fascinating to me about what I do is that we can get on an airplane and fly halfway around the world, all the way around the world, really easily. We've been able to do that for decades. But my world, a few hundred feet below the surface, has somehow been almost impossible for us to get to. So horizontally, we can move thousands of miles. Vertically, we're separated by a barrier that's less than a football field.

Dr. Biology: Right. So, I've read that you're a scuba diver. We have a lot of questions that come in to Ask A Biologist, and that fascination with the ocean is definitely there. But to actually be able to dive - and you don't just dive like the everyday kind of, what would you call...

Vicki: Recreational diver.

Dr. Biology: Yeah, recreational diver. You dive to crazy-deep places, I mean crazy-deep.

Richard: Deep is a very relative term. In my world, in the scuba diver's world, deep means anything more than about 100 feet below the surface. The ocean goes seven miles deep. Now the deepest I dive is about 500 feet, which, to a scuba diver, is jaw-droppingly deep. But to a submarine, it's nothing; it's just a tiny, little distance. So in a sense, yes, in the context of diving, I do go quite deep. In the context of the Pacific Ocean, I barely scratch the surface.

Dr. Biology: So if you dive to 500 feet, are you using those exotic gases, the ones that make you sound like a chipmunk?

Richard: As a matter of fact, I do. [laughs] For a lot of complicated reasons, helium is a good gas to breathe when you go down underwater where there's a lot of pressure. And so when we talk to each other underwater, it's really quite silly. We sound like Mickey Mouse or the Chipmunks babbling to each other. And it's funny, because I've been in situations where we've been surrounded by sharks - like hundreds of sharks, 400-feet deep, in some remote reef in Papua, New Guinea - and our backs are up against the wall. We're very nervous, and then somebody says, [speaks in high-pitched voice] "What kind of sharks are those?" And it just takes all the tension out of the situation, instantly.

Dr. Biology: [laughs]

Vicki: I would also like to point out that, just recently, I was reading an article about the Pacific, because I do some work on the islands, the terrestrial Pacific, and I was surprised to find that two-thirds of the marine diversity of the globe is found in the Pacific Ocean.

Dr. Biology: Wow, two-thirds.

Vicki: Yeah.

Dr. Biology: Amazing. All right. So, crazy-deep or something, without having a submarine, 500 feet, what are you looking for that's down there?

Richard: Well, that's a really interesting question. As it happens, our ability to explore this world is sometimes limited by our technology. And historically, technology has allowed us to sample very deep water in the bottom of the ocean by dragging nets across it, trawls. But we can't do that in coral reefs, because the coral reefs have so many sharp rocks and things that the trawls get hung up. So, the way you get into coral reefs is you drop a baited hook, a hook and line, but only the large fish will take that. Coral reefs are dominated by little, tiny fish that would never take a baited hook.

Dr. Biology: How tiny are we talking?

Richard: We're talking, some of them are less than a quarter of an inch long as adults. Some of them get quite large, but the large ones are usually caught by hook and line, so we already know about them. But the many, many, many that we don't know about, you really have to go down there to find them. Now, one way to get down there is with a submarine. Everyone is familiar with a submarine. Submarines are great, except for two things. One, they're extremely expensive, sometimes $40,000 for one dive. That's a lot of money just to spend a few hours down there.

Even if you have that money, when you get down there, you're inside a giant metal sphere, looking through a tiny window. You can't really get into the coral reef. You can't take a submarine into a cave because if it gets trapped, who's going to come rescue you? So, submarines are very limited on coral reef environments. A scuba diver, however, can get right there inside the coral reefs.

One of the interesting things about what I do is I use something called a rebreather. Now, a rebreather recycles the same breath; you exhale it and you re-inhale it again. It scrubs out the bad stuff and replaces the oxygen. It's wonderful. It's actually very old technology; it's been around longer than scuba.

The problem is a rebreather has a variable oxygen percentage. When we breathe, the main thing we need is oxygen. In a rebreather, if you're re-breathing the same breath over and over, if you use up all of the oxygen, you could die.

So you need sophisticated electronics to monitor the oxygen and replace it when it's needed. Those electronics haven't been around in a reliable way until the last couple of decades. This new technology of electronics, which we can fit into small spaces, allows us to build rebreathers that let us breathe these helium mixtures much more safely down deep.

Dr. Biology: Your little fish, are they colorful?

Richard: Many of the fish we find are incredibly colorful, probably some of the most colorful organisms in the world. When you see these paintings of coral reefs, you always see these incredible, colorful fish. Some of the ones that live down deep are some of the most colorful of all. However, a lot of them are really quite drab; they're just brown and gray and they live inside caves. And you would almost never notice them, if you didn't know to look for them.

Dr. Biology: So I go back to Vicki with her plants. I can look out and I can see plants that are very, very colorful, too, and some that would be described as drab.

Vicki Funk: Grasses would be drab.

Dr. Biology: Right. So, what's nature doing here? We've got some color going on, and other times we don't. Is it the same thing for plants and animals?

Vicki: I don't know. I mean I can say that for plants, the ones that I work on, the color is definitely related to reproduction. You have bees that are attracted to the plants. You have birds that are attracted to the plants. The plants that are drab are often wind-pollinated. So, the wind comes along, blows the pollen; they don't need bees or birds, so they don't have to be colorful. That's a primary, driving force in the evolution of some of these.

Dr. Biology: OK. So, the plants are trying to attract the animals to help them pollinate so that they can have more plants.

Vicki: Exactly.

Dr. Biology: OK, that's great. What's going on with these fish?

Richard: Well in the fish world, a lot of the fish, it's for the same reason. The same species need to be able to spot and recognize each other; the colors are a good way to do that. In fishes though, there are all kinds of fascinating examples of color patterns that are meant to do other things. For example, the butterfly fishes, which are what a lot of people are familiar with: They're the very pretty, colorful fish you see in aquariums and things like that. A lot of them have a black spot near their tail and a black stripe running through their eye. You wonder, why is this pattern showing up again and again?

It turns out, by obscuring their eye with a black stripe, and putting a false spot near their tail, a predator will think they're facing the wrong direction and expect them to swim in the opposite direction than they actually swim.

So when a predator strikes, it's expecting to move in the direction of the eye, because the predator's evolved to recognize what an eye is and that's the direction the fish will swim. But the butterfly fish will bolt in the opposite direction, because the eye is camouflaged and they have a false eye near the tail.

Dr. Biology: You also do some work with fish that not only has camouflage, but they also can change the way they look so that they appear like something else. We call it - I think it's a good word for people to know, mimicry.

Richard: Mimicry, right. That's one of the areas of great interest to me. I find that to be one of the most fascinating things that shows up again and again in coral reef fishes. The reason I find it fascinating, is some of these examples are so precise they fool scientists. I'll just give you a few examples of these things. There's a little wrasse called the cleaner wrasse. A wrasse is a little fish, cigar-shaped, that swims around. The cleaner wrasse's job is to swim around cleaning parasites off of big fishes. So, big fishes have learned to come up close to these little cleaner wrasses and allow themselves to be cleaned. The cleaner wrasse gets a meal and the big fish gets its parasites removed.

There's another little fish that's in a different family, the Blenny family, that looks exactly like the cleaner wrasse. It'll swim up to a big fish, and the big fish will mistakenly think it's about to be cleaned. The little Blenny comes up and takes a little bite of flesh out of it - it's a carnivore; it's got these big-fanged teeth - and then darts away before the big fish knew what even hit him.

I've been fooled by this fish. And the way I found out is I've caught what I thought was a cleaner wrasse, put it in my hand. Bam! It bit me on the finger. It hurt like crazy.

Dr. Biology: Wow. OK, well that is a true lesson that you, I hope, didn't repeat.

Richard: Oh, absolutely.

Vicki: Dr. Biology, I'd like to point out here that plants do something very similar.

Dr. Biology: Right. I was going to ask. Plant mimicry, let's talk about that.

Vicki: We don't call it mimicry, because it's not an exact replication. But, plants living in the same environment can look like one another when they're not related because of the environment. So in the desert, you might find a lot of plants that are fleshy and hold water. Other environments would be like Mediterranean climates, like you have in Europe or in the West Coast of Australia - all have similar environments - Southern California.

You find many plants that are native to those areas that are similar to one another, because they have learned to live in that kind of a very specific climate. We often call that convergent evolution, because there are things from very different groups that converge onto the same appearance but in reality are not related.

Dr. Biology: Somehow I'm not surprised. Mother Nature seems to do very clever things. All right, we talked a little bit about Richard's travels, and some of the exotic places. You mentioned, Vicki, that you've been off to Tibet. What's the coolest place you've been to?

Vicki: The tops of the tepuis in northeastern South America. These are the lost world of A. Conan Doyle, huge table-top mountains that rise up out of the rain-forest, right on the equator. Many of them are flat on top, and there's a completely different climate on top of these than you have below. Getting to the top, however, can be very difficult. We often use helicopters as the fastest way to get up there. They take you up, they drop you off, and they go away. They come back at some point in the future, hopefully, and pick you up.

We have been stuck without any food for a while, but you know we all could stand to lose a little weight. We call it the Smithsonian diet.

[laughter]

Dr. Biology: As a bunch of botanists, you should be able to find some plants to eat, right?

Vicki: I can say we had an invertebrate biologist there who worked on worms, a bird biologist, a plant biologist and somebody who worked on moths. There's nothing to eat on top of these mountains.

Dr. Biology: The moral of the story is to make sure that round-trip ticket is really working.

Vicki: The real moral of the story is know who's flying your helicopter. [laughter]

Dr. Biology: Both of you have this real exciting part of your lives. I'm not going to say that what we're talking about next is not exciting; it's just a shift. We use computers everywhere. As a matter of fact, sitting on the desk right here is my iPhone which is, quite frankly, a little computer. And it's really interesting what's happening with computers nowadays.

One of the things I've noticed is that we can collect a whole lot of information like we've never been able to collect before, but that seems to be a bit of a problem right now. So, both of you are working on how we deal with all this information we're collecting and how we're going to use it, so we can actually learn what's going on and we can deal with taxonomy and a lot of these things.

So, let's see here. Vicki, what have you been doing?

Vicki: Well, I would say it falls into two categories, one more useful to people and the public than others. The first one is where we are just data basing the information found on the labels of the plants or animals in our museum. These data are mostly useful for people doing research. On the other hand, we are scanning in images of these organisms, we're putting up our photographs from the field and we're matching those to the entries in the database. That's the transformation from being something useful for science to being something you can Google and find when you need it.

Dr. Biology: Right. The whole world now can come to your front door, so to speak, and look through your collection. But there's more to it, right?

Richard: I would say what Vicki just described is exactly the world I live in as well. It's getting items data based; digitized is a general way of saying it. So, you have labels from specimens entered into a computer database. You have images that are scanned and can be put up on the Internet. One of the areas I've been working on a lot lately is, how do you connect all this information together? Right now, we've got these great big buckets of information scattered all over the planet, and we're reaching out little tendrils between the buckets to try to connect them to each other.

We still mostly live in a world where a human has to make those connections and match them up. But we're quickly transforming into a world, thanks to the Internet, where we can have these databases connected automatically. So, you can go to someplace like Google or some other website, do a search and bam, have instant access to all the museum collections, rather than going to ten different museums and seeing what each one has.

Dr. Biology: Do you see these databases getting sophisticated enough so that if the next door neighbor is interested in something, they can actually find out what they just discovered, say, in their backyard? Maybe it's one of those great sunflowers.

Vicki: There are movements in that direction, but very difficult to do. To do that, somebody has to sit down and put into a database all of the species that you are talking about, all of the characters that you are talking about, and make a big matrix. Then on the screen, it looks very simple. In Western Australia, they have a wonderful one going. They have one in New South Wales in Australia. You can identify any plant. You can go online, you can hold it in your hand and you can say, "OK, this has yellow flowers and it has divided leaves." They have little pictures of what they are talking about, so you can identify any known species from Western Australia by using this system.

Globally, we're a long way from doing that. The thing that stops us is money, always money. You have to have people interested in it that are willing to do the work and that have the skills to do it.

Dr. Biology: Right. So maybe we can get more of this citizen science involved in this. This is a theme that's coming to the forefront, at least on Ask a Biologist. I know it's in the world, but we are talking more and more about this. You don't have to be a trained scientist, but as you get more and more familiar with something, you might actually be one of the best experts on sunflowers in Arizona.

Vicki: Absolutely. And the really nice thing about this is once you get a virtual key done, every person out there that is interested adds to the data, because they key it out, they can go online, they can say where they found it. And all of a sudden, their backyard discovery becomes part of the larger science data information that is available globally.

Dr. Biology: Well, Richard, what about you?

Richard: Yeah, I would say that that's exactly it. There are a couple of expressions that come to mind. One that we bounce around a lot in my world is that once digitized, always available. So, once you get the information digitized and structured in a way that it's on the Internet, no one ever has to go through that work again. It takes a lot of money and a lot of effort to build it. But once you build it, like Vicki said, you can add on to it, and it only gets better with time, not worse. Another expression that comes to mind is the expression "the whole is greater than the sum of its parts." Now, what that means in this context is that all of these little bits of information are important by themselves. But when you can connect them all together, these incredible patterns emerge that you might not have seen if you hadn't brought them all together. So, networking all of this information is almost like a snowball effect. Once you get it going, it starts accelerating faster, and more information begets more information. It gets really, really exciting at that point.

Dr. Biology: So if you're a computer science person out there - you love computer games, you love the thrill of the keyboard, so to speak - you might be one of the important parts to the next frontier of biology.

Vicki: Absolutely. There's a whole discipline called bioinformatics that's all about this. If you are interested in that kind of thing, I would suggest that there are programs all over the United States now where you can study that.

Dr. Biology: Now on this show, you don't know it, but we do three questions with all my guests. And I'm going to start with Vicki. When did you first know that you wanted to be a biologist, or knew you were going to be a scientist? Is there a spark that you can think of?

Vicki: My physics teacher in high school got me very interested in asking questions, being curious, sharpening my curiosity. That led me to be convinced that I wanted to be in science. Unlike a lot of other people, it took me a few years to figure out exactly what I wanted to do. I sort of like to say I wandered around in the wilderness for a few years trying out different things until I went to a field station and I learned about field biology. I fell in love with it. From that point on, it's been a major focus of my life.

Dr. Biology: All right, Richard?

Richard: Well, I can't answer that question truthfully, because that moment occurred before my brain was registering memories, that is, before I was three years old. My very, very earliest memories all have to do with being absolutely fascinated by fishes. Now, for most of my childhood, I didn't know that that meant I was interested in science. All I knew was that I was just utterly interested in the natural world.

Dr. Biology: Right, you didn't know what the name was, but you just knew.

Richard: I just had this fascination. But I mean now in hindsight, looking back, that's when I knew I was going to be a scientist, even though back then I didn't know what a scientist would be. Now, I've been nurtured over the years and guided by very supportive parents and very supportive teachers, all of whom have helped steer me in the direction that I've come. And it's been just one exciting event after another.

Dr. Biology: All right. Well, guess what? I'm going to take it all away. You can't be a scientist. You're not going to be the biologist. I'm not going to let you do your scuba diving. What would you be or what would you do?

Richard: I don't know that I could answer that question.

Dr. Biology: I'll tell you what. I'm going to give you a few moments, because I'm going to let Vicki try to answer that question. And then you have to come back; I need an answer.

Vicki: It is a very difficult question, because when I started trying to figure out what I wanted to do, I was selecting among the different disciplines of biology. But if I had to do something else, looking at my skills and what I'm good at, I would probably be a water engineer. I've always been fascinated by the power of water and the way - it's so simple when you look at it, but when it moves as a force it is so complex. It has catastrophic effects, and it has beneficial effects. I think I could really get interested in how water works.

Dr. Biology: You're my first scientist to do that. I think it's great. All right, the pressure is on.

Richard: So, it's got nothing to do with science? So, engineer can't even count?

Dr. Biology: No, engineers count. Yeah, you get to be that.

Richard: Then I can answer the question. I love designing new devices that can be built and machined and created together. I use this CAD, computer-aided design software. What I build are rebreather parts. That is, I use these rebreathers, I've gotten so intimately involved with, and I'm actually directly involved with the companies that develop these things. I can spend hours on my computer spinning around these 3D models of what a part should look like, putting a hole of a certain diameter here and cutting an edge off. I just love working with mechanical things. I suppose I'd either be an engineer or a machinist of some sort.

Dr. Biology: OK. That means you're kind of that Jacques Cousteau, right?

Richard: Right.

Dr. Biology: You had the tough question. I'll go back to an easier question. I'll start with Vicki, so you can even think about this. What advice would you have for someone who wants to become a biologist?

Vicki: Follow your curiosity. I would give this advice to anyone, whether they are ten years old or a graduate student trying to decide what they want to do with their life. Go where your interests are and you'll never be disappointed. You'll never wind up doing something that you don't like.

Richard: I don't even need to think about this one. This one is easy. More or less what Vicki said, but I often frame it as "follow your passion." Science is driven by passion. There is never enough money to actually run the science, so what makes up the difference is passion. And what I tell people is that when you become a biologist, don't count on making lots and lots of money, owning huge houses or expensive cars. I'm sorry. You're going to get something much more valuable. You're going to enjoy every day of your life. If I had to trade between a job that I didn't enjoy intensely every single day, so that I could go on vacation for two weeks out of the year, versus the life I have, which is earning enough money to get by comfortably but enjoying and waking up every morning excited about what you are going to get done that day, believe me, that's by far the better path you can take.

Dr. Biology: Speaking along those lines, Richard, your office is the ocean. Come on, that's so easy that I don't even have to ask that. Vicki, a lot of the time you spend in the Smithsonian. And people come to visit the Smithsonian, and I bet they only see one part of it. What's it like to work at the Smithsonian?

Vicki: Well, for a biologist, it's like being a kid in a candy store. You're surrounded by hundreds if not millions of things that you can work on, that you can study. You have scientists from all over the world that do the same thing you do come by to visit. And you get to go off and do wonderful things like this, talk to people that you never would see otherwise about something that you are very passionate about. And I spend most of my time, when I am not in the Smithsonian, high somewhere, usually above 10,000 feet. Because for me that's where - when you get above the tree line - that's where you get into a lot of the really interesting plants.

Dr. Biology: I'm glad you defined high as you went along there. I was a little worried. Richard, is there any new digital imaging equipment that has you excited nowadays?

Richard: I'll tell you the one that is somewhat mundane but very exciting to us, which is high definition video. Now when we do our dives, historically the way that you document that a species occurs at a place is that you either collect a specimen or you take a still photograph of it. Now, in the old days when we had film cameras, we were limited to 36 pictures per dive. Now we have digital cameras, but even still, as I mentioned time is your limiting factor under water. You still take some time to line up your camera and get the picture just right. It takes some time to collect the specimen. With video, we are capturing 30 high-resolution pictures every second, and we can just let that camera run. And it is amazing the information we can capture with these videos, these tiny little high definition video cameras we take with us on these dives. It allows us to capture more information in our brief visits than we ever could before.

Dr. Biology: Vicki, on Ask a Biologist, we have the instructions on how to make your own herbarium. As a botanist, you know what we're talking about; taking these plants, pressing them, labeling them properly. They end up being beautiful pieces of art. And for many, many, many years, botanists would trade these. They would send them around the country or around the world to study them. What's going on in the digital world that's changing that?

Vicki: We still send lots of plants around and trade them, almost like baseball cards. If I collect four of something at the same place, I will bring them back and I will trade three with my friends in Europe or South Africa to get some of their stuff. But, for the specimens we already have, the first thing we try to do when somebody wants to look at one of our specimens, and they want to borrow it - they want us to mail it to them - is we take a digital image of it, and we send it to them. If they can answer their question looking at the image then that's great. If they can't, then we loan it to them. We send it off, they look at it and they send it back. But, it's a lot easier, faster and cheaper to send an image and hope that takes care of what they need.

I will say that for our most important specimens, which are called our type collection - you may not know this but every single species that has been described, the name is tied to a single specimen somewhere in a museum. So, those types are very valuable because they hold the name of that species. We don't like to loan those. Since we have digitized all of our types at the Smithsonian, at least in botany, it has decreased the number of loans that we have had to make by 80 percent.

Dr. Biology: Wow. I can believe that. Can anybody get to them then? Can anybody see these pictures?

Vicki: Absolutely. They are on the public website.

Dr. Biology: OK, so anybody can go to the Smithsonian and look at these. OK, great. Is there anything digitized for fish?

Richard: Oh, yeah. Jack Randall, who was my advisor when I earned my PhD, has something like 20,000 images of fish that he shot on film, and about 10,000 digitized that are online.

Dr. Biology: Marvelous. OK, I want to thank you again, Vicki for being with us.

Vicki: It's been a pleasure.

Dr. Biology: And Richard.

Richard: Thank you.

Vicki: Come visit the Smithsonian. [laughter]

Dr. Biology: And?

Richard: Bishop Museum in Honolulu.

Dr. Biology: And in case you'd like to listen to more of Vicki's and Richard's adventures and, well, misadventures as biologists, check out our Darwin Distinguished Lecture Series at darwin.asu.edu and then just click on the Podcast and Video link. The Ask A Biologist podcast is produced on the campus of Arizona State University and is recorded in the Grass Roots Studio, housed in the School of Life Sciences, which is a division of the College of Liberal Arts and Sciences.

Remember, even though our program is not broadcast live, you can still send us your questions about biology using our companion website. The address is askabiologist.asu.edu or you can just Google the words "Ask A Biologist." I'm Dr. Biology.