In Their Own Words: Nalini Nadkarni

In Their Own Words chronicles the stories of scientists who have made great contributions to their fields. These short histories provide our readers a way to learn from and share their experiences. We will publish the results of these conversations in the pages of BioScience *and on our podcast,* BioScience *Talks (http://bioscienceaibs.libsyn.com). This history is with Nalini Nadkarni, professor of biology at the University of Utah.*

Note: Both the text and audio versions have been edited for clarity and length.

When did you first know that you wanted to work in the life sciences?

As with almost every scientist, my interest in nature started out when I was a kid. I loved climbing trees. My family was a large, chaotic, mixed family. My dad was a Hindu from India and a scientist. My mom was an Orthodox Jew from Brooklyn, New York, whose parents immigrated from Russia, and she studied languages. And there were five kids, dogs, cats, homework, chores, and so forth, and so for me, being able to run outside the front door and climb a tree was my refuge.

There was a row of eight sugar maple trees that lined the driveway of my parents' home. They were inviting, with big, wide crowns. Some of them had branch intersections that formed little platforms, and I could stand there and recite poetry and sing songs to myself and dream of what my life might be. When I was 9 years old, I took an oath that when I became a grownup, I would do something to protect trees, because they'd given me so much.

You knew from a very early age that you wanted to pursue a conservation-minded approach?

It had a strong sense of wanting to do something for trees, but I didn't exactly knowing how I would do that. I thought, "Oh, maybe I could be a firefighter or forest ranger," At that time,

Photograph: University of Utah Office of Media and Communications.

I didn't know that there was a way for people to study trees as a pathway to help protect them.

It wasn't until college that I discovered the world of ecology. I had a wonderful professor, Dr. Jonathan Waage. He studied damselflies and talked about how he published papers describing how certain damselflies only inhabit streams that have very clean water. In that way, he helped us see that his basic research was relevant to water pollution, and it drew an early connection between the world of academic science and the world of restoration biology. I thought, "Goodness, that's the career for me."

What was your undergraduate experience like?

My undergraduate experience is sort of like me, a mixture. I really loved field ecology, and I loved discovering the world of ecology, and I lived for my field labs with Dr. Waage. My second love was modern dance and the arts, and I had taken modern dance since I was 4 years old—and loved being able to express my ideas through movement and music. But I realized that I probably couldn't do both.

I felt that to make a good decision, I should experience both professions—field biology and modern dance—as thoroughly and "real-y" as I could. The year after I graduated from college, I wrote letters to 60 field stations all over the world, saying, "I would like to find out what it's like to be a field ecologist, and I would like to be an apprentice. I don't need much money; I'll just help you out." I got one letter back, from the Wau Ecology Institute in Papua New Guinea. It was this tiny little field station, and the director, Dr. J. L. Gressitt, a beetle taxonomist, said, "If you can make your way out here, you can be my field assistant." That was the perfect opportunity. I worked for a year as a field assistant in this little station in the remote highlands of Papua New Guinea, interacting with the biologists and ecologists who were doing research there.

Then, I tried out the life of a modern dancer. I traveled to Paris, and I found a dance studio there to be the apprentice, to try out the world of professional dance. At the end of a year, I sat

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***Performing canopy research suspended in the canopy. Photograph: Christian Sinibaldi,* The Guardian.**

down in a Parisian café with all of my journals, read through them, and said, "Field biology." That choice felt right because, as a field biologist, I was able to work in nature, interact with people who were always happy to share their discoveries, contribute to the scientific record, and participate in academia for decades. In contrast, dancers have to be super careful with their bodies (no hiking!), are extremely competitive, and a performance career ends at around age 30.

What's the next step?

When I went to graduate school, knowing that I wanted to help trees somehow, I thought I would go in as a master's student and contribute to reforestation by learning how to grow trees or start a nursery. But my first summer of graduate school, in 1979, I decided to take a course in tropical biology that was offered by the Organization for Tropical Studies, a consortium of universities established to enhance the study of tropical biology.

Doug Gill was the professor, and there were 20 other graduate students from all over the country. One field site we visited was Monteverde, which is where I have continued to do my research ever since. Just looking up into the treetops and seeing these orchids, bromeliads, mosses, ferns, monkeys, and birds, I asked Doug Gill, "What is going on in the canopy?" He said, "Well, Nalini, we don't really know much about it. It's hard to get up there. We've lost our prehensile tails over evolutionary time, and there's so many questions on the forest floor."

There was something exciting to me about looking up into that world and realizing that it was a world that hadn't been explored. It was called "the last biotic frontier," at the time, because it was virtually unexplored. Scientists are supposed to explore and discover new frontiers, so that—combined with my love of climbing trees—inspired me to study the canopy for my dissertation research.

I happened to encounter Don Perry, a graduate student at the time, who had pioneered the use of mountain-climbing techniques to get up into the forest canopy of lowland tropical rain forests. I asked him, fervently, to teach me his methods. As it turned out, he needed someone to take photographs of him while he was in the canopy, so he literally, taught me ropes—the techniques of climbing trees using harnesses, climbing ropes, carabiners.

I went back to my graduate committee at the University of Washington and told them that I wanted to study the canopy from an ecosystem perspective—what goes on in the canopy and how those processes relate to the forest as a whole. At first, my committee was… lukewarm about this proposal, "That's just Tarzan and Jane stuff. It isn't science." But I had some sense of intuition that there was something important going on. I was able to get a grant from the Man and the Biosphere program, funded by UNESCO, and I had a supportive major professor, Charles Grier, who enabled me to do a comparison of the biomass and nutrient capital of the canopy-dwelling plants in the temperate rainforests of Washington State with the tropical cloud forests of Monteverde.

I hate to say this, but it was nineteenth century work. It wasn't testing any elegant hypothesis, the way my fellow graduate students had framed their dissertation research. I was just establishing the description and inventory of the biomass and nutrient capital of material that is held in the epiphytes versus in terrestrially rooted vegetation. It was basic accounting work, but it led, as my career progressed, to asking other questions that were answered by experiments and modeling approaches. For example, it led to answer questions that documented the dynamics of the capture of nutrients by these canopy-dwelling plants from atmospheric sources, how long those nutrients stay within the system in the canopy, the rate of their movement to the forest floor by what I termed *epislides* and riding down fallen branches, and the speed of their death, decomposition, and ultimate availability to terrestrially rooted members of the ecosystem. That led to other questions, such as the role of epiphytes in providing resources to birds and other vertebrates and, the presence of invertebrate groups in the canopy versus the forest floor. And all of that has led to my current research on the effects of natural and human-caused disturbances in canopy structure. I'm now examining

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An early photograph of Nalini Nadkarni perched in a tree. Photograph: Moreshwar Nadkarni.

the impacts of physical disturbances within the canopy on epiphyte community resilience, and working with plant physiologists to understand the effects of climate change (longer dry seasons, reduced mist) on canopy community vitality, and the effects of isolation of relict trees in pastures on canopy plant reproduction. So that single, seemingly dull, question I had to start out with—what is the biomass of this *stuff* in the canopy—turned into a very rich array of ecological questions that I've been able to pursue ever since.

What's it like, up in the canopy?

The most prominent difference between the canopy and the forest floor is the difference in microclimate. The upper canopy is more exposed than the forest floor; it has great amounts of isolation, extremes of relative humidity and temperature, and experiences more frequent "drydown" events. But more subtle is that the canopy has such a completely different architecture, set of substrates for colonization, and maintenance than the forest floor. When you walk on the forest floor, you're viewing the forest as a two-dimensional plane, essentially, with tree trunks that interrupt it. But when you're in the canopy, the forest itself is three dimensional, and the space is occupied by suspended cylinders, the branches that stick out into it. Those cylinders, then, are colonized in wet forests by canopy-dwelling plants: epiphytes.

In tropical montane cloud forests—places such as Monteverde—the canopy supports an incredible diversity not only of species but of plant structures: pineapple-topped tank bromeliads, carpets of mosses, arrays of delicate, beautiful orchids, giant ericaceous shrubs with leathery leaves. It's like a forest on top of a forest. If I took you up to one of the giant figure trees I climb in Costa Rica, you would be blown away by the diversity of shapes within the canopy, by the species diversity of these epiphytes, and then by the mass and structure that's provided by this community of canopy-dwelling plants: life on life on life.

Have you been able to return often?

Yes. I have been fortunate in being supported by the National Science Foundation, the National Geographic Society, and the Mellon Foundation ever since I started that graduate work. One question has always led to another set of questions, and the ones I don't have the time or skills to answer, have often been pursued by my graduate students or collaborators.

I started out alone. At that time, ecologists often saw themselves as lone researchers, and I certainly did. I'd go out to the reserve with my backpack full of climbing gear, climb my study tree, and gather my data. Year after year I kept doing that, but as my career progressed, I would include other researchers, too. For instance, Peter Hietz studied the nutrient status of epiphytes using N^{15} isotopes. That's something that I had never done. He became a collaborator, and we verified that these epiphytes really do use atmospheric nitrogen, not nitrogen that's intercepted from the leaf litter.

Now, as with so many ecologists, I see myself being much more of a collaborative scientist, one who takes on interaction with other kinds of scientists to answer our questions. For example, I've been trying to understand the dynamics of disturbance and recovery from the lens of both theory and practice. I've established that these epiphyte communities are important for nutrient cycles, for providing habitat for animals, for their beauty, for their interactions, and for their diversity in themselves. But what happens when you get climate change? What happens when trees are isolated in pastures and in forest fragments? How is that going to affect these movers

Dr. Nadkarni poses with a one-of-a-kind TreeTop Barbie. Photograph: Hayley Eckhardt.

and shakers of ecosystem function and diversity?

I find myself now at a place where, rather than seeing myself as the lone explorer, discoverer, queen of the forest canopy, I see myself as one of a happy team that can interact and share each other's tools, knowledge, and processes to answer the questions that we're all interested in answering.

What's been your experience of the academic side?

One of the big surprises of my career has been that I have an academic career. I never really thought, in a predicted way, "Oh, I want to be a professor. That's going to be my job." My career was complicated a bit by my getting married to Jack Longino, an ant taxonomist, He and I met when we were in graduate school, in Costa Rica. It was a very romantic courtship, and we decided we didn't want to have jobs in two different places. We didn't want to be apart.

Instead, we figured that whoever gets a job first, as long as the other person can do research, we'll go there. I ended up getting an offer right out of graduate school at UC Santa Barbara, and we decided then that Jack would come along—as a so-called captive spouse. He used space in my lab to do his ant work, but he never had a position.

Then I got a job as the director of research at the Marie Selby Botanical Gardens in Florida, so we went there, and again, Jack didn't have a position, but was able to carry out field research at a state park and do his ant taxonomy research in a lab he set up at our house. Then we heard about a single faculty position at The Evergreen State College, an alternative, forward-thinking teaching institution founded on the principle of interdisciplinary learning and teaching, so we said, "Well, how about if we split this position? You'll get two people for the price of one, in terms of our expertise." They took us both, and so we each had a half-time position there for 20 years.

Teaching there opened my mind. I taught with people from many different disciplines: artists, philosophers, geographers, and political scientists. And because it was half time, Jack and I could apply to NSF for grants to support the research that we wanted to do, and we could leave campus for whole semesters at a time.

In a funny way, going to The Evergreen State College not only broadened my thinking; it also removed the pressure to produce in the ways that professors in a traditional R1 university feel, because Evergreen has no tenure. It also eased and balanced my relationship with my husband. We were on equal footing.

We spent 20 years there, and we raised our kids there. We continued our research, very actively, and then in 2011, I got a phone call from the University of Utah, offering me a position as the director of their new Center for Science and Mathematics Education. They made a position for Jack, as well. So, through a circuitous route, we've reached this senior part of our careers with both of us having tenured positions at an R1 institution, with lots of resources for research and

Dr. Nadkarni speaks to prisoners as part of the Sustainability in Prisons Project. Photograph: Benj Drummond.

for graduate students. It sounds idyllic, but it took a long time to find ways to shape our personal and professional lives.

How have scientific societies played a role in your career?

Scientific societies have been extremely important to me. Academics tend to identify themselves by their universities, but scientific societies give us a bigger identity and a more specific web of relationships that are needed for a strong academic career and lively personal connections. My touchstone society is the Ecological Society of America, which I joined as a graduate student. I have attended nearly all of the annual meetings, publish in and read their family of journals, and served on their governing board for 3 years. I also participate in the activities of the Association for Tropical Biology and Conservation and served as a council member and President in the early 2000s.

I also started a scientific society, called the International Canopy Network, back in 1996. At that time, the very few canopy researchers were scattered geographically, with no meetings or journal. A then graduate student of mine, Joel Clement, and I started the network as a nonprofit. Our idea was to provide scientifically sound information for other scientists, for educators, and for conservationists.

Your career has been marked by a focus on outreach; how do you feel about that role for scientists?

For me, as someone who has an extroverted personality and a background in performance in modern dance, science has always been both about my basic research—the measurements, the interpretations, the analyses, and the reporting in scientific journals of my forest ecological studies—as well as spreading the word about how cool the canopy is and raising awareness of how critical trees are to people.

There are many others who see the validity and importance in both the scientific work and the public engagement work in academia, and the number of scientists and science administrators who think similarly is growing. However, I understand that if a scientist is shy or introverted or finds a whole lot of meaning in naming that next ant species, like my husband, or in making that next biochemistry discovery, it is sufficient for that person to say, "I published that work in the *Journal of Biochemistry*." That contribution is part of the scientific record, and there's nothing nobler than that. I love doing it.

But what I think needs to change is for the scientific community—faculty, administrators, scientific funders, foundations, and science policymakers—is to understand that if a scientist wishes to communicate directly with the public, to agriculturists or foresters, or the incarcerated, or to anyone outside of academia, then they should be given the tools and the permission to do that, with the understanding that it's not a waste of time, that it can be a benefit to one's scientific career and the scientific enterprise.

I believe that scientists who want to do public engagement, who even have an inkling to do it, should be provided with those tools. One of my current projects—supported by a large grant from the National Science Foundation—is to train scientists to engage public groups effectively and efficiently, focusing on those groups who do not or cannot gain access to science education in traditional venues or who do not have easy access to nature. We need to sing—and listen—to people who are not part of the choir.

How do you reach outside the traditional science communication audience, who've already bought into the message?

I remember a moment when I was sitting in the canopy of a figure tree in Monteverde, and I heard a chainsaw right outside the Monteverde Cloud Forest Reserve. I realized, "My gosh, if they're right outside the Reserve, I've got to do something. I've got to do something more than only writing my little scientific papers for my small circle of colleagues." That's when I began thinking that it was time for me to do public engagement. Although many scientists feel that engaging policymakers has the greatest impact, I have found that I am not good at talking to decision-makers. But what I can do is public engagement to raise awareness of the importance of trees, because people are curious about a woman of color who climbs 100 feet up into the forest canopy and makes discoveries.

I started working with the National Geographic Society, contributing to television specials, writing for *National Geographic* magazine, and giving talks in museums. At first, I thought I was doing a really great job, going outside of academics, but I very soon realized that most of the people who read *National Geographic* and watch the documentaries are people who already know that science is great and think trees are important.

That's when I began thinking about how I might engage with people who don't necessarily think trees are cool or don't have the finances or capacity to visit real nature. I had to think of ways to connect with other people in societal sectors outside of science and what they value and connect trees to those values. What do little girls love? Well, they love Barbie, all over the world. In fact, my own daughter, who was 6 or 7 years old at the time, said, "Mom, can I get a Barbie?" I was horrified, thinking, "Where did I go wrong?" That's when my students and I came up with this idea of TreeTop Barbie, realizing we could piggyback messages about conservation and how important it is for women to study the forest canopy onto something that girls already love and cherish—Barbie.

This was in 2004. I called Mattel, and they weren't interested, so my students and I began designing and selling (at cost) our TreeTop Barbies. We bought used Barbies from consignment stores, and enlisted volunteer seamstresses to sew Barbie-shaped field clothes. We bought tiny helmets on eBay, and created a pamphlet called *Canopy Plants of the Pacific Northwest*, which we included with TreeTop Barbie when kids would order them.

The New York Times did a story that a scientist was partnering with Barbie. Mattel called to inform me that I was encroaching on their brand. I said, "Yes, but take the idea. I'm not trying to make money." I said, "Well, I have a lot of journalist friends, and I think they'd be interested in knowing Mattel is trying to shut down a woman of color who's trying to encourage young girls to go into science." They allowed us to continue.

Fifteen years later, in 2020, I got a call from National Geographic, who were partnering with Mattel on a new line of "Explorer Barbies." and asked me to advise them. They were making a Wildlife Biologist Barbie, an Astrophysicist Barbie, and Polar Marine Biologist Barbie, and I advised them on the accessories and clothing. Then they made a "one-of-a-kind" TreeTop Nalini-looking Barbie. I love having it my lab, as it is a manifestation that a scientist can be effective in realms well outside of academia. In fact, you can even work with objects that you don't believe in, like a plastic Barbie who represents the worst of our consumerist society. But, if you bring those values together with ecological values, then you have something that you can disperse to people outside of science.

That set a pattern for my approach to the public engagement work, which I've followed ever since. For example, I learned that over 80% of the world's population self-identifies as being religious or believing in God. Now, I don't believe in God. I was raised with an odd mixture of Hinduism and Judaism. But I recognize that there are a lot of people out there who do believe in religion and God, and so if I could somehow find common ground between the values of trees and religious values, I would have the potential to engage a huge group of people who might become comrades in forest conservation.

I downloaded the Bible, the Koran, the Talmud, and Buddhist stories from the web, and then did a search for all the verses that had the word *tree* or *forest* in those holy scriptures. Then I synthesized what those verses expressed about trees. Trees are represented as religious symbols, as adornments for temples, as location markers, and for practical uses, for food and shelter. I then put together a sermon called "Trees and Spirituality," and knocked on doors of churches, synagogues, and temples, saying, "I'm a scientist, but I've read your holy scriptures, and I've learned about what you believe about trees. I want to tell your congregants about what I have learned from your scriptures, your authorities, about how valuable trees are." May I give a sermon from your pulpit or your bema to tell your congregation about this?"

Not surprisingly, it was the Unitarians that offered me a place at their pulpit first, but after that, I was invited to give sermons in over 40 places of worship and I've not once had an experience where people would say, "What about evolution versus creationism?" There was no conflict, because I had drawn on their own authorities. I had used what philosophers term *intellectual humility*, putting aside for the moment what I hold as my own values and beliefs to understand those of others.

It was an amazing finding of common ground. One Sunday, I was approached by a congregant in a Baptist church after my sermon, asking for my email address. I thought, "Oh, no, he's going to proselytize." Instead, he said, "We're having a tree planting on Sunday afternoon after church next week, and we thought you and your students might be interested in joining us in protecting God's creatures, God's trees, God's creation."

I realized how wrong I had been. The assumptions I had made about a person in a church and his desire to help trees were wrong. I was the one with the closed mind. It taught me that if we scientists, can bring an open mind to venues where we think we're going to be shut out, like churches or the Mattel Corporation, we must recast our expectations. It's a matter of opening our minds to the possibility of learning and gaining from these groups.

Is that the key, being open to the things that you're hearing as well as the things that you know to be scientifically true?

Yes, being open to hearing others is the key, and one that is very difficult for academic scientists, since we are so used to being the authorities, and holding forth at the podium, lecturing. However, science communicators have come to understand that the deficit model doesn't work; that is, they have debunked that idea that if we just pour scientific facts into the minds of the public, then people will accept it, and they'll make scientifically sound decisions. Instead, we have to understand that people may not automatically find science interesting or important.

I can get this by shifting our lens. For example, I do not care about professional sports. I just don't see the point. But a lot of people are very, very excited about the World Series. If a sports fan tried to convince me with statistics that Major League Baseball is interesting, I still wouldn't get it. But recently, I learned that professional baseball bats are all made of wood, either ash or maple. Now, that is an interesting fact to me. That would take me to a baseball game, because I'd wonder, "Is the bat made of ash or maple, and why are they using wooden bats instead of metal bats?" It would draw me into this whole world.

To me, this is the same thing as getting a nonscientist interested in science. If I can present ecological information on tree biology, or the importance of turning the tide on climate change by providing some connection to what people already value, that's going to draw them in. They may not be interested in how many species of mosses coexist on a branch, but they might be interested to know that the tree supporting the moss—the Pacific yew—produces Taxol, a highly effective anticancer drug. Somebody who knows somebody who's died of cancer is going to care about the Pacific yew tree more than they care about the moss diversity, so you connect the value of trees to medicine, not (at the beginning point) biodiversity.

The key is opening your own mind to others and connecting, even by that very small thread, what you want them to know about and what you might want to know from them. That was what drew me to my work to bring science education and conservation projects to people who are currently incarcerated. Although I've never been incarcerated, I have always held concern about the 2.3 million adults who are held within the system of mass incarceration in our country. What could I—as a scientist—do about that social justice problem?

I recognized that adults and youth who are incarcerated are not only locked away from their jobs, their homes, and their loved ones—they also live and work in environments that are almost entirely lacking in contact with nature. In 2004, I realized that the public group who would most value nature would be those who are imprisoned in correctional centers.

The first project I carried out was to engage inmates to address an ecological problem in the Pacific Northwest—people harvesting moss from the trunks and branches of old-growth temperate rainforest trees in of the Pacific Northwest to sell to the horticulture trade. I know from my own research that it takes decades for these ecologically important mosses to grow back.

I thought that if I could learn how to grow these mosses in a horticulturally sound way, it would relieve the pressure of wild collecting. It was also a project that seemed appropriate to partner with the incarcerated. Mosses are small, and you don't need sharp tools to work with them. They're wonderful to touch, feel, and smell.

I located a minimum-security prison, the Cedar Creek Corrections Center, which had a very forward-thinking superintendent. He gave me permission to engage his inmates to help me learn how to grow these mosses. The inmates became involved with nurturing and caring for the mosses and learned about moss biology. After 18 months, we knew which species grew fastest. The inmates valued the interactions with biologists, and the superintendent valued the fact that the men interacted with each other well, learned skills that would help them in the job market after release, and felt a sense of contribution.

That led to my starting a science lecture series, where I brought in other scientists to give lectures about aspects of science. It also led to many other conservation projects: rearing the endangered Oregon spotted frog, raising the federally listed Taylor's checkerspot butterfly, growing 17 species of rare prairie plants for Nature Conservancy restoration projects, and so on.

The inmates were intimately involved with the touching, growing, caring for, and learning about these living things, as well as understanding that they could contribute to these efforts to preserve these species. That's a very powerful thing to present and offer to someone who's incarcerated, because everyone else is telling them, "You're useless. You're bad. You can't do anything." It reinforced in me a deep, certain knowledge that, if presented with the opportunity, everybody can contribute to conservation.

Is it a challenge to get other scientists to think in this way?

When I started doing these kinds of out-there public engagement, I did them by myself. I'd go to a church and give my sermon about trees and spirituality to the congregants. I'd go to a prison and make arrangements with the prison warden and then give a lecture about trees or moss to the inmates. I'd go to the rap singer and convince him to hang out with biologists and a group of at-risk urban youth. I'd knock on doors at the state capital to recruit policymakers for a treetop session of my "Legislators Aloft" effort. It all felt pretty easy to me. The challenge was teaching other scientists to do it.

In 2009, I got an EAGER grant from the National Science Foundation. These Early Concept Grants for Exploratory Research are for high-risk, potentially high-payoff projects. I used it to explore what I called the Research Ambassador Program. I gathered 10 scientists, helped them think innovatively about which public groups they might engage with, and set up venues for them. It worked, but it was time-consuming and couldn't be scaled—so it was kind of a dead end in terms of making it available to lots of scientists.

So later, I collaborated with science of learning experts, science communication researchers, and an expert in design thinking from Stanford, and we put together a successful proposal to start the STEM Ambassador Program. We draw on the impact identity of the scientists to link both the scientists' research interests and their personal characteristics (religion, hobbies, nationality, parental status) to potential public groups. The connection may not have as much to do with that person's research as it has to do with who they are as a person. That then allows them to make that connection to the public group. We've since trained over 100 scientists to carry out nontraditional public engagement in the venues of their community groups, such as churches, sports arena, rifle ranges, senior assisted living centers, and ski resorts.

Do you have any advice for early career scientists who are embarking on this sort of effort?

One of the pieces of advice that I always give to people is to be fine with starting small. For instance, I was in Seattle one day. I had a couple of hours to kill before a meeting, and I saw these two young women at a bus stop, talking about their fingernails. I don't care about fingernails at all, but I saw that they were really interested in fingernails, so I said, "Hey, I can use these 2 hours to get a manicure, and I'll ask the manicurist to paint little trees on my fingernails." She did, and she used bright green paint, so they were very noticeable. For two and a half weeks, I could walk around, and people would notice my fingernails, and I could say, "Yes, they're trees. Let me tell you about how great trees are."

It sounds silly, but I did the math. I found that there are 325 million people in the United States. There are 6.2 million scientists and engineers, so if each of us scientists or engineers talks to just 52 people a year, one person a week, we will have talked to and had contact with every single person in our country. That's not hard. You get a latte, and you chat with the barista about shade-grown coffee. Bingo, there's your one conversation a week.

We want to tell scientists that it is certainly possible to devote a lot of your time and energy toward public engagement, toward knitting together science and society, and that's a wonderful thing to do. But even if you're committed to the rigors of an academic life that values published papers over talking to Boy Scouts, you can still carry out public engagement in these small but significant ways, and I think we can all do that.

The more we can build up those little bricks of support, trust, and interaction between scientists and the public, the better we collectively are in terms of promoting our message that science is a way of knowing that can be trusted, that can be valued, that can be listened to, and that, in fact, can be inclusive of people who have other ways of knowing, as well.

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