



## After the Fact | From Lab to Life: The Science of Touch

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### TRANSCRIPT

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**Dan LeDuc, host, "After the Fact":** Welcome to "After the Fact" from The Pew Charitable Trusts. I'm Dan LeDuc. And I'm joined again today by our lead producer, Emily Chow.

**Emily Chow, senior producer, "After the Fact":** Hey, Dan. Our latest season, From Lab to Life, has been really fascinating—and opening a lot of doors into the world of scientific discovery. Who are we hearing from next?

**Dan LeDuc:** Well, I had this cool conversation with Ishmail Abdus-Saboor. He's a professor at Columbia University, and he studies how our bodies and our brain distinguish different kinds of touch.

**Emily Chow:** Are you talking about, like, physical touch, and even pain?

**Dan LeDuc:** Oh yeah. And he takes it a step further to see the impact that has on our mental health. The pandemic, you know, and the isolation that so many of us felt have had a real influence on his work.

**Emily Chow:** There's data on that, for sure. Pew Research Center found that 41% of adults at some point during the pandemic experienced high levels of psychological distress. And there's even a new study from researchers in Germany [that] confirmed that touch actually has positive impacts on our physical health—not just our mental health.

**Dan Drop-In:** You know, before the pandemic, many of us took a hug from a loved one for granted. And we're learning just how essential those feelings are for us.

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**Dan LeDuc:** Today we are joined by Ishmail Abdus-Saboor, who is a professor at Columbia University and a researcher who studies sensory perception through touch. And I have to tell you, man, reading about your work, I have so many questions for you.

I'm really excited to get into it. But let's start by letting the audience know a little bit about who you are. How did you become a scientist?



**Ishmail Abdus-Saboor, associate professor, Columbia University:** I was always a scientist. My earliest memories as a kid—6, 7, 8 years old—I spent a lot of time outside, was always in the backyard picking up rocks; overturning dirt; looking for worms, garter snakes, things of that nature; going to creeks with my friends and bringing animals home. My parents start to bring all sorts of pets home. So I had dogs and cats, lizards, snakes—you name it. I always was fascinated with biology and animal kingdom. Even in school, my favorite classes were always science. It's just been a through line through my entire career. And even now as a professor here at Columbia running a research lab, I still feel like a big kid. That passion and love for science had just been with me my entire life.

**Dan LeDuc:** OK, I'm meeting you at dinner somewhere and I say, Ishmail, cool, you're at Columbia. What do you do?

**Ishmail Abdus-Saboor:** Yeah, so I'm very interested in how we sense and perceive our outside environment—how we communicate with the world. And if you were to, for example, hold your arm out, and I were to tickle it or to give it something hot or cold or painful or sharp, you would tell me instantaneously, or almost instantaneously, what you felt, even if you couldn't see what I stimulated you with or had any expectation as to what was to come.

And that's because we have a nervous system, the peripheral nervous system in our skin, that's finely tuned toward detecting signals out in the periphery, and then somehow, those signals need to be communicated and transmitted from the skin to the spinal cord and brain, where perception ultimately occurs.

And these are things that we experience throughout our daily lives, but how many times do we stop and think, How does it actually work?

**Dan LeDuc:** Oh, that's fascinating. So, you've said that when it comes to the sensory systems, that touch is one of the least studied. Why is that?

**Ishmail Abdus-Saboor:** That's a wonderful question that I've thought a lot about. And I think it comes down to the researchers and practitioners in the field and what questions people latch on to. So from a scientist or neuroscientist who may enter the field, I think it's been more tantalizing for people to embrace a field where there's a lot more known, because a lot of us want to get to deeper and deeper levels of understanding. So going to a place where there's already a bit of a canon there and room to make even more impact—some people like that.

Whereas for me, I've always been more attracted to fields where a lot less is known and there—there's still room to make, sort of, foundational discoveries.



**Emily Chow:** So, Dan, Ishmail is studying the different ways our brains and bodies sense touch. Like the way you'd hold your kid's hand feels different than holding your partner's hand. And for us as humans, it's easy to tell the difference, even though the physics are the same.

**Dan LeDuc:** Well, right. And scientifically, we're not sure what causes us to feel that distinction. Ishmail's work is getting to the bottom of that.

**Ishmail Abdus-Saboor:** You have some sensory receptor cells in the periphery, and they detect touch, but then all the meaning, everything is driven by the brain. How should it make me feel? What emotion, what behavior, should I generate? Some of the work that we and others are beginning to do are showing that there is even some specificity in the skin at the level of detection. There's certain nerve cells that are more tuned towards detecting socially relevant cues versus other types of touch that we may use to determine that you bumped up against an object, or I'm sitting here touching this chair, right? But they're probably different than the touch neurons that are activated during a social encounter.

**Dan LeDuc:** In your lab, are you working with mice and rats to get at this preliminarily?

**Ishmail Abdus-Saboor:** So, we use the mouse, and the mouse has been used in biomedical research for a hundred years. So, they're just a wealth of genetic tools. More recently, we've started to study these weird animals called naked mole-rats.

**Dan LeDuc:** Okay, that's a name you've got to tell us more about.

**Ishmail Abdus-Saboor:** It's an East African naked mole-rat. They hail from Kenya and Ethiopia. So, for us, these naked mole-rats, they're highly social. They organize their communities like our communities—long-term, stable relationships over the course of decades. They can live 30 to 40 years.

There is a queen, a king, and a bunch of workers. We're interested in how that social community is set up and the role of touch in shaping that community. These animals are blind, they don't seem to smell so well or hear so well. But touch is very exquisite. And most of their brain, their sensory cortex, is dedicated to touch. Touch seems to be a major conduit to how they interact and identify each other.

If we can learn how they're using touch to recognize one another and set up this, their social structure, that could teach us some fundamental biology in ways that perhaps we couldn't easily arrive at studying the mouse. So, we use these two animals in parallel.



**Dan LeDuc:** Now let me ask this devil's advocate question, which is, look, I know what hot is—I touch it, stove's hot, I pull my hand away. Lesson learned. What more do we need to know? What are the practical applications for humankind of the work you're doing?

**Ishmail Abdus-Saboor:** Yeah. The example you just mentioned that you know something is hot, so you avoid it, or you know something is cold, you avoid it. In diseased states, those relationships become unclear. For example, if you don't have some of the genes that would allow you to sense those things, you wouldn't avoid it, and you could hurt yourself.

Or in chronic pain conditions, or people who have autism or neurodegeneration, the normal perceptions that people have to this touch or pain are greatly altered. For example, many autistic patients will start to withdraw or have hypersensitivity to touch in a way that's maladaptive, because the system has been altered. Or people who have experienced certain types of trauma will have abnormal responsiveness to normal forms of touch. It may evoke anxiety or fear. Or there's some situations where people may crave touch more so than others. Learning how things work at a basic level opens the door to learning how things work at a disease level.

If you think about chronic pain, for example, this affects millions of people here in the U.S. Some reports [say that] one in four people will experience some form of chronic pain in their lifetime. Many diseases—patients die in unrelenting forms of chronic pain. So, there are all these scenarios where this relationship between touch and pain are altered, either diminished or greatly exaggerated. And those are the conditions we want to try to treat.

**Emily Chow:** As we talked about earlier, the pandemic really put a lot into perspective, especially the value and importance of physical contact with others and socializing. I mean, overnight, most of our daily interactions disappeared. Remember when people tapped shoes instead of high-fiving? It was incredibly isolating. Could science actually help solve loneliness?

**Ishmail Abdus-Saboor:** We learned that touch is foundational to our daily interactions. It's one of those things you take for granted. But we learned when [there's] an absence of touch, how it affects your mood and how just the increase of touch can make you feel better. I remember even with my own lab, as we start to slowly come out of the pandemic with my lab or with family or friends, you notice when people saw each other for the first time, sometimes in weeks or months, and we're allowed to engage, the hugs were so much deeper. We held people a lot longer. Why do we do that? What is so special about touch?

It really brought home how important it is for our relationships, our development, our bonding. Since the pandemic, I've heard lots of stories about how people now just actively hug more. And it's been a good entry point for people like me to talk about the work that I do and bring it home to something that people can appreciate.



But I think the pandemic really sparked something in me to think a little bit more about the work that I'm doing and how we can maybe use this system to turn on or to have some therapeutic benefits by activating the peripheral nervous system. So, for example, what if, God forbid, we go through another pandemic or there are situations where people need to be isolated?

You can imagine—what if we had, like, a cream, for example, that worked to activate these neurons in the skin that seem to activate these positive valence—emotional—positive emotion networks to mitigate many forms of disease or even social isolation? I think that's a tantalizing idea for us that we would like to pursue.

**Dan LeDuc:** That's fascinating. You think—I think about the sort of anxiety and depression that is so prevalent in society today. And sometimes people are being prescribed medications that they take a pill. And instead, we might be able to let people rub a cream on their arm that sort of has the same effect, if not even—maybe even better.

**Ishmail Abdus-Saboor:** Exactly. That's our hope. It's speculative at this point, but we're scientists. But I think it's a reasonable presumption that we can begin to test.

**Dan LeDuc:** Let's talk about the practice of science. What you do, you described yourself as a basic scientist. There are other scientists who want to take what—the knowledge that you develop and start applying it. Is this, like, this sort of almost narrative of—a continuum of—how science works? We discover stuff. Somebody thinks about how we can use it. We try it out. It works, but oh, we can make it better. I'm fascinated by it. It's linear but not a straight line by any means.

**Ishmail Abdus-Saboor:** Yes. Yeah. And I think that's the beauty of science. We all approach it from different perspectives, even in my own lab. I guess there are 15 people or so now. If you talk to each one of those 15 people and ask them, What's your motivation for being here and the work that you do? What gets you out of bed and excited about coming to lab each day?

You might, you probably will hear 15 different answers, right? I have some people who—it's personal to them because of some health condition they're experiencing or a family member. Others like the camaraderie of science and working together in a team to solve a problem. I think it's an exciting time to be in neuroscience, because even within the basic neuroscience, there are many different ways that people are approaching the problem.

**Dan LeDuc:** You talk about the varied backgrounds that people come at this with. But we should also point out that—in among your many accolades—is that you are a Freeman Hrabowski Scholar. Dr. Hrabowski is a hero of this program. He's been on it before. He—and he has done wonderful things when he was at the University of Maryland, Baltimore County,



and nurturing young scientists of color and other backgrounds. That's a big part of diversity that you bring to science as well. Can you talk about the importance of that?

**Ishmail Abdus-Saboor:** Yes. We have a lot of big problems facing society, right? That we need science to intervene and provide some solutions and ways out. And there's a lot of data that shows to really innovate, you need diverse teams, you need people coming from different backgrounds.

The more homogenous the group, the more people will not challenge and [instead] say, Oh yeah, you're right. And everyone just goes down a singular path. We need people that are going to go down different paths. As scientists, we all approach the world differently, and our backgrounds matter.

The way you approach science, the questions that matter to you, are all shaped by your background. So, to the degree that we can diversify our teams, we will get more innovation and creativity. And this is something that Freeman Hrabowski has pushed for a long time. And in particular, in this country, there have been certain groups that have not been able to fully participate in the scientific enterprise, or felt at home, or felt like it was a welcoming place for them.

So, to the degree that we can lower the barriers and allow people to come in from all walks of life, that will only enliven our enterprise. And this is something that Freeman has been all about. I had dinner with him the last year or so, and we got to talk one-on-one, and it was very powerful to me. During this dinner, he told me something that just gave me chills. He told me that me, I, myself, am a living embodiment of all he's worked for [for] many years. He said he's told people for years that minority scientists can be just as good as anyone else if given the opportunity. And, if given the resources, the belief, the confidence, the investment in them and their ideas, you can find just as much success from them as anyone else. Not looking for you to lower the bar but just to give them the same opportunities. And he told me, "When I see you and all you've accomplished, I feel like my life's work has had some meaning."

And that was quite powerful for me. And it emboldens me to keep moving forward and doing the things that I'm doing, and as I move forward, to bring other people along, as well, from a variety of backgrounds.

**Emily Chow:** Ishmail really helps us understand how diversity among researchers can enrich scientific discovery.

**Dan LeDuc:** Well absolutely, and he practices what he preaches, taking on a large teaching load in addition to his research and serving as a role model. Well, here's some more of our conversation.



**Dan LeDuc:** So, one of the things you do a lot of is mentoring and teaching as well as trying to get younger people involved in science. Tell us more about your work there.

**Ishmail Abdus-Saboor:** In addition to scientific discovery and innovation, which certainly drives me and animates the work that I do, mentorship and teaching is an equal arm to my portfolio and excites me equally as well. In terms of teaching, I teach a large undergraduate class on cell molecular neurobiology, and most of my colleagues here think I'm crazy to teach this one-hundred-person-plus course in addition to running a big research lab.

But I love it because I love interacting with the students. The questions that they ask—a 19-, 20-year-old is so naive, but articulate, and they're not, they're not wedded to certain ideas about how things work. And we have these really fruitful conversations and discussions, and I get a lot out of that, just like they do.

And I think, teaching—it increases my knowledge and I get new ideas, but I also invigorate the next generation. And many of the people who have taken my class also work in my lab, so I have a lot of graduate students and postdocs, but I also have a number of undergraduates.

And a number of the undergrads who work with me say they never even envisioned a career for themselves in science or medicine until they interacted with me and came to the lab and felt really empowered that they could do this now.

Many of them who work in my lab do come from underrepresented minority backgrounds, are first in their family to go to college. So, a career in science seemed like it was far-fetched, but working here, they definitely got the confidence.

We have our weekly group meetings. One of the things that I like to actively do is to break down the hierarchies, OK, because we're all important, and all our ideas matter and have value. You'll hear me talking, you'll hear the PhD student talking, but you'll also hear the first-year undergraduate asking questions and making comments. And because we value all voices, we don't create a hierarchy where only certain people's ideas matter. So that, that's an important part of what I do as well.

**Dan LeDuc:** You're giving each one of those people their own little Freeman Hrabowski moments like you got. What else would you like to see science do to earn the trust of the people and make sure that, the next time there's a health crisis, people want to believe scientists. What else can science do?

**Ishmail Abdus-Saboor:** One of the things we must do is to begin to communicate with the public, form connections, and build trust. And you don't build trust when the pandemic comes or when a crisis occurs, and then you just show up and say, Believe me, trust me, I'm



the all-powerful, all omnipotent, we'll get you out of this. Because people are going to be wary, especially some communities of color where people have bonafide reasons to be a little bit wary and skeptical. It takes some of us to go out into the community, tell people about what we're doing. Let them know what science is and what it's about. And meeting people where they're at—not talking down to people but having genuine conversations, listening to people's trepidations and fears.

We publish these papers, and we live in our ivory towers, and we have to slowly but surely start to move out of that, because as we saw with the pandemic, there was so much hesitancy and skepticism with taking the vaccines.

But you saw, with many communities of color, as we started to break down walls, people were not eternally recalcitrant to taking the vaccines, but it was just—we had to break down these barriers. I would love to see more opportunities for scientists to connect with the public and to be able to communicate what we do, why, and why it's important at a human and basic level.

**Dan LeDuc:** You just did that for the last 20 minutes, sir. Thank you very much.

**Ishmail Abdus-Saboor:** Much appreciated.

**Dan LeDuc:** Ishmail, this has been great. Thank you.

**Emily Chow:** In our next episode, we speak with another scientist who's been making connections.

**Dan LeDuc:** Yes, Marco Hatch, in Washington state, is a leader in connecting Indigenous knowledge with conservation science. And he's showing how practices that go back thousands of years still have real meaning today.

**Emily Chow:** For more information about this season, visit our website at [pewtrusts.org/afterthefact](https://pewtrusts.org/afterthefact). And if you're especially interested in diversity in science, you can find our episode with Freeman Hrabowski there, too.

**Dan LeDuc:** I'm Dan LeDuc, and if you have a question or a comment, write us at [podcasts@pewtrusts.org](mailto:podcasts@pewtrusts.org).

**Emily Chow:** And I'm Emily Chow, and this is "After the Fact" from The Pew Charitable Trusts.