

***Science Writer Lydia Denworth Discusses Her Book Friendship and Her Experiences as a Science Writer
Exploring Issues that Highlight the Personal Aspects of Science***

Jennifer Cohen

Welcome to the voices and bioethics podcast. I'm Jennifer Cohen and it's my great pleasure to welcome journalist and author Lydia Denworth to the podcast. Lydia, thank you so much for being with us today.

Lydia Denworth

It's great to be here, Jennifer. Thanks for having me.

Jennifer Cohen

Lydia, you are a science journalist and contributing editor for Scientific American. You write the Brainwaves blog for Psychology Today. Your work has appeared in The Atlantic, Newsweek, The New York Times, The Wall Street Journal, Time, and many others. You're the author of three books, all of which I hope to discuss with you today: "Toxic truth about the dangers of lead poisoning", "I can hear you whisper about deafness", and most recently, "Friendship, the evolution biology and extraordinary power of life's fundamental bond", published by WW Norton in 2020. Friendship has met with rave reviews, and was selected as a 2020 Nautilus gold Book Award winner. Congratulations on receiving such a prestigious award.

Lydia Denworth

Thank you so much.

Jennifer Cohen

I'd like to jump right into your fascinating book on friendship and social relations, which it's so timely as we deal with the aftermath of now nearly a year and a half of social distancing. So the intro to your book is entitled A new science. Friendship is traditionally thought of as a social experience. But your book is making a very persuasive argument that there are ways that friendship can be analyzed scientifically, and that this science of friendship, as it were, can contribute important insights. Can you tell us what you mean by that?

Lydia Denworth, Journalist, Science Writer, Author. Books include Friendship: The Evolution, Biology, and Extraordinary Power of Life's Fundamental Bond; I Can Hear Your Whisper; and, Toxic Truth.

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Lydia Denworth

Sure. You know, we've known for really 1000s of years, that friendship is pleasurable, Aristotle and Socrates disgust it, you know, so it's not that friendship is new in the least, of course, what is new is that we understand that friendship is not just cultural. And that is, frankly, what we thought for a very, very long time. That it was this kind of lovely byproduct of human civilization and language. And of course, there are cultural layers to friendship, lots of them. But it turns out that there's really also a biology to friendship and an evolutionary story here. And that's what I sort of came to understand as I mean, as a science journalist, my job is to go out and talk to scientists, listen to them, listen as they speak amongst themselves, and see what they think is interesting and what's important. And I began to notice that there was a lot more talk about friendship, and talking about it in these different ways, talking about the biology and evolution of it. And that seemed to me to be new. And it is. It's really only in the last 20 years that people have approached, studying friendship in this way. And that's what the book is all about.

Jennifer Cohen

Your book begins on the island of Cayo Santiago off of Puerto Rico and a team of scientists studying Rhesus macaques. How can the study of social relationships in primates help us understand human friendship?

Lydia Denworth

Yes, well, I started the book there, in part just to show you sort of this is not your parents book about friendship. This is a whole new way of looking at this subject. But the thing that is interesting or that some of the real groundbreaking work has happened in other species. So that's another reason why I started there. So it was when we began to understand that there was friendship or something like it and other species, we realized that there was a deeper story here, that there was something more fundamental to friendship and to the ways that we have of connecting. And so Rhesus macaques in particular, and well, non-human primates, so monkeys and apes, are especially useful because their social behavior is really the most like ours, and their brains are quite similar to ours as well. And so we can kind of strip down some of the complex variables of human life and get to the core questions of how individuals interact. And this is not to say that human beings are exactly like monkeys, or that a monkey friendship is the same thing as my relationship with my best friend. But there's plenty that it has to teach us about how and why friendship developed the way it does. And I find it just fascinating. Plus, it's fun to watch the monkeys and think about how they're similar or different from us.

Jennifer Cohen

So your book is looking at the work done and understanding social relationships and non-human primates as you've just discussed. You also explain a lot of the theories put forth by Richard Dawkins and others, that there is this genetic basis for maximizing friendships. That can give an evolutionary advantage. Can you discuss this field of evolutionary biology, evolutionary psychology and how that is informing our understanding of human friendships?

Lydia Denworth

Yes. So basically, either way, evolutionary biology is about looking at how natural selection has shaped our biology. And then evolutionary psychology is looking at how evolution has shaped our minds and our behavior. The behavior sort of crosses over I mean, everybody's looking at behavior, but trying to understand what are the biological basis of behavior. And what is its adaptive value. Why would we engage? Why have friends? What are friends really for? is one way of asking this. And I think everybody knows they think about evolution in terms of, you know, the size of the beaks of the finches on the Galapagos, the finches that Darwin recognized as being important and used as the basis for his thinking of the origin of species. And so the beaks change size according to what food was available and things like that. But thinking about evolutionary pressures, and the pressures of natural selection on your instinct to be friendly or not, is kind of another leap to get to looking at it with behavior. But we know from this work in other species that that is exactly what friendship is, that there are real evolutionary advantages to being good at making and maintaining friends. And we know that from the research in the macaques, and also, it really began with research in baboons in Africa. And the short version of the story there is that there were primatologist watching these troops of baboons over many, many years. And they were recording everything that the baboons did, just like the researchers do with the macaques in Puerto Rico in Cayo Santiago, and they kind of watch who does what to whom, and they keep track of what it gets them, I guess, over the course of time, and at the same time that sociologists and epidemiologists were noticing in humans, that maybe it seemed like there was a link between how socially integrated you were, how social you are, and how long you live. They were noticing in these monkeys, that there seemed to be an instinct to be friends. And so it actually, allow me to digress a little, there was a baboon named Sylvia, in Botswana, and she kind of triggered this. Sylvia was very high up in the hierarchy of these baboons. And so baboons and macaques are very hierarchical. And the researchers who were watching them always kind of thought that dominance must be the most important factor in their sort of success in life. But this Silvia was very high up, but she was also rather nasty. She really treated just about everybody terribly. And she mostly hung out with her daughter, Sierra, who was her primary grooming partner. But then Sierra was killed by a lion, which is sadly something that happens sometimes to baboons, who live in Africa. And Silvia did something interesting. Everyone kind of expected her to go off and be sulky, and grieve on her own because that had been her M.O. for her whole life. But she didn't. She started trying to make friends to make overtures to the other baboons. There's a grunt that baboons use that sort of signals that they come in peace. And it was surprising to the primatologists who were watching, presumably, it was surprising to the other baboons as well who were used to her being such a nasty piece of work. And it got the scientists thinking. And what they did was they took their years of data on these baboons. And they were able to calculate a number that essentially was how often the baboons were nice to each other. And then they compare that to their reproductive successes, what they started with, but ultimately, reproductive success, which is how many babies you have or how healthy those babies are, how long they live, and then how long you live, your longevity. And what they found was that the baboons with the strongest social bonds, lived longest and had more and healthier babies. So longevity and reproductive success are as good as you can get in evolutionary terms. And so it made clear that there has been essentially a survival of the friendliest among these baboons. And so that is where this evolutionary idea comes in. And once they discovered that, that was just reported in 2003, the initial findings and then it's been built on since then, that is where we began to say okay, there is something far more fundamental going on here and maybe the stuff that's going on in humans is not just as straightforward as we thought. They thought maybe it was a concept called social support that explained why someone who's more socially integrated live longer. And that makes sense, because most fundamentally, you would say that you have someone to drive you to the hospital, if you need to go at somebody to notice that you need to go to the hospital. And that's true, that makes a difference. People who live alone are at higher risk of dying earlier. But baboons also live longer if they have good friends and

baboons can't drive each other to the hospital. So that is how we know that there is something much more fundamental going on in friendship. And that's what's so fascinating to me.

Jennifer Cohen

So interesting. Yeah, in your introduction, you say that it's time to bring friendship to the foreground, because it's a matter of life and death. And it's a striking statement. But the research that you bring forward, as you just described, really makes that argument.

Lydia Denworth

Yeah. I'm glad you agree.

Jennifer Cohen

So your book is a wonderful chapter, if we could just drill down into the sort of physical benefits aspect of friendship. Your book has a wonderful chapter and titled "Middle School is about lunch". And you look at the phenomenon of social buffering and the protective, positive effect that peers have on not only our mental health, which, as you say, had been recognized for millennia, but our physical health.

Lydia Denworth

Yeah.

Jennifer Cohen

You drill down a little on the effects of friendship, on physical health.

Lydia Denworth

Sure, so everything I just described about the fact that having more friends helps you live longer. The flipside is also true, that being lonely or socially isolated, is bad for you. And a lot of this work that's happened in the last 20 years has been to try to pinpoint why exactly. And it's a pretty startling list. So if you consider friendship at one end and loneliness at the other as two ends of a continuum, right, that basically measures how socially integrated you are. Those things friendship and loneliness, affect either for good or for ill, your cardiovascular functioning, your heart rate, blood pressure, all of that, your immune system, how resilient or susceptible you are to inflammation and viruses, yes, viruses in this time of COVID, your stress responses, how well you sleep, your mental health, so your risk of depression and other things like that your cognitive health, your risk of dementia, and even the rate at which your cells age. So there's a little cap on your DNA called a telomere and it gets shorter faster in people who are lonelier. So they are actually biologically older than someone who is more socially integrated. So in addition to friendship having real evolutionary advantages, it has real here and now

health advantages. And so I will go so far as to say friendship is as important for your health over the long haul as diet and exercise. And almost none of us treat it that way. And we should.

Jennifer Cohen

Incredible. So loneliness should be looked at as a public health crisis, you're arguing.

Lydia Denworth

Yes. So it's important to define some terms here. So loneliness, is the subjective feeling that there's a mismatch between the amount of social connection you want and the amount you have. And social isolation, which is what so many people have been forced to live with during the pandemic is the more objective measure of your size of your social network and the number of social interactions you have. Both are dangerous. But loneliness really seems to be especially bad for us. Because it's how we feel. I mean, it's possible to feel lonely in a crowd, right? So it gets at that need to really feel a sustaining connection with other people. But that's not the only I mean, there are benefits to more casual relationships, too. We can talk about that. But if we have to pick, if you're going to ask me, you know, how many friends do I have to have? The answer is really one, the biggest step change is between zero and one friends in terms of your health and loneliness. Yes, it is a public health crisis, what it does to our body. So I mentioned the immune system earlier, I'll just explain that a little bit more. So there what we know is that, and I won't get too technical here, but your genes are your sort of blueprint for how you might be in the world. But then whether or not genes are turned on or off has a lot to do whether they're expressed is the scientific term, you have a scientific audience, right?

Jennifer Cohen

We do.

Lydia Denworth

Whether the genes are expressed or not has a lot to do with your environment, the environment that you grow up in, that you live in. So this whole idea of genes times environment, right is what we know now of epigenetics that's a quite a new, relatively new field, but fascinating. And it changes how we think about genes. But so what happens in the body when you are lonely is that the cells in your immune system, so especially the white blood cells, the leukocytes, the genes in them are expressed differently, when you are lonely and when you are not.

And those genes that gene expression, that difference in gene expression is the difference between that susceptibility versus resilience to inflammation and viruses and things like that. And, you know, it's like, why would your white blood cells care about that, and what's happened is they identified this response. It has a very technical name, which is actually escaping me at the moment. It's CTRA which I think it stands for conserved transcriptional response to adversity, but I could have that wrong, but maybe we'll go back and double check.

But it turns out so that that's what your body is doing when it is lonely. And then it turns out that your body does this same kind of response in the immune system, to other really big things like trauma and poverty and living through a war. And most of us would never have put loneliness on the same scale as those other things.

And I think what this science is telling us is yes, this rises to the level of a major traumatic experience, if it's sustained. But the other thing I want to say about loneliness is that we also understand, a little loneliness, like a little stress can be good for you in that it is a biological warning signal. It's your body telling you that you need to connect, and in fact, deep in the brain, this was theorized quite some time ago, in fact, between the time that my book came out, and now it went from theory to having some evidence is the first pictures of the brain. Deep inside the brain, they can show now that loneliness looks an awful lot like hunger pangs, there's a real similarity to how your midbrain, deeper parts of the brain are responding to hunger and to loneliness. And I think we can think of it in the same way. It's telling us it's warning us get out there and connect your body needs some connection. Now, once loneliness becomes sustained, and chronic, that's where it starts to do harm to the body.

Jennifer Cohen

That is incredible. I'd really like that framing of loneliness, which is more positive as a nudge to get out and be more social. Wow. I was just going to ask about neuroscience. And my next question. And what that has helped us understand about friendship. You outline a number of critical elements to friendships in the book, time spent with another person, one of your experts even gives a number of at least 50 hours, proximity face to face and physical contact. One of the experts you cite identifies the two most important elements to a friendship as laughter, and disclosure. But the other crucial aspect of friendship you highlight is this feeling of empathy. And there's a wonderful quote from Edith Wharton, you have in the book about a friend being not a separate person, but an expansion and interpretation of oneself. And the answer you just gave about gene expression being so dependent on social relationships informs that quote, for me even more. How has neuroscience helped this field of evolutionary biology progress, if they're connected, or is neuroscientist separate way of understanding friendships, that's giving us insights into the way the brain works, as you were just describing loneliness triggering the same neuro response as hunger, that type of thing?

Lydia Denworth

Yeah, no, I think neuroscience is proving really critical. In fact, that's how I first got interested, it was at a social neuroscience conference, and the whole field of social neuroscience is relatively new as well. And it is all about how much of the brain is designed to connect to other people. The analogy I use in the book is that there's been a lot of attention, a lot of what neuroscience has been focused on is trying to map the connections in the brain. That's what the Big Brain Initiative that Obama put so much money into is all about. But you can also think of social neuroscientists anyway, as trying to map the connections out of our brains and our bodies and to other people, and showing how much of difference that makes and just as one example of the way neuroscience, or actually I'll give you a couple, in this last year when we were all stuck at home and spending so much time on Zoom and things like that which most people hadn't used before. Neuroscience can tell us something about the difference in the response in your brain to watching someone on a screen versus interacting with them in person. So, eye contact when you are face to face in person operates a little differently in your brain or activates your brain a little bit differently, it primes the communication parts of your brain to get ready to connect, and Zoom does some of that, but it's not all the same. Also another thing that neuroscience does is really show us how sensory or the sensory nature of friendship is, so much of it is about what you take in with your eyes and your ears and your sense of touch and smell. And maybe we don't think about smell very much as humans, and when we think about how we interact with other people, but it all factors in, all of that sensory information is

being processed by your brain. And I mean, it's why babies when from the minute they're born, they're predisposed to focus on faces. Why would that be if it didn't get them something if it wasn't useful, right? I mean, why would a face stand out for babies among anything else, and yet, it seems they fixate on faces and things that look like faces, and then they get better at that, almost instantly, like you can tell the difference between a baby born in one week and then the next week in terms of how fine-tuned their social sort of visual and auditory skills are. And then across those first couple years of life, there's a trajectory that neuroscientists can identify of how babies are getting better and better and better at the sort of social elements of neural processing. And another thing that neuroscience does that is just super cool, I talk about it at the end of the book, because it's really the cutting edge is that they're now trying to look at different people's brains while they're interacting together. Or, I mean, that's hard to do. But we're beginning to be able to do it just for technological reasons, it's hard to do. But these same neuroscientists did this very cool thing where they use social network analysis to map out how connected a bunch of students, so they were all students in a graduate program at a university. And they were able to say, you know, okay, Joe is friends with Jim and friends with Sally, but doesn't really know Kate. And then they put people in the scanner. And they showed them video clips, and they were able to see that the way your brain processed different kinds of video clips, it's kind of like a neural fingerprint, but also that there was similarity in friends. So you could predict just by looking at how similar the brain processing was, who was friends with who and who wasn't because they processed it differently. So it literally means that you are seeing and hearing the world, more like your friends, and less like the people you're not friends with. I don't know if that made sense. But I think it's fascinating.

Jennifer Cohen

Yeah, incredible. So your book ends with a reminder that for friendships to work positively, they require a lot of attention. A lot of work. Your recent article in Salon addressed the subject of ending friendships.

Lydia Denworth

Yes.

Jennifer Cohen

When is it healthier for people to do that? And under what circumstances should people end friendships?

Lydia Denworth

Yes, this is one thing I wish I had put in the book because it comes up so much. So clearly, this is on people's minds. I am in the camp that believes that it's okay to end friendships more than people think. So and what I mean by that is that, first of all, there's more churn over the course of our lives than we sometimes imagine. And as an example of that, I have a statistic in there about sixth grade, you mentioned that there's a chapter Middle School is about lunch. Well, that's really about what's happening in childhood and adolescence in the brain and behaviorally and how kids are learning to be social. But one of my favorite statistics, or I think most telling is that sixth graders, two thirds of sixth graders change friends between September and June of the sixth

grade year when you're usually about 11. Now, part of what that is, is in the US a lot of sixth graders are coming from an elementary school where they were in one classroom and then going to a middle school where they're starting to move, you know, they're in a different environment. So some of it is environmental and context. But think about all the sixth graders you know, who are in the middle of the pangs of and the pain and the sort of excitement of all of that social turmoil. They think they're the only ones going through it. And in fact, two thirds of sixth graders are changing friends. And it's sort of a natural process that's happening because they're meeting new people. They're also starting to coalesce their own interests and things like that. I think that kind of change in friendship is a little bit. If you imagine that same sort of September to June of sixth grade year as one long trajectory through your entire adult life, I think you probably are changing your friends in similar ways. Now, that said, what really, really matters is that you have good quality friendships in the core of your life, sort of your inner circle, you need people that you can really count on. And friendship, the science of friendship actually gives us a kind of handy definition of friendship. That is, it's a relationship that is long lasting and stable, that it's positive. So it makes you feel good. And it's cooperative. There's a reciprocity and helpfulness to it. Those three things are necessary to consider something a good friendship. And if we take those three, we can say that we need to sort of look at our relationships and see whether they're hitting all of those things, and they don't all. So sometimes we have relationships with people we have a long shared history with, but we find it very draining to be with them or other friendships are very lopsided. One person does all the talking, and the other does all the listening, and it never ever evens out. And those are the kinds of relationships that you want to look at and say, Is this the best use of my time? Because the truth is, we have limited time. And friendship does require time requires time to make friends, and then it requires some time to maintain them. I mean, to get really technical biologists talk about the energy use, that we put into our relationships, and that the benefits that we get from it have to outweigh the costs to us. That's a pretty reductionist way of thinking about it. And yet, if you think about it, we use that kind of language when we talk about friendship, when we talk about somebody being draining, it's essentially a saying that it's using up my energy in a way that is depleting, right. So the other really important thing to know is that ambivalent relationships where there's good and bad in how you feel about someone turned out to not be good for your health, according to the research so far. And that's interesting, because a lot of us think that the good must outweigh the bad in those relationships, where we feel a bunch of different things about someone. But that does not seem to be the case, biologically, it shows up in your heart rate and other kinds of measures, that aging of yourselves that I talked about, those researchers have been looking at that. And so this is not to say that every relationship in your life can possibly be all good all the time. I'm not. I don't live in some fantasy world, where I think that's possible. And sometimes you know, what it's about is having a relationship where you can work on it, and it can get better. And you can talk about things when there's a problem. And sometimes we don't make that effort with our friends instead, I mean, what I wrote about in Salon is that we have a tendency to just kind of walk away we ghost people, and unsubscribe and unfollow and you know, these social media gave us terms for the end of a friendship in a way that we didn't have before. They're kind of harsh, but they do capture something about the end of a relationship. So look for the relationships that are sustaining, and that make you feel good, but also examine your own behavior in your friendships. And I think that definition of friendship is something long lasting, positive and cooperative, actually gives us a template for how to be a good friend. It's to be a steady, stable presence in somebody's life, to be reliable. It's to make them feel good. So think about when was the last time you told your friend what you like about them or that you appreciate them, and then be helpful. Show up. Notice when somebody needs you and reciprocate, and make sure that you're doing at least as much listening as talking.

Jennifer Cohen

That is such incredibly good advice and so helpful. Thank you for that. Let's turn to your 2014 book "I can hear you whisper an intimate journey through the science of sound and language". How did this book come about?

Lydia Denworth

This book is about my youngest son Alex, who is deaf and uses a cochlear implant and a hearing aid. Just in case people aren't clear. A cochlear implant is essentially artificial hearing. So a hearing aid uses the residual hearing that a person has and just amplifies it makes everything louder in a very technically sophisticated way now, but basically you have to have a little bit of hearing in your ear to make use of a hearing aid. A cochlear implant does not require that it bypasses your ear altogether and it takes in sound as a little computer, it's got a little computer processor that sits on the back of your ear and it takes in sound and it digitizes it. And then it sends it through these electrodes through the skin through a series of magnets. And then another set of electrodes goes to the inner ear, and it sends the signal up the auditory nerve to the brain, and the brain is able to make sense of it, and understand that sound as language or whatever else anybody's listening to. And that really, so cochlear implants mark, the first time that we humans were able to, it's not a cure, but to mitigate a major disability in that way. So that what it does is it takes people from being deaf to being sort of hard of hearing, but my son can, he's 18 now, he can hear with his equipment on his head, he hears really well, like in a sound booth, he can hear like 95% quality, not so much in the real world. It's messier and noisier. But, you know, he operates really fluently in the hearing world. So that at its best is what cochlear implants can get you. But my book is about it's a combination of things. It's part memoir, about the experience of being his mother, because Alex was the first deaf child I ever really knew in a meaningful way. And I, you know, I knew perfectly well that deaf people lived very happy, fulfilling lives or could, but I didn't know anything about how to help him do that. So I was thrust into this whole new world. And then, because I'm a science writer, and a reporter by profession, I mean, in a sense, I was writing that book from the minute he was born. I just didn't know it at the time. But I was learning all about deafness and sound and what sound does in the brain, and he was my youngest child. And so I thought it was an experienced parent, I had been down this road, I knew what I was doing. But there was so much I didn't understand or had taken for granted with my first two boys who could hear and in teaching them language, and then teaching them to read. So for instance, I never understood that reading was related to sound and that most kids use sound to develop spoken language, but then everything that they've processed in terms of sound, then leads to their being able to read the same, the circuitry that gets laid down in the brain to listen is then fundamental for reading. And that actually explains why a big number of deaf adults who were signing don't read well, they read at a fourth grade level. And that is an unfortunate truth that most people don't know. And it is because sign language is a different language than English, you can't read in sign language. And also many, many deaf people don't learn sign in a kind of native way from the beginning. So that's another question. So I began to understand deafness as a story of the brain as a brain plasticity story that this question of how language and sound shaped a child's brain was fascinating to me and felt urgent and important. And then I also could see, though, that there was this whole cultural story. So the third strand of the book is the cultural history of deafness and why there was actually so much argument over cochlear implants and why they were so controversial. And I got dropped into this as a hearing parent. And so I was used to thinking of myself as a very tolerant and liberal person. And yet in this story, I was kind of one of the bad guys in that I wanted to implant my child. And I wanted to understand why that could be viewed in such a negative way.

Jennifer Cohen

Yeah, the book is such a moving story of your family's love and strength and your son's resilience and intelligence and humor, and also just an incredibly intricate lesson of the mind boggling complexity of hearing, and how that process interacts with the brain. So to pick up on your last point, you outlined in the book, the two ways that deafness is framed, you can be deaf, sort of little D, a medical condition or deaf, capital D, a culture with its own language, a more social model of understanding that can you flesh out those two worlds and how you navigated that as a family?

Lydia Denworth

Right. So that is exactly what I came to understand is that there were these two ways of thinking about deafness as a medical issue or as a cultural one. And most people like me who are hearing think of deafness as well. So it's a whole question of Is it a disability or a difference? That's basically sort of sums it up in a nutshell. And the thing that is interesting about cochlear implants was they came along in the 1990s really, is when they kind of really in a meaningful way, and there was a perfect storm, because it was the same moment that Deaf civil rights were flowering. And you may remember the Americans with Disabilities Act came out in 1991, and Gallaudet University, there were protests in the late 80s, early 90s, there about having a deaf president, and the students shut down the university for a time, they were finding their voice, so to speak, and saying there's nothing wrong with us. And also, American Sign Language was, and other sign languages in other countries, were being recognized as real languages in every sense. And in fact, if they are learned at birth in the same way that spoken languages, they are laid down in the brain in the same way that use the language parts of the brain, obviously, there's a more visual component as well. And so the auditory parts of the brain can get, partially not entirely, not as simplistically as people imagined. But some auditory parts of the brain get used for visual things. It's because that's prime real estate, right? But people like me, thought that cochlear implants were miraculous. And I still think that they are. And the other thing of it is that cochlear implants came along at a time when people have been trying to, quote unquote, fix deafness for a very long time. And nothing ever worked. Right. And so there was this fundamental objection on the part of the capital D Deaf culture, that they didn't need to be fixed. And also, I think, a belief that this wouldn't work any better than anything else. And the real objection was not so much to the technology by itself because in say, an older adult who loses their hearing late in life and has been part of the spoken world. Nobody really objected to those people getting cochlear implants, because they were not part of Deaf culture. It was the implanting children, that was seen as so egregious. And there was an idea that deaf people knew better than a hearing parent, what a deaf child needed. And I mean, there was even talk of taking kids away from hearing parents and having them be raised in the deaf community. I mean, that's the most extreme version. Most people didn't say that. But this question of what you as a parent, I mean, there is a fundamental truth there, that I can never understand exactly how my son experiences the world. Just as if I had adopted someone from another race or culture, there's something about his interaction with the world that I won't get, right. I mean, that's true of all of us in some ways. But there's something more, deeper here. But my argument is that, well, first of all, cochlear implants actually do work. And they work remarkably well. Not for everybody, and they're not perfect, they don't just make you hear as if you had no deafness whatsoever. In fact, I have a quote in there that I loved from someone who works on this science. And he said that it's basically like listening to Donald Duck read a ransom note. That's the quality of the sound for a lot of people. So that gives you a sense. I mean, there's a lot of specifics about the different elements of sound that get worked by the cochlear implant, and it tells you, as you mentioned, the sort of intricacies of hearing. We have no, I mean, we don't appreciate in the least how complicated it is and what our brain is capable of doing until you don't have it. But cochlear implants for most people, and if children get them young enough, they really work. And what's interesting is that the brain, the reason this is a child development, and a plasticity story

is because the earlier kids get the technology, the better sense their brain makes of it. and the more able they are to speak fluently, and to listen well, and then also to read, and there is what's called a sensitive period in the brain for sound. And if you don't get sound within that period of time, that part of the brain will get used for something else. I mentioned that earlier. And so the argument in Deaf culture was that that no one should be implanted until they were old enough to make the decision for themselves. But that argument ignores the science because if you in fact wait to implant children, you have made a decision because you will never be giving them the access to sound that they can get if they get the implant when they are very young. And it also to me is a fundamental question of what kinds of decisions do parents get to make for babies and young children? I think it's your job to do the best things that whatever you think is best for your child. For me, what we decided was that we wanted to give Alex access to this technology and all that comes with it, which is the opportunity to speak and listen in the world, not to need translators. And I always talk to him about Deaf culture that it's out there. And it may be that as he gets older, he wants to explore that. And that would be absolutely fine. I've told him all the things I think are wonderful about Deaf culture. But I didn't want to shut off his options. And I felt that not giving him a cochlear implant would do that.

Jennifer Cohen

Finally, let's turn to your 2008 book, toxic truth, a scientist, a doctor and the battle over lead. It's such a fascinating story. And you've been so generous with your time, Lydia, we're not going to do it justice. I commend it just as much as the other two books. To our listeners. I'm wondering, so much of the story that you lay out in the book is about determining, quote, acceptable risk. Yes. And I'm wondering if you thought about how the lessons from that story apply to today, where so much of the understanding of the pandemic is trying to land on an acceptable risk threshold?

Lydia Denworth

Haha. Yes, I mean, I lead is a case study for so much. Because this comes up again, and again. It comes up with toxins, obviously, it's with climate change. And yes, you're exactly right with the pandemic and the virus and how we need to operate. It's this weighing of the balance between public health and economics. And the answer is, as we've seen with the pandemic is that people will disagree. And on some levels, they may have to agree to disagree, because different people have different priorities. But we do have a responsibility to health and public health. And actually, in the pandemic, in some ways, I think it's a simpler story is that there's a real argument that the economics benefited from a stronger public health approach upfront, right, and consistently, so that we could get back to more normal life faster. And that by ignoring the public health advice, people extended and made worse, right, the pandemic, and you can see, I mean, the sad thing in our country is that everything became so politicized. And that was not the case in a lot of other places. I mean, I know that in Canada, liberals and conservatives alike followed the mask rules and things like that they really succeeded in separating this from politics. But ultimately, what science does is gives us the information we need to make informed decisions and then to make the best decisions we can do. The pandemic has been an interesting case of seeing the messiness of science unfold, though, because of course, you don't know all the answers, and you've got to work them out and science is figuring them out as it goes. I think they've done remarkably well. But they're never going to be able to give us the kinds of assurances that people want. And some of that is the way just our psychology is, our cognitive bias. We're not comfortable with uncertainty.

Jennifer Cohen

And my last question, Lydia, how do you feel the field of science writing? How would you grade them on meeting the task of explaining science to the public? And what advice would you have for people getting started in the field of writing about science for the public?

Lydia Denworth

Well, certainly I think I and my colleagues at Scientific American do it really well. I have to say that. Not everybody does. I do think that people have outdone themselves during the pandemic. You need to read the science writers, though, the people who do this regularly because they have a better understanding of how science works. And I think that the value of good science writing has been made crystal clear here. I mean, all you have to do is read Ed young in the Atlantic to see how powerful it can be. Or Carl Zimmer writing about vaccines and viruses in the New York Times. I mean, they're two of the best in the business, and they're amazing. People getting started should look to the people who are good at this and look at how they do it. You need to be skeptical. It's not just gee whiz, and isn't this cool? It's asking questions, you need to become familiar with how scientists talk and write which can be impenetrable. And scientists need to do a better job of communicating at their end. But you know, you just start by putting ideas out in the world and what I say for all writers is, when you're starting out, make your goal 100 rejections. And not five acceptances because if you aim for 100 rejections, you will get five acceptances and you'll have had to put that many ideas out into the world.

That's a more technical, freelance writing kind of piece of advice, but look for ideas go out there, listen to scientists see what they think is interesting and then tell people about it.

Jennifer Cohen

Lydia Denworth, thank you for your exemplary work in scientific writing for the public. We eagerly await your next project and best of luck in the future.

Lydia Denworth

Thank you, Jennifer. It's been great.

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