Season 2, Episode 1: Monita Chatterjee Transcript

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Karen Gordon: All right, so welcome to season 2 of the Hear Here podcast, and I'm really excited to welcome back co-host, Dr. Sharon Cushing.

Sharon Cushing: Hello, everyone

Karen Gordon: and Dr. Blake Papsin

Blake Papsin: Hello

Karen Gordon: Okay, season 2 of the Hear Here Podcast, I'm really excited about this and I want to thank Dr. Monita Chatterjee for agreeing to come on and speak with me she is a senior scientist and the director of the Auditory Prostheses and Perception Lab in BoysTown National Research Hospital which is in Omaha, Nebraska in the United States, welcome Monita.

Monita Chatterjee: Thank you so much Karen for inviting me I've listened to a few of your podcasts so far on this Hear Here podcast program and they're brilliant.

Karen Gordon: I pick people who are just wonderful to talk with. I'm so happy that you're here. you have such a wealth of experience, and you are so willing to share that.

So let's start maybe at the beginning.

Monita's Journey in Academia; Electrical Engineering to Neuroscience

Monita Chatterjee: I grew up in Kolkata which is used to be called Calcutta in India, the very big crazy city . My parents were both professors of literature and I, I was an only child and the one thing I wanted to do is not go into a field that my parents knew anything about. So luckily It so happened that I was pretty good at math and physics and things like that. in India, you really have to choose pretty early on, so I chose science. I wanted to study physics, but then it so happened that there was a competitive exam for engineering and I got in. So I had to choose between physics and electrical engineering. I went to the university campus and there was some electrical engineering people and I felt like they're really fun. You know in electrical engineering, there were maybe like 8 women in a class of, you know, 90 or something. The cohort I was with the guys, you know were largely very, very cool and very good friends and we remain very strong friends and actually my husband was one of them. We were in the same class.

That electrical engineering program was really designed to make us into power engineers, power systems engineers. As I went through the Program, I kind of started losing interest in some of the kinds of jobs that might be available for me, you know. And I had been volunteering at a at a place sort of like a home for children with number of disabilities. A lot of the kids it was you know they had neurological problems probably stemming from poverty issues in large part, The field of neuroscience wasn't really known to us in India, so I kind of made it up in my head and my professors all thought I was insane.

Karen Gordon: And I'm sure they had more of an interest maybe in biomedical techniques, but not necessarily the more basic principles of neuroscience.

Monita Chatterjee: Right so biomedical engineering was just starting, you know you could sort of sniff it in the air. I wanted to understand how this whole brain thing works

Karen Gordon Of course, you wanted to apply all of that electrical engineering to a physiologic human property, I totally understand that.
So that got me thinking about all the work that we've done also using neural responses to inform us about the impact of cochlear implantation in children. Some people will argue that no, we really just want to know about how they're doing how they're functioning. But I still think there's a value in understanding how the auditory system responds to this unusual stimulation.

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Let’s hear what Blake and Sharon think about this.

Blake Papsin: That's incredible, incredibly important, especially in infants. That's why we've continued to do it.

Karen Gordon: There’s this idea that that the neural responses have to tell us what the child or the adult with cochlear implants is actually hearing, and those two may not be the same thing. it makes it complicated when we try to use these measures as biomarkers.

Sharon Cushing: And I think it's important not to underestimate that gap right? That's sometimes where the magic happens

Karen Gordon: Let’s get back to Monita. She explains in the next part how she found a doctoral research program in the US that was right for her.

Monita Chatterjee: In the US, there were few programs that I found that were not based on biology.

Karen Gordon: We should just remind people that you didn't have the Internet to go and Google.

Monita Chatterjee: So there's something called the United States Educational Foundation of India. Luckily I was in a big city so they had a big branch. There was a room full of these you know Peterson's guide. We spent hours in there, looking for programs that we wanted, and for me, this is a major challenge, because you know I didn't know the word neuroscience existed.

By chance, this white brochure falls out between two Peterson's guides. And it's this Institute for Sensory Research at Syracuse university and there's a PhD in neuroscience and all the Faculty have electrical engineering degrees, except for one, I think, and there was a picture of a neuron and the charging equation for the membrane. And I'm like, "I know this equation!".

Karen Gordon: The sign from above.

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Sharon Cushing: I liked Monita's, you know, hearing about her background, because, you know, I came to thinking about neuroscience in my undergrad, and I worked with an electrical engineer, Ken Rose, who did just that and looked at sort of the function of neck motor neurons. And so, you know, it was a very familiar place for me, although you know again, we come from 2 very different backgrounds. That was probably the first kernel of my journey, you know. The the next kernel came when as a first year resident, I was in an operating room with Blake Papsin right, and he bothered to ask me what I did before I came to medicine. I told him about that experience with Ken Rose, and literally that afternoon he introduced me to you, Karen. I still see that day as sort of a pivotal moment in my journey. So I think that, like again, it's a story about electricity and human connection and there's a lot of, um you know, fun and exciting parts to it.

Karen Gordon: Amazing.

Blake Papsin: You know a parent just asked me the other day, they asked me, why did I choose this, uh, field? And I said I didn't really...It chose me. The understanding of sound is really the most important thing in my life. I wanted to know about it, the deeper into the science I got. And so my entire life has been twiddling knobs to improve the way things sounded and now I just do it surgically as well.

Karen Gordon: Let's get back to Monita to hear about how she began her PhD studies with Josef Zwislocki. Listeners might know his name as he made landmark contributions to auditory science including the Zwislocki coupler, used to this day for calibration of sound at the eardrum.

Monita Chatterjee: So, I went in January and I'd never seen snow.

Karen Gordon: What was that, like to work as a graduate student for one of the leaders in auditory research.

Monita Chatterjee: He was known for being very authoritarian and very strict. He's also a genius. I actually you know, it took a lot of guts, I think, looking back, but I did we had a very good working relationship. We had a framework that we built together and that really helped that conversation.

Electrical Stimulation within the Cochlea

Karen Gordon: What was it about what you found in your PhD that led you to your work in cochlear implants.

Monita Chatterjee: We got training in neurophysiology and modeling and psychophysics and we sort of rotated the labs. There's also somatosensory lab a group there so we got quite a bit of training in these various areas. We came out of this program feeling like you could attack almost anything. I was getting very excited and you know about the cochlea. It was a time when you know Kemp's discoveries had happened, and this whole idea of the active feedback mechanism in the cochlea. A t the same time, cochlear implants was starting to really happen

Karen Gordon: You point out such a big shift in the way that we were thinking. That the cochlea was active -more active than we realized in that it, it really is such an integral part of how we hear soft sounds and fidelity between different frequencies.

Monita Chatterjee: It was not at all clear. I was wondering how am I going to go from this, you know neural systems to perceptual stuff. There were those scientists that felt that this whole issue of cochlear implantation is unethical. Safety studies hadn't been done, which is true right. And they just felt that you know, this would not work.

Karen Gordon: That's a really important point, I think. Even now we are so amazed that the cochlear implant does work. So I think it would be valuable to listeners to explain why at the beginning, this idea of just because you can stimulate the auditory nerve with electrical pulses, why the translation into actual hearing seemed completely untenable.

Monita Chatterjee: You know the cochlea is more sharply tuned in in live animals. In our field, people were just obsessed with this incredible tuning. Nobody really thought that just with you know one or a few electrodes, right, that you could possibly represent that that gorgeous detail, right, that the cochlear manages to do.

Karen Gordon: It reminds me that we can't get too wedded to our ideas that are popular at the time. In a way – we've talked about luck even in science – in a way the cochlear implant is a little bit of luck. It just gives enough to give the brain a chance to put it all together.

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Karen Gordon: At the time that Monita was entering the field, when she finished her PhD in Auditory Neuroscience, cochlear implants were just a new invention. She really enjoyed her work with cochlear implants at the House Ear Institute. She says they jumped and skipped along the hallways to see the initial cochlear implant recipients because they were just so excited to learn about what was possible with this new device.

Sharon Cushing: I think you can go through a whole career and see lots of advancements without ever seeing something as big as the cochlear implant It's a really special technology.

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Monita Chatterjee: It so happened that Josef Zwislocki went to a talk by Bob Shannon at an acoustical society meeting and Bob was presenting those first I think he was presenting those data with that were later published in Science. So, I had to figure out how to get to Bob Shannon I didn't know him so it to you won't believe this, I went to a Gordon conference at Bryant College Rhode Island, which is now Bryant University and the reason I'm saying you won't believe this is that we just met at Bryant University.

Karen Gordon: And we were there two weeks ago, so tell me about the work that you are doing at House at that time.

Monita Chatterjee: I wanted to understand everything at the smallest detail. So I asked if I could work on channel interaction, which was part of the project. Qian-Jie Fu was going to work on speech perception staff, we just divided up things and Qian-Jie and I. And then soon John Galvin came in as a technician for speech, perception outcome in CI patients all at the same time, you know.

Karen Gordon: We're talking about an evolution from single channel to multi-channel devices, so this was a really important time.

Monita Chatterjee: We had this set of CI patients: there were like three or four of them that would come into the lab basically every day. The excitement I can’t describe it to you Karen. I don't remember ever walking from my office to the lab I think we all ran you know.

Karen Gordon: These early participants just encouraged new generations of people that were following them and I tell participants today, the same thing. I think it's really an important part to to thank them for their time and for that willingness to volunteer and commit and be part of this.

Monita Chatterjee: Those early participants, they were amazing people, their contributions I you know, cannot be overstated. I think they had to have more of an adventurous spirit and more you know, a desire to live life more fully.

Karen Gordon: you were really working and honing on the electrical stimulation, to give them that access to speech and the understanding. But I think we should acknowledge that we want to improve upon where we're at now.

Karen Gordon: What do you think, Blake?

Blake Papsin: Yeah, it's interesting. I now have implanted children whose parents I implanted as children. And that was a big question. Do they work? Are they some subset of humanity where they're not deaf and not hearing, marrying each other. But no, they're generally functioning and doing well, it has been an amazing thing. It's not to diminish the importance of implants, but I think they are at the end of their shelf life. I really believe that certainly every direction is pointing at robotic insertion and genetic manipulation, and physiologic or hormonal manipulation of the electrode inside. Each new refinement of the device is actually bringing as many, if not more, limitations to their use, because they're becoming very delicate and hard to handle. It's fascinating. I think the asteroid is gonna take them out one day, and I don't know what the asteroid looks like- if it's a genetic asteroid or a robotic asteroid- but it's coming.

Karen Gordon: I think the wow factor was from silence to sound. That's the biggest change you can get. The brain says, that is a change I can really recognize. There is nothing, now there's something. The changes between one sound and another are smaller, and the implant is trying to make those subtle changes meaningful.

This is a good segue to think about how the cochlear implant provides subtle cues in sound like what emotion is being carried in speech. In this next part, we discuss studies that investigated this issue. Our group at SickKids found that children with cochlear implants don’t always understand the emotion conveyed in speech and Monita has done wonderful work that expands on this. You’ll hear more about this from Blake and then Monita.

Cochlear Implants, Emotion Perception and Communication

Blake Papsin: So cochlear implants have a signal field wave envelope and, based on that, the brain miraculously does its best to pull emotion and stuff out of the world. It does it well enough to get fed but not well enough to stay out of trouble. Socially, these kids are not integrated because they simply misread the emotional queues in the environment.

Monita Chatterjee: What even got us on our way because those early studies from your group. These issues of emotion perception. Our lab in general had been looking at intonation, perception question statement contrasts, and that was you know also inspired by Peng, I felt like this is such a difficult stimulus. How you know as a psychophysicist (a recovering psychophysicist) how are we going to control this thing? We're getting into the production of emotional information by children. What are the mechanisms that might help some kids do lots better in communicating emotion?

Karen Gordon: It was really from Blake Papsin who said: “Why can't they understand my jokes?” and I said: “Because you're not very funny.” And it was true that there's a subtlety in a joke, a sarcasm, an intention in a voice.

Monita Chatterjee: It was very surprising to me that the post-lingually deaf adults had impaired emotion recognition and not that different really, in the perceptual domain, from the children who had, been born deaf.

Blake Papsin: They developed entirely novel pathways because because every living thing needs to find a way to eat, to remain safe, and to have children. There's a number of social skills involved with that third one, as you can imagine. And they find their way with limited information by either manipulating their environment or finding a certain number of questions to give them the answer that they need. It's never ceased to astonish me how phenomenal the ability to adapt humans have.

Karen Gordon: In this next part of the discussion, Monita moves from how cochlear implant users hear emotion in speech to how they produce emotion in their own speech.

Monita Chatterjee: The adults who lost their hearing later in life are fantastic at emotion production, right. The children who were born deaf are, showing some deficits here. Here we can see that things like an earlier age of implantation helps and we know that the speech therapists aren't provided with tools to address this.

When I hear the children’s speech, they seem very good at producing their phonemes and yet the emotions they're producing are not as well identified.

Karen Gordon: Do you think that this is something peripheral and how they're able to move the articulatory mechanisms or is it something cognitive where they've missed that nuance of emotion. If they haven't cued into it in an auditory sense, then, of course, they won't produce it.

Monita Chatterjee: The fact that they're producing words so well, tells me, and you know they all these kids have substantial speech therapy, so I wonder if speech therapy might solve it. You know it's just a matter of learning to produce these emotions.

Karen Gordon: We've done such a great job in instilling language for children who have pre-lingual deafness and use devices like cochlear implants, but I've worried that it has been very based on optimal listening conditions, not real-world type of situations. We have the children usually seated, not moving around, sometimes we put them in highchairs, and you know buckle them in. They sit with an adult, the therapist, and another adult, usually a caregiver/parent. It's only one hour a week typically so not a lot of time. That kind of example is very, very different from where they're going to be in the rest of their lives. So maybe we should be focusing on the kind of communication that they would need in a group and in their school and their daycares and in their homes.

Monita Chatterjee: I cannot agree more with you, I mean we don't even know you know how normally hearing typically developing children are talking to each.

Karen Gordon: Why it's really fascinating that you say that. What I learned from my own children and then watching other children is, they love to be with peers, and they're very engaged in their activity and they get this incidental hearing. They pick things up they kind of check on each other, but they don't look at each other, the way that we do as adults. We stand one place and we sit in a room at a table. Kids are not like that-they're engaged in lots of other things while they're communicating.

Monita Chatterjee: I think it's a different world you know this world of child life, compared to the adult world you know. We're struggling to get teenagers to even want to talk in an emotional way. Right, they're like, "No- don't make me do that thing".

Karen Gordon: Really so tell me what you're asking them to do.

Monita Chatterjee: We have two tasks. One of them - they read a scripted set of sentences in a happy way, and then a sad way. We don't give them any training or practice or anything. And that's still okay/ tolerable to teenagers. However, the second task, so it's a wordless storybook, we noticed that up to ages 12 or 13, it's okay.

Karen Gordon: Yes. Yes, this is a really important stage- the adolescent teenage stage. We often talk about these normal confrontational personalities. That's part of their development at that time.

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Topic: Engaging Teenagers and Young Adults in Research

Karen Gordon: I want to segue there to the discussion of teenagers. It came up when Monita was talking about designing research paradigms for children and for adults. and the teenagers - it's such an important part of development.

Sharon Cushing: I think you know I think you're right, I’ve been one, I haven’t yet raised one. I think it is tumultuous period in in every sense of the shape and form And then you add on a child that has a special relationship with their parent, because they've had medical appointments to go to. And that relationship might be different because of all of the stuff that went around the cochlear implant, or whatever chronic illness they had. And then I think there's this added layer related to the importance of socialization and and becoming an individual. Gillian, our social worker- I'm always interested in what she has to say and reflect on in the team group that she runs. Just in the ways that these children respond to social cues or initiate social activities. I don't think we understand it.

Blake Papsin: The other thing that's interesting, we might be asking the wrong questions unless we involve the children in the design of the paradigms that we're going to test. And we, historically have not done that. And I think that's our mistake, as a field is not to do some of this a very, very important work of including the the adolescents in in the design of the study, not just as subjects.

Karen Gordon: That is such a great connection to our episode number two, where we talk to our Lab Ambassadors. These are cochlear implant users, as well as siblings of cochlear implant users, who are in our lab team. And there are our guides in the lab to what we're doing. And I, I've become very sensitive to exactly what you've just said. We have no idea directly what this experience is. We are not cochlear implant users. We know where the limitations are but, at this stage, the subtlety of not understanding the experience, and how we can help through the research, that's where we are.

Blake Papsin: It's fascinating what it's called the model is called YARP, Young Adult Research Partner, flow of engagement.

Sharon Cushing: Sometimes we forget as clinicians that we're not the ones living this, right? And we're used to having an answer and sometimes we forget to listen. And and I, I see this in the importance of you know I can sit with a family and try and explain to them as they sit there with their baby, who is newly diagnosed as deaf what life is going to be like with a hearing-impaired child. What the benefits of cochlear implant are. But- them speaking to a parent who's been through it? It's way better than anything I can ever tell them, and it's because it brings that reality to it. In truth, most of us haven't lived that journey.

Karen Gordon: Yeah, I think shared experiences are really important, and and, as you say, we can learn and create nuances in our own work by taking into account those direct experiences. This also leads me to discuss Monita's leadership and a support to the BIPOC community in the auditory research world. Because she said she looked around and was getting comments from people saying. You know I I'm in situations that I don't know how to navigate. Can I get your advice? And so forth? And so she took it upon herself to be the ears, and then it became more formal, to to create a group. And I think you know I'll let her tell the audience about that group and her leadership there.

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Topic: BIPOC Network within the Auditory Community

Karen Gordon I also want to talk about your leadership in the hearing community for Black, Indigenous and people of Colour (BIPOC) network

Monita Chatterjee: It's a very new effort. In the last two years, particularly during COVID, a couple of people reached out to me for help with situations they were in that led me to suddenly realize that there's a certain, you know, isolation in being a person of color in our field, currently. And, I have been reading, for instance, the audiologists in the US, um, are 92% or so, white, right. Um, and similar numbers for speech language pathologists. Um, our labs may be somewhat more diverse. If you look at the proportion of full professors that are people of color again, you see the basis of that isolation. It's small numbers really small numbers. What I realized is that when you're a person of color in a lab where maybe you're a woman and most people are white men.
These people that reached out to me had faced some problem, it might be a technical problem, it might be some of their career related problem. they didn't feel comfortable bringing that problem to the attention of people in their labs. They didn't want to be the person of color or the woman who couldn't solve that problem on her own. I just felt like if someone doesn't do something, we're going to lose the few people that we have who are of color in our field and that's a terrible consequence. I brought a few people together and I said, “Hey do you think there's a need for a network that we share resources, we share mentoring”. It is an affinity space in other words. It's all people of color, so we are not marginalized. They really felt strongly that there was a need, so I just like declared it that afternoon.

We've had three meetings so far. The first meeting was you know, maybe top 25 people total students to full professors. Now it's more than 120 people. I see the need. In our meetings, we've talked about a number of things, including how do you deal with the microaggression that you might experience that totally destroys your day. And you may not be able to talk to people about it because they wouldn't understand. How do you deal with that? how do you seek out resources? how do you seek a cohort to make sure you're not just by yourself?

We've also had some lovely science presentations. Recently Jasmine Kawasa gave a fantastic talk. EEG you know they don't work so well if you have African hair. If a child has epilepsy, and they go to the hospital and they need your basic EEG. That measure is not as good. We know this happened during COVID with the pulse oximeter measures. She gave this beautiful talk about her work, and you know, addressing these issues. Institutions have you know these EDI statements. A lot of times what I'm hearing is that the burden of this falls on people of color, you know, who are already burdened. We're cited less, receive few less funding, you know the, the data are all coming out, if you're a person of color, if you're a woman who's a person of color, you have to work that much harder for your work to gain the recognition it deserves.

Karen Gordon: True, I see this happening, where the responsibility of creating that space is falling to you and thank you for doing it so beautifully. Of course, it’s important for us and the community outside the BIPOC Community to be allies.

Monita Chatterjee: We've had really great great excitement from our allies about this. We've had people reach out and say, “Can you make a list of people who are experts in your network or people who are looking for jobs?”. So we're hoping to provide this interface and resources to allies. We're hoping to do a lot. Let's see.

Karen Gordon: I think we have a real opportunity here because research has an inherent mentorship structure. I personally have felt so enriched or just supported by mentors. Each mentor could be for something different and more nuanced within the career, whether it be a particular part of science, or the experience that you have in your particular place that you're working, your particular country, and you know in in the particular culture that you're in. What you're talking about is trying to get a foothold or recognition and support. Being you know less less represented, but not alone.

Monita Chatterjee: Exactly right yes that's exactly right.

Karen Gordon: I really want to commend you for this work. I'm really thrilled to hear that in such a short time you have such numbers of people coming together, and I hope that people listening here will will be encouraged to join, either in the group directly, or as allies, or whatever you need.

Monita Chatterjee: All they have to do is email me it's monitachatterjee@boystown.org

Karen Gordon: It's amazing, we have just had such a great discussion. I feel like there's so many things that I've learned and thank you so much for doing it.

Monita Chatterjee: you know I love talking about this stuff and I could go on forever so thank you for providing, um, this wonderful platform.

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Karen Gordon: You can catch other episodes of the Hear Here podcast. There's a link on our website. Search Archie's Cochlear Implant SickKids Research Institute or wherever you get your podcasts.

The Hear Here podcast is put together by me, Dr. Karen Gordon, with my colleagues at the hospital for Sick Children in Toronto, Canada, Drs Blake Papsin and Sharon Cushing with a tremendous production and advisory team, Sofia Olaizola, Rachel Bedder, and Maria Khan. Our wonderful Hear Here podcast music was composed and performed by Dr. Blake Papsin.

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