

Inspiring Women

Episode 51: Dr. Natasha Sheybani

Laurie McGraw:

Welcome to Inspiring Women with Laurie McGraw. I am your host, Laurie McGraw. I have spent the past 30 years in leadership, and over the years I've come to learn one thing, women need women and not just any women, but inspiring women. Tune in every week to hear from women at the pinnacle of their careers and from others who are just starting out. Episodes can be found at inspiringwomen.show, or subscribe on your favorite podcast app. Thanks for listening and I hope you will be inspired.

Today on Inspiring Women, we're speaking with Natasha Sheybani. Now, Dr. Sheybani is a PhD who is a senior scientist at the Focused Ultrasound Foundation. There, her role involves supporting research programs in glioblastoma, gene therapy, and cancer immunotherapy. She's a postdoctoral research fellow at Stanford University. Her research focuses on how focused ultrasound can be applied for the treatment of cancer.

Now, Dr. Sheybani, at the age of 11, was doing experiments in a garage. And then fast forward many labs later after her work and undergrad work in biomedical engineering from Virginia and UVA, she then began to do her work at Stanford. She is a leading scientist, recently recognized as a 2020 wunderkind, which celebrates the unheralded heroes of science and medicine and the next generation of scientific superstars. And Dr. Sheybani, I'm delighted to be speaking to you today.

Dr. Natasha She...:

Likewise, it's such a pleasure to be here and I want to thank you and the Inspiring Women podcast for having me.

Laurie McGraw:

Well, let's get going. So, I always start Inspiring Women trying to get oriented just in terms of what are you doing today, as a scientist at Focused Ultrasound work? What is your day job, day to day?

Dr. Natasha She...:

Oh, yeah. I feel like I'm very biased, but I have one of the most exciting day jobs, which is, I just get to think about critical scientific issues all day, every day. And in my case, all of these relate to ways that we can treat cancer in an improved manner.

So as far as Focused Ultrasound research goes, as you mentioned, my foray into that field sort of began while I was a graduate student. When I was 14, I had started doing drug delivery research. And I was really fascinated by this area, so I decided to dive a little bit deeper into image guided drug delivery, when I started my PhD at the University of Virginia. And that was when I sort of fell into the field of focused ultrasound.

And just to give a little bit of background, focused ultrasound, is this really exciting, disruptive technology, if you will, that basically is a non-invasive means of depositing sound waves into the body in order to exert different biological effects. And these effects can sort of come in a variety of forms, so we tend to think of these sound waves as operating on a spectrum from being thermal to mechanical in nature. So, we can heat up tissues with these sound waves. We can mechanically disrupt them.

And what's really exciting about that is, we're discovering all these different therapeutic effects that can emerge from the use of these sound waves. And at the foundation, actually, we have some exciting resources that help people kind of visualize what this looks like. But what we often liken it to is, if you go out on a hot summer's day and you take a magnifying glass and hold it up to the light, you may have even done this as a kid, you basically can focus all of those light rays into a single point. And for instance, burn a hole in the leaf. Well-

Laurie McGraw:

Okay, okay. Hold on, Natasha. We got to back up a little-

Dr. Natasha She...: [crosstalk].

Laurie McGraw:

... bit here. When I was 14, I was focused on getting my braces off and things like that. So I just have to back up a little bit to-

Dr. Natasha She...:

Sure.

Laurie McGraw:

... what are you talking about, "When I was 14, I started doing research in..." Again, this is a really different beginning to be doing deep science, serious science, that has led to some new technology breakthroughs. And I do want to learn more about those technology breakthroughs, but how does that begin? I mean, usually the science types of experiments that we're doing in the labs, in those early science classes, they're not the level that you are talking about. How did you get so interested, so deeply involved, at that early age?

Dr. Natasha She...:

Yeah. So prior to entering the field of focused ultrasound, I kind of bounced all over the scientific world. So, you mentioned that I started doing science experiments in my garage at home, and that was totally true. That's not made up. Basically, I think was very lucky that I had parents who exposed me to math and science and fostered a love of math and science in me very early. And I think it's because I showed some interest.

But in part, I feel like one of my earliest memories, like the time when this really blossomed into something more serious than just messing around with concepts in my garage was, I had some really great middle school science teachers. So specifically, I'm thinking of this mother and daughter pairing. Their names were both, Mrs. Kelly, because they were mother and daughter. And we would do a lot of cool science in their classroom. But they, at some point, took notice of the fact that I was really interested in this stuff.

And so what happened was, that at the time there were sort of these local science fairs that a lot of different counties were participating in, but I sort of lived in a pretty rural county. We didn't have a lot of access to outside resources, in the way of doing science after-school. So, our county generally didn't participate in these fairs. I had found out about them and really wanted to participate. And the Mrs. Kelly's basically gave me access to the school lab after school. They gave me access to our classroom, and also set me up with these cool, little plants called, astro plants. So, these are basically a type of plant that goes up into outer space. And all sorts of studies have been done on these plants in space, but sometimes they're ordered for the purposes of classroom experiments. And we happened to have some.

At the time, I was also very interested in the concept of fractals. So I'll never forget, my very first scientific poster was based on a project where I basically looked at fractal patterns in these astro plants. And the poster was covered in big red glitter-filled letters. The title was, Fractal Frenzy. And I ended up actually winning first place that year at the science fair. [crosstalk]

Laurie McGraw:

And was it for the astounding research or the glitter? Was that the-

Dr. Natasha She...:

I like to think it was a mix of both.

Laurie McGraw:

Natasha, I love the call-out to the Mrs. Kelly's. I think-

Dr. Natasha She...:

Yes.

Laurie McGraw:

... sometimes we forget how impactful teachers are to unlocking and unleashing that innovative mind and mindset that young innovators have. So, that's just really terrific that you had that opportunity and then we're able to pursue it with things like access to labs and other things where you could experiment.

Fast forward a little bit for us. So you started... You did this experimentation. You started to do... hone in on new advances in technology, some math was a part of it, and then, you started to move to an interesting cancer specifically. Where did that sort of shift happen? And that's a very large problem. People have been trying to solve cancer for a long time. But based on the research, as I understand it, you actually believe that you can make some advances, some significant ones, based on these new technologies. What's happening there?

Dr. Natasha She...:

Sure. So yeah, I mean, my exposure to cancer research, again, really took its most mature form, I would say, during my studies as a graduate student. So, that's at the time where I had entered this domain of focused ultrasound.

And just to preface why cancer, I mean, for me, I think cancer is one of the most fascinatingly profound problems that we face, from the standpoint of diseases that afflict humanity. And there's this really fascinating biography called, *The Emperor of all Maladies*. And essentially, it's a biography of cancer itself as a disease. Siddhartha Mukherjee is the author and he takes the reader through basically the history of cancer from the very beginning, or somewhat the beginning.

Laurie McGraw:

Mm-hmm (affirmative).

Dr. Natasha She...:

And the reason I mentioned this, is because there is a really powerful quote in that book, which basically states that, "In many ways, cancer is a reflection of the self. Cancer is essentially a pathological mirror of our existence as humans." And that's really interesting when you think about it, because part of what I work on, as a cancer researcher, is enabling this really exciting class of therapies known as, immunotherapies.

And immunotherapies are basically these drugs that can go in and empower your immune cells or equip your immune cells with the ability to better recognize and fight off cancer. And one of the reasons that this is a major challenge in general, is because cancer has this really fascinating ability to veil itself from the body, such that your immune cells that are typically surveilling the body just simply see tumors as self. So in essence, these immunotherapies trigger the immune system to actually recognize tumors as being non-self.

Now, one of the challenges with immunotherapy, even though there has been, I think, a lot of exciting progress in the field of immunotherapy... And when immunotherapies work, the exciting

thing is, that they really work. I mean, we've seen patients who have even seen so far as cures with immunotherapy. But unfortunately the percentage of patients that receive this benefit, particularly those with solid tumors, is very small. We're talking about 15 to 40% of patients, out of all those who have cancer, receive benefit from immunotherapy. So, we want to widen that margin. We want to make these therapies more accessible to a broader scope of patients.

Well, incomes focused ultrasound. One of the exciting things and the thing that I'm still most excited about in terms of using sound waves in the body, which at first, sounds very science fiction-y, is simply the fact that we're starting to learn that these sound waves, depending on how you apply them, can actually sensitize tumors to immunotherapy. Meaning that, they can basically perturb the tumor tissue in such a way that the right types of immune cells infiltrate these tumors. And make the tumor more recognizable to be fought off by the immune system, much like your immune system would fight off the common cold. So I think the holy grail for us is really, to be able to leverage focused ultrasound as a technology in such a way that it can actually aid in the implementation of immunotherapy paradigms, going forward.

Laurie McGraw:

Well, I certainly hope that you're successful. I mean, advances in these critical areas, is important. You mentioned a key word in there, access. I mean, with any new innovation, making sure that it is available to everyone so everyone has an opportunity for optimal health, these are critical things. How do you, at your young age, think about access, health equity, so that innovations like you are working on, are available to everyone who could benefit from them?

Dr. Natasha She...:

That's a great question, and definitely not something that I take lightly. A lot of us can still sort of be in our own silos as researchers, trying to solve these tough problems. But as you mentioned, at the end of the day, if they're not able to reach all the right people, then what's the point, in a sense? I do believe that everybody should be able to have access to technologies like focused ultrasound, to therapies like immunotherapy. But as you know, there's still a lot of hard work that remains.

And so, I think my abilities as a scientist sort of span a few different facets. I mean, one sort of critical sub-component of that access question you're talking about is, I think, medical literacy and scientific education. Right? I think that there are a lot of ways that we, as scientists, can sort of reach out and inform the broader population of these possibilities in such a way that they're more equipped with the kind of information and the kind of options that they can actually seek out, for instance, in their cancer care.

So one really exciting part of graduate school or even now in my capacity with the foundation, one exciting part of my sort of job description, if you will, has been to really reach out, to go into broader communities. And try to educate people on what focused ultrasound is, for instance, and what opportunities to even contribute to scientific research can look like. And that's an activity in particular, that I really enjoy doing with younger populations of students, sort of the next

generation that's coming up and may not even know what kinds of opportunities they have access to.

I just wanted to mention actually, that this is sort of a great opportunity to highlight the Focused Ultrasound Foundation's work. One exciting part of getting to interface with that foundation, as a graduate student and now beyond that, is that the foundation is really hard at work, basically trying to enable that access that you're talking about. And there are a lot of people who have the expertise in a far greater capacity than I do, to sort of usher focused ultrasound into the clinics. And not only do that, but also make it accessible financially, to patients. So, I think that that frontier is really exciting.

Laurie McGraw:

It's good to hear, Natasha, that that is part of what you're already thinking about, because it is a big problem. And it's definitely not one of those things that should be an afterthought. It should be embedded. I want to move the conversation a little bit more to you, specifically. And so Natasha, during your work as a PhD student, your advisor, before you earned your PhD, described you as, "The most prolific student he ever had, in his 22 year tenure of advising PhD candidates." And this was during the course of this pandemic. I am curious, how... I mean, that is a pretty astounding, wonderful accolade from that tenured professional. Tell me about that. How could you be sort of like at that top of the game, during the course of a pandemic?

Dr. Natasha She...:

I firstly want to say that as a graduate student who worked really hard towards getting a PhD, I think that that is just one of the most exciting and gratifying comments that you can receive, at the end of the journey. I mean, receiving the honor of being a star, wunderkind and getting that comment from my advisor, I think, was hugely validating in so many ways. As you mentioned, he is a full professor, he is extremely accomplished himself. And so I think that receiving that comment from somebody who has sort of seen a lot more than I have within the scientific landscape and the training landscape, is really exciting.

But in a sense, I think what it takes to get a comment like that, is just hard work. That's always been my philosophy. I think the reason that I maybe got that comment was just because I was always juggling so many different tasks. And I was so incredibly excited about what I was doing as a graduate student, that that just sort of fuel the work and kept it moving forward. And I think that that excitement was even contagious at times, with the people that I was working with. Again, to receive that comment, I think it's just a testament to the fact that, if you love what you're doing, you'll be good at it, eventually. And I just got lucky that I've sort of been able to fall on that track and find something that I'm so passionate at this age, to where I can really just continue building the research and growing in that context, in the years to come.

Laurie McGraw:

I always wonder about comments, when women like yourself say, "Oh, I was lucky." I never believe it. I have to tell you, I always think that it's something personal that drives that luck. So,

that's just my color commentary on that. Let's talk about the pandemic. That has impacted all of us, but in scientific communities, we have seen some of the most astounding and excellent research, resulting in things like vaccines and other scientific development because of this pandemic. What are you seeing? Certainly, you have been prolific. You are very passionate about the work that you're doing. Are you seeing this permeate across the scientific community? Give us a sense for that.

Dr. Natasha She...:

Yeah, I am. I mean, I've definitely noticed a shift in the culture. And personally, I hope it stays that way. I think that a couple of the key things that this pandemic motivated, were really a new take on team science. And we're talking about this at a multi-institutional, multinational level where people really came together around a pressing issue. And I think it was the urgency of the challenges associated with the pandemic that really motivated people to maybe reconsider the paradigm for how they were doing their science. So I think one major part was, again, that team science.

The other is, just the nature of open science, also. I mean, the rate at which papers were coming out as relates to COVID and the vaccine, was just unprecedented in a lot of ways. And there are even a lot of people already talking about the fact that, if we could take this model and apply it to other pathologies like cancer, like Alzheimer's disease, if we could basically generate that momentum and that robust team effort around these other problems, then who knows what we can do in the coming years. And so, I... And sure, I've definitely seen a culture shift, but my only hope is that we really use that as an opportunity and we leverage it, going forward.

Laurie McGraw:

How do you think those opportunities could be leveraged for women, specifically? So you are a woman scientist, we sort of know the numbers, there's not enough women in stem. We're looking for greater gender parity and equity, both in numbers, as well as contributions, recognitions, leadership types of roles. You both had mentors, you also are a mentor. What do you think this acceleration might mean or could mean for women specifically in the field of science?

Dr. Natasha She...:

Yeah. I think one thing it certainly means, is at this very exciting time, there are some very prolific women who are being propelled forward in their careers, and are making very meaningful contributions to science. And one exciting opportunity that lies within that, is for those women to, in turn, pay it forward. And I think for all of us as women, to consider paying it forward in a very meaningful way to future generations of women.

So it's interesting you ask these questions, because I've been on several panels recently where it's basically been a discussion among women about women in science. And I think that a lot of the general consensus around what we should do or in a lot of cases, should simply continue to do. Right? It's not that we're not doing these things, but we ought to do more.

What we should do, is really champion other women. And I think, again, especially during this time, if and where, there are women in a position where they have the ability to advocate for others, sometimes mentorship reaches a point where it's no longer enough. I think that mentorship is such an important concept, but there's also the concept of being a sponsor for the next person. And so where women have the opportunity to be that sponsor, and for instance, to pick up the phone, or put in the nomination, or to advocate for another woman behind closed doors, those are the things that are going to help everybody move forward in a meaningful way. And I think, especially for women, there are so many exciting and sort of ripe opportunities around this. Because even podcasts like this are a Testament to the fact that we have such a strong community already. And it's really about using that community to the fullest extent.

Laurie McGraw:

It also speaks to... And I will just say, Natasha, it is encouraging for me to hear, that here you are at a young age, already at a level of accomplishment in your profession, but with a sense of agency and voice and feeling that you have those opportunities. That's encouraging to hear. I really am enjoying this conversation and don't have time to sort of cover everything that I'd like to cover with you. But maybe as we close out on Inspiring Women, Natasha, based on where you are today, could you just give us a sense of what you think about yourself in the future? What do you want to accomplish? You have a long career ahead of you. What are you looking to get done, and how do you think about it for yourself?

Dr. Natasha She...:

Oh, if I could have the biggest dream, right? And I think this is true of every scientist who's doing cancer research, I would love to see a world where cancer doesn't exist anymore. I mean, that is the ultimate goal for any of us, who are doing this work. And I think that there are a lot of different incentives to being a scientist. And there are a lot of selfish ways that I could answer that question. But at the end of the day, I think, especially having such a close tie to the clinical domain where I sometimes get to see this work translated... In fact, one of the studies that I worked on as a graduate student, is now in clinical trials at UVA. And so, breast cancer patients are being treated with focused ultrasound and the chemotherapy that I was evaluating at the time.

And I just mention that because, at the end of the day, getting to actually set foot in the clinic and see real people battling cancer, and of course having had personal experiences and even losses in the family, relating to cancer, I think that that is the most noble goal that we can have as researchers. But from a personal standpoint, I'm still dreaming very big. My goal as a graduate student turned post-doc, is much like many who follow this path, in the sense that I would love to go into academia one day. And my goal is absolutely to enter a tenure track faculty position of my own and start a lab where I can continue doing this research.

But I think beyond that, from a societal perspective, there's so much more impact that I dream of having, outside of the scientific domain. There are a lot of, sort of philanthropic and broader societal goals that I have. And I'm very motivated to pursue those, alongside being an academic. So in a sense, I sort of feel like the sky is the limit right now. And I feel very fortunate to be able to say that.

Laurie McGraw:

Well, it's great to have a really large vision for yourself. And I love that you were aiming as high as you are. That's just fantastic. I'm going to look forward to following you, Natasha, and see where this all leads. As we close out on Inspiring Women, I'd just love, if you could just leave our audience with a last piece of important advice, something that was meaningful to you that sort of propelled you on what is your current journey.

Dr. Natasha She...:

Yeah. I think one big piece of advice, and I'm really, I'm giving this to any of the young people who are out there listening, is, you can only plan so much. So I say this because, throughout my journey, there have been a lot of times where I have really tried to plan every single step, in terms of how things were going to turn out, what I was going to do next. But in a sense, the thing that was propelling me forward the whole time, was just this self motivation and determination and hardworking spirit that I had.

But in a sense, I had no idea where it was leading me, a lot of times. But where I am now, I couldn't be more excited about. And the me, five or even 10 years ago, would never have envisioned, the girl in garage would never have envisioned that she would be doing the kind of science that she's doing today. But that's why I like to encourage people to just really hold onto your goals, but realize that there are so many different paths by which you could get there.

Laurie McGraw:

That is terrific advice. I love it. We have been speaking to Dr. Natasha Sheybani on Inspiring Women. And Natasha, thank you so much.

Dr. Natasha She...:

Thank you so much for having me. It's been a great, great discussion.

Laurie McGraw:

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