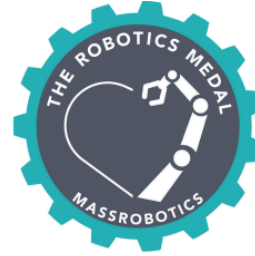# WOMEN IN ROBOTICS GALA

October 26th, 2024

Hello, everyone. Joyce warned me that I would have to work for my medal tonight, so am your evening entertainment. We started with… maybe 10 minutes of remarks. I said, can I have 15? Well, it's going to be a little bit longer because Joyce also told me that some incredible, young aspiring women roboticists would be in the audience tonight. And I wanted to take some time to tell some stories I don't usually share because they are here. I have also invited a lot of my former students and colleagues to share this moment with me. I have many people I want to acknowledge and celebrate tonight.

As we have heard, there are so many phenomenal women in robotics. I was just telling Daniela a couple of days ago that I think women in robotics are the best-kept secret. So, I really want to thank Amazon Robotics and Mass Robotics for deeply appreciating the importance of recognizing and celebrating women's accomplishments in shaping the world through robotics. They bring their brilliance, their creativity, and humanity to this work. And I also want to thank all of you. I mean, I'm just amazed this room is full. You all look fabulous! It just speaks to how much you also understand the importance of recognizing women in robotics. And congratulations to Heather and Josie for their recognition as well. You are inspiring, you're shaping the future, and you're just getting started in your careers. We're looking forward to seeing more of your accomplishments.

So first, I'd like to hear the young women make some noise! You're here! [cheering] We are so delighted you're here.

And as Daniela shared with you, my research group at MIT in the Media Lab is called the Personal Robots Group. We call ourselves "robots," and there are robots in the house! [cheering] *And they all look fabulous*! They are also brilliant and inspiring role models. So, I hope you all have a chance to speak with them as well and hear their stories.

The robotics medal recognizes a woman in robotics, and in my case, the pioneering work is in social robotics and human-robot interaction. It's actually been 25 years since I began this work as a PhD student, right here at MIT, at what was then known as the MIT Artificial Intelligence Lab, working with the famous professor, Rod Brooks, as you just heard. So tonight, I wanted to share a little bit of my personal journey and express my gratitude to all the people who have made social robotics and human-robot interaction the field it is today.

Okay, so this is a little bit of a personal story. I grew up in Livermore, California. As some of you may know, Livermore is the home of two national labs. Growing up, it was a town of cowboys

and scientists, vineyards and lasers. Both of my parents worked at the National Labs, and both were computer scientists. They, of course, cultivated my interest in technology and engineering.

Now, as with many leaders in the field of robotics, they will tell you they were first inspired to pursue this kind of work in childhood from reading or watching science fiction. My parents took me to see the movie *Star Wars* when I was 10 years old. And I was fascinated by and fell in love with the droids, R2D2 and C3PO. These robots were very different from the other robots I had read about in science fiction, or saw on TV or other movies. These droids had rich personalities. They had emotions. They were capable of friendship, not only with each other but with their human companions. They were highly capable, *and* they were lovable. And they were heroic teammates, working alongside Luke and Leia to do really important work, like save the galaxy from the evil empire! How important does it get, right?

Okay, so needless to say, this vision of robots made a lasting impression on me. I was old enough to know that robots like that didn't exist. And I had assumed robots like that would never exist in my last lifetime. They were a fantasy.

So, flash forward. My parents encouraged me to pursue engineering in college. They were very rational about it. They said, Cynthia, you know… you could pursue an undergraduate degree in engineering, and you could still go to med school, you could still go to law school. You could go get a good job. I'm like, okay, that sounds very practical and very reasonable. I went to UC Santa Barbara to major in Electrical and Computer Engineering.

I remember one day, I was sitting around a table with my friends. We were studying, and one of them said, I just read a really fascinating article about people who build robots as lunar rovers and send them to the moon. How cool is that? And I thought… that does sound pretty cool. But do you know what's even more cool? Becoming an astronaut and using robots in space! *Now, that is cool*! So, that became my career ambition. When I wrote applications to graduate school, it was all about me wanting to get a PhD in space robotics so that I could become a mission specialist and go into space with space robots. Makes a lot of sense, right?

So, as luck would have it, I was accepted to MIT. And I say "luck" because Rod Brooks, (y'all know Rod Brooks?), he had just started a new project on planetary micro-rovers. He had already written a paper in 1989 called "Fast, Cheap, and Out of Control: A Robot Invasion of the Solar System." It was a radical concept for how to explore Mars, by not just sending one or two very large, expensive rovers, but lots and lots of small autonomous rovers. So, my timing was perfect, right? I came to MIT to study under Rod Brooks talking about being an astronaut. He had this new project on planetary micro-rovers. I worked very closely with Colin Angle here on the first prototypes. It's as if I came to MIT, you know, and unexpectedly stumbled into my Star Wars dream. MIT is an amazing place. It's just an amazing place.

So fast forward. The year now is 1997. I'm a PhD student. I am well into my doctoral work, now working on humanoid robots. And NASA lands Sojourner and Pathfinder on Mars! This was a celebrated day for all of robotics. I mean, everybody rejoiced at this incredible achievement. I'm

watching footage of this robot on Mars. Amazed. Inspired. But this little voice crept into my head. And it said, "Wait a minute. We send robots to explore oceans. We send them into volcanos. And now we land them on Mars! *Why* are they not in our home? Is the home the final frontier of robots?"

Back at the time, robots were a lot like the first computers, expensive machines that you had to be a trained specialist to use. And I thought about how Apple had brought the personal computer to the home, the idea of this very natural, intuitive interface. So, to do the same with robots, I thought all kinds of people would need to be able to interact with robots in a very natural way. And, perhaps, the social interface was that universal interface.

So, as a PhD student (and did I mention I was well into my PhD?) I marched into Rod's office and I said, "I have stop everything! I have to build an entirely new robot! I have to start looking at social interaction and emotional interaction between people and autonomous robots." In true Rod fashion, and I am paraphrasing, he said, "That's a big idea. I like it. Do good!"

So, there I am! I created the world's first social robot, called Kismet. I collaborated with a lot of my lab mates in order to do that. Robots is definitely a family/team effort. You actually do have to see videos of Kismet in action to really understand the social presence and emotional responses that both fascinated and charmed people. Kismet was able to engage all sorts of people in interaction -- almost like a very young, pre-linguistic child. Kismet didn't speak language, but it would kind of babble in its own way, and it had facial expressions, and could direct its gaze to turn and look at you and other things. But communicated in a way that conveyed a sense of intention, emotion, and desires. People formed an emotional connection with Kismet. Kismet was provocative.

One of the key things that was so different about Kismet is, you know, I read a lot about developmental psychology and the social development of infants, and the critical dyad between a mother and her newborn. Human communication is *not* like playing chess with discrete turns. I feel like a lot of the work in AI kind of views communication as the sort of discrete turn-taking sort of thing. But human communication is a real-time *dance*, and *they call it a dance*. It's mutually regulated through our bodies to share attention, to coordinate turn-taking, to establish an emotional connection, build trust and rapport, and it really underlies all of our ability to collaborate and interact with one another. Kismet was the first robot that could really engage in the dance of communication with people.

Now, when you think about the bigger picture, social embodiment, our human social embodiment, allows us to engage in really rich forms of social interaction. The ability to infer the mental state of others -- thoughts, intents, beliefs, desires -- to communicate, to collaborate, to empathize, to learn from one another. And, whereas most of robotics was interested in this question of how can you build robots that can interact with things, with objects governed by the laws of physics, it is quite a different intellectual pursuit to try to build a robot that can successfully interact and collaborate with entities in the world whose behavior is governed by having a *mind*. That is what we mean when we say social intelligence, emotional

intelligence. So, the pursuit of building a truly social robot is the pursuit of trying to endow robots with social and emotional intelligence.

As the field of social robots and human-robot interaction began to take off, we saw it spread pretty rapidly. It was very exciting to see people looking at all kinds of different forms of human-robot teamwork, collaboration -- whether it's in manufacturing, search and rescue… many, many, many different kinds of physical, practical tasks, I would say. But, in my group, we could not ignore that there was something important and special in the social and emotional engagement that people felt with *our* robots. It was personal. It was relational. They were more than helpers. People connected to them like companions. And we began to ask, "can the social and emotional connection that people feel towards social robots contribute to human flourishing?" Just completely other kinds of questions. Can robots help people to learn in new ways? Can they help people to thrive and be healthier? Can they help promote people to be more curious, more empathetic, more creative? Can they foster a growth mindset? Can they help people be more emotionally resilient and empathetic? And as we built these robots, and we deployed them in longer-term studies, the answer kept coming back, "Yes!" The answer kept coming back, "Yes."

So stepping back, you could sort of generalize to say social robots were this kind of new, powerful, socially and emotionally engaging experience that can bring all sorts of content to life: education content, health content, activities, games, you name it.. to people in their real life, in their physical life, in the real world, beyond screens, in this interpersonal way.
So I started to begin to think about doing a startup. And this was years before Alexa hit the market. Just to put this into perspective, okay? [laughter]. At the time, actually, it was all about mobile computing, right? Smartphones were proliferating. You know, we had smartphones. We had mobile apps. We had the idea of developer ecosystems. These were new ideas that were starting to gain a lot of traction, right? And as the smartphones proliferated, sensors got smaller and better, compute got smaller and faster on device, but also moved into the cloud. Everything got cheaper. All these conditions started to converge. My lab actually started to literally build robots around smartphones as kind of a key computational/sensing/networking element. So, it finally felt possible to bring social robots from the lab into the world as a mass-consumer device at a mass-consumer price point. Maybe even at the price of an iPad, which would be pretty amazing. And not just into the home, but into the *family*. So, social robots, in this way were conceived as a new kind of platform that could bring all kinds of content to life in this new way.

Jibo was founded, and I'm here, joined by my co-founder, Jeri Asher. We were these two women, a dynamic duo, taking on Silicon Valley and VCs, as *women* in this high-tech innovative space. There were a lot of adventures, okay, following the typical nail-biting, rollercoaster journey of a tech startup trying to establish a new kind of product category in the consumer space.

In 2017, Jibo entered the market as the world's first family robot. Jibo wasn't a camera. He was a fun photographer. Jibo wasn't an e-book. He was an engaging storyteller. Jibo wasn't a

telepresence screen. You could jack into Jibo to have a physical social presence with others at distance. Jibo wasn't a digital assistant. He was a helpful companion.

People and families *loved* Jibo. But, alas, Jibo was a product before his time. Once Alexa had entered the market, with Google Home and all the other smart speakers, the business model didn't work. The company had to shut down. Our little Jibo was sold to another company. It was a really difficult time, and I want to share this because you need to know sometimes you go through difficult times. It was difficult for everyone. We put our hearts and our souls into this little robot. And, you know, we loved Jibo, the robot. We loved the idea of Jibo. And we loved what Jibo represented -- a very different and much more humanistic relationship with technology. Jibo was the first robot, really, for the rest of us, who was capable and lovable.

I, fortunately, was able to negotiate a license to be able to continue to use Jibo, the full software stack, and we have the robots, for my research group at MIT. We have continued the work with Jibo, which has proved to be *to this day*, a one-of-a-kind research platform. Jibo allows us to continue the dream: to advance and investigate how people *truly live* with social robots, responsibly and ethically, in their busy, complex lives, day in and day out, over long periods of time. That has really been the guiding research question we have worked on over the past several years.

Today, we've entered the era of personified AI. People are now accustomed to talking to AIs like people -- smart speakers, chat bots. But they are <u>not</u> people. They are <u>not</u> human. And this raises important questions about the ethical design and responsible use of this particularly emotionally engaging, socially persuasive technology. Social robotics has never been more timely or more relevant in the big questions it has pursued in the past that will continue to guide us well into the future.

But guess what? It's not enough. It's not enough because it's not just about us roboticists getting it right. We need to prepare people, everyone, for this AI-powered world. We need a responsible, wise, empowered, AI literate world that can be shaped by, with, and for all. So, a couple years ago, I teamed up with faculty across MIT to create the RAISE initiative. RAISE stands for Responsible AI for Social Empowerment and Education. Ever since, we at MIT have been leading the way in pioneering and scaling up AI literacy for K12 students all over the world -- in the spirit of MIT education that is hands-on, minds-on, hearts-on learning and making. Open and free.

We have trained 1000s of teachers. We have served millions of students through these teachers and through our platforms. You think about it -- students today are our first generation of AI natives in over 120 countries all over the world. We've witnessed the creativity and passion of young people, diverse youth all over the world, with the will to build a better world with AI. What do kids want to solve with AI? A more socially just world. A thriving planet. A flourishing people. And it is truly inspiring.

Sometimes people ask me if I have a favorite robot, and I wonder "Is that? Like asking me if I have a favorite child?" [laughter]. If I had a screen, I could show you a collage of all these wonderful, colorful, fanciful robots, in all kinds of shapes and sizes that we've built over the years. But here's the thing. The robots who I am *most* proud of, are right here in this room, and those who could not join us here tonight. I would not be here, standing before you tonight, without *these* robots. As professors, we often think of our students, as Daniela said, as our children -- our academic children. They come to us as brilliant young adults with huge hearts and huge dreams. And we do our very best to nurture them and give them opportunities to grow and to flourish. And right when they get really good, and I do mean really, really good. They leave us! [laughter] Yes, they leave us. But, it is as it should be. They go, and they change the world in their own unique way. It's a beautiful thing. So, to my students, it has been a true honor and privilege to be part of your journey to greatness, at a pivotal moment in your development, and to help be your launch pad to the world. The world needs you.

Looking back at my journey, I would say there are two quotes that I live by. The first is *Dare Mighty Things* by Theodore Roosevelt. I want to recognize two people who've given me the courage and the confidence to do so.

The first is my father. He always had tremendous confidence in me. He raised me to believe that I could do anything, be anything, through hard work, education, and resilience. But if you think about it, Title IX was passed in 1972. I'm among the first generation of girls, attending public schools, who benefited from equal access to educational resources and opportunities regardless of gender. That's literally the year I started school. My father, of course, knew this, and I think it's why he may have stressed this to me. He gave me this deep sense of confidence not to be afraid *to strive as a girl,* and to take on bigger and bigger challenges.

The second person who gave me this courage to dare mighty things is my advisor, my academic father, Rod Brooks. Not only did he give me access to tremendous resources and opportunities here at MIT, he was a living role model of visionary thinking. And, you know, back in the day, Rod had very different ideas about robotics that were not popular with a lot of leading figures in the field. But he persevered, and he pursued them with us, and demonstrated their merit. He taught us all academic courage.

The second quote I find myself living by is *Lifting as We Climb*. This is a quote from Mary Church Terrell, a famous African American suffragette. As time has passed, I find that my work is increasingly inspired by an important social mission -- to serve and contribute to the opportunity and betterment of others through my work. Wisdom, valuing human experience, human creativity, responsible design, and empowering others -- applied to technological innovation (and in my work, applied to robotics) – is what the Media Lab is all about. I'm joined here by Dava Newman, the Director of the Media Lab. It is an incredible place that has really shaped my ideas. And being part of this community has allowed me to grow, and change, and evolve in important ways. So, I want to acknowledge the Media Lab, MIT, and Dava for that.

And finally, I want to talk about the importance of love and family. I am joined here by my husband, Bobby Blumofe. I have three sons. Two in college and one in high school. And as you might imagine, we are pretty nerdy. This summer, we as a family, watched the entire *Attack on Titan* anime series together. How many of you know *Attack on Titan*? [cheering]. Right?! Attack on Titan! We really got into it. And, I mean, we *really* got into it. For my birthday, my middle son, Nathan, gave me a family portrait, where we are all members of the survey corps. [laughter]. Now, the survey corps is the elite fighting group, the vanguard, who protects and defends the city against human-eating giants, called Titans. So, in this family portrait, we are standing atop the city wall, city ablaze in the background, with our capes flying in the wind, standing in different dual Katana hero poses, and wearing our omnidirectional mobility gear. We are looking super badass. All of us, *super badass*. Okay, so why do I share this with you? Well, it is my favorite portrait! But, also, when you dare mighty things -- when you are taking on titans -- the love of support of your family is huge. It's huge. And knowing that whether you succeed or fail spectacularly, and I have done both, knowing that your family has got your back no matter what, gives you the courage to keep going. So, Bobby, you have been my foundation these many years. I can place my ladder and climb as high as I dare. And I continue to dare, as you know. I continue to climb with the determination and the strength to lift others along the way. I could not do this if you were not my rock.

As we all know in this room, robotics is hard. It's really, really hard. But the dream lives on. So, dear colleagues in robotics, who have joined me here tonight looking particularly dashing, together, let us dare mighty things, lifting as we climb, to advance a humanistic vision where robots engage, uplift, and empower us to become who we aspire to be, and help us to achieve our dreams. I cherish being on this robot adventure with you all. And I look forward to celebrating our future award winners, our fantastic and fabulous women in robotics.

Thank you.